PCA Case No. 2023-01

IN THE MATTER OF AN ARBITRATION

-before-

THE COURT OF ARBITRATION CONSTITUTED IN ACCORDANCE WITH THE INDUS WATERS TREATY 1960

-between-

THE ISLAMIC REPUBLIC OF PAKISTAN

-and-

THE REPUBLIC OF INDIA

FIRST PHASE ON THE MERITS

MEMORIAL

VOLUME I

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CHAPTER 1: INTRODUCTION

1A FRAMING THIS FIRST PHASE ON THE MERITS

1.1. The Indus Waters Treaty (the "**Treaty**") concluded between the Governments of India and Pakistan, and the International Bank for Reconstruction and Development (the "**Bank**" or the "**World Bank**"), on 19 September 1960 was the solution to and marked the settlement of a rupture between the two States, going back to their earliest days, of the most dire and potentially catastrophic kind that threatened the stability of the region. On 1 April 1948, Indian East Punjab severed the water supply to Pakistani West Punjab, depriving a significant proportion of Pakistan's population of water just as the summer crops were about to be sown. Lahore was deprived of its main source of water. The situation was desperate.

1.2. An interim agreement—the Inter-Dominion Agreement on the Canal Water Dispute ("**Inter-Dominion Water Agreement**")—was reached to resolve the immediate crisis a month later, on 4 May 1948. That Agreement also committed the Parties to further meetings between their representatives, each side having concluded, after an examination of the legal issues, the method of estimating the cost of water to be supplied by the East Punjab Government, and the technical survey of water resources, that further discussions were necessary. The Indus Waters Treaty was the culmination of those further long and painstaking discussions and the solution agreed upon by the Parties to address, once and for all, the visceral issues of transboundary water allocation and rights that were the unresolved consequence of the United Kingdom's partition of British India into what became the independent States of the Islamic Republic of Pakistan ("**Pakistan**") and the Republic of India ("**India**"). The (British) Indian Independence Act, 1947 (the "**1947 Independence Act**"),[1] enacted on 18 July 1947, proclaimed "two independent Dominions", following which Pakistan declared its sovereign independence on 14 August 1947, with India following suit a day later, on 15 August 1947.

1.3. Section 4 of the 1947 Independence Act divided the Indian Province of the Punjab[2] into West Punjab, to become part of the newly independent Pakistan, and East Punjab, to become

[1] Indian Independence Act, 1947 ("**1947 Independence Act**"), **Exhibit P-0327**.

[2] The name "Punjab" means "Land of Five Waters", referring to the five tributaries of the Indus River, the Chenab, Jhelum, Beas, Ravi and Sutlej.

part of the newly independent India, on the basis of a boundary to be determined by a boundary commission chaired by the British appointed Sir Cyril Radcliffe, with other members being drawn in equal number from the Muslim League and the Indian National Congress ("**the Radcliffe Commission**" or "**The Punjab Boundary Commission**"). Failing agreement within the Radcliffe Commission, the boundary in the Punjab was eventually delimited by its chairman alone, in The Punjab Boundary Commission Award of 12 August 1947, the possibility of such an approach having been expressly contemplated during the passage of the 1947 Independence Act.[3]

1.4. The line running from the British partition of India and the Ratcliffe Boundary Commission dividing the Punjab, through the unresolved and potentially seismic issues of water allocation and rights across the partitioned province, and the near catastrophic dispute of April–May 1948, to the Indus Waters Treaty, is clear and reflected on the face of the Treaty. By an exchange of Notes Verbales dated 19 September 1960, the same day on which the Treaty was signed, India and Pakistan agreed that, on the ratification of the Treaty, the Inter-Dominion Water Agreement "shall be without effect". That Exchange of Notes, together with the text of the Inter-Dominion Water Agreement, which was superseded and replaced by the Treaty, are reproduced as the first annexure of the Treaty—Annexure A—thereby shining a light on and incorporating the roots, historical context and foundational character of the Treaty in relations between Pakistan and India.

1.5. This cornerstone character of the Treaty in the sovereign relations between Pakistan and India is reinforced by both the Preamble and the concluding provisions of the Treaty. The Preamble is expressed in terms of the delimitation of ("delimiting") the rights and obligations of each Party concerning the use of the waters of the Punjabi rivers. Article XII(4) provides that the Treaty "shall continue in force until terminated by a duly ratified treaty concluded for that purpose between the two Governments." In other words, the delimitation of water allocation and rights was intended to be in perpetuity.

1.6. Seen through this prism, it is neither fanciful nor an overstatement to describe the Treaty, as Pakistan has done, as akin to a treaty of peace or a boundary treaty. In fact, it is both. It was conceived in May 1948, in general terms, even if not in the particular, as a

[3] Section 4(3) of the 1947 Independence Act provided that the expression "award" was to mean "the decisions of the chairman of [the boundary commission] contained in his report to the Governor-General at the conclusion of the commission's proceedings." 1947 Independence Act, **Exhibit P-0327**, p. 5.

necessary instrument to settle a transboundary dispute of serious proportions between the two States that threatened to destabilise the nascent birth of independent Pakistan and India. That dispute, dramatic in its effects and seismic in its portents, was a direct and immediate result of unresolved boundary delimitation issues in consequence of the British partition of colonial India and the Punjab Boundary Commission Award. The delimitation, once and for all, of transboundary water rights and obligations, as a necessary component of the partition of the Punjab, was the driving imperative of the Treaty, its acknowledged purpose, and its effect. It is a peace agreement and a boundary treaty rolled into one, save only for its name and that it addresses only some, and not all, of the issues between Pakistan and India that were left unsettled by the 1947 partition.

1.7. The relevance of this appreciation to the task of the Court of Arbitration (the "**Court**") in this First Phase on the Merits is addressed throughout this Memorial. It is an appreciation that informs Pakistan's argument and, Pakistan submits, should also inform the Court's approach to its task, not just its understanding of the technical issues of interpretation with which it is faced. There are disputes that find their way to third party settlement in which the task of the court or tribunal is informed by an appreciation of the virtues of an economy of reasoning—address only what needs to be addressed; not more. This is not one of those cases. With the present dispute, Pakistan and India stand on the cusp of a much wider and potentially more hazardous and destabilising dispute about access to and use of water. India says that it wants to renegotiate the Treaty. It has plans to build hundreds of dams on the waters of the Western Rivers, with potentially disastrous consequences for Pakistan and its people. It contorts the meaning of the terms of the Treaty and denies Pakistan rights that are set out in the Treaty in plain terms. It is weaponising water, as was done in April 1948, and is threatening to do more. If neighbourly relations are to be maintained, this situation cannot be permitted to continue.

1.8. The Treaty contemplates, in Article XII(3), the possibility of modification "by a duly ratified treaty concluded for that purpose between the two Governments", i.e., by the agreement, but only by the agreement, of the Parties. Pakistan is not averse to addressing the future with India; far from it. It wishes to have good neighbourly relations with India. But any engagement on the issue of the rights and allocation of the waters of the Indus system of rivers can only rest on a considered appreciation of what has already been agreed. Relations between the Parties cannot rest on a moving platform, still less on a platform that one Party considers that it can shake unilaterally. Stability is required, as a foundation and as a starting point. That is the role of boundary treaties and of peace treaties. That is the function of the Indus Waters Treaty.

1.9. The Court, as the Treaty-mandated neutral third party arbiter, competent to determine any question concerning the interpretation or application of the Treaty, can aid in the search for stability. A fully reasoned award, addressing not just narrow issues of interpretation but also the Court's appreciation of the system of the Treaty and the place that it occupies in the fabric of the sovereign independence of the two States, would contribute immeasurably to stability between the Parties. It would establish a common prism through which the Parties could better approach the issues that divide them. This case, and in particular this first phase of proceedings, is more than just about the interpretation of technical provisions of the Treaty concerned with the design of new Indian run-of-river hydroelectric plants ("**HEPs**") on the Western Rivers. It is about the system of the Treaty and the balance that was reached by the Parties in 1960, against the background of a portentous dispute, to delimit their rights and obligations into the future. As the Court comes, in due course, to deliberate on its award, Pakistan urges it to do so with a sense that an economy of reasoning will not best serve the Parties. This phase of the proceedings is not about a finely crafted *dispositif*. It is about a considered and reasoned award that, through its analysis and conclusions, not just its operative part, will provide a benchmark by reference to which the Parties will be able to pursue their future relations.

1.10. As is addressed more fully elsewhere in this Memorial, the Treaty embodies three bargains relevant to these proceedings, an appreciation of each of which is necessary to inform the Court's understanding of the issues of which it is seised. The first bargain is the **Peace Bargain**, the settlement between the Parties that addressed the unresolved transboundary issues concerning the use of water across a partitioned territory. The second bargain is the **Treaty Bargain**, narrower in scope, focused on the *quid pro quo* between the Parties, the agreement between them on the terms of the division of rights and obligations in respect of the use of the waters of the Indus system of rivers—the waters of the Eastern Rivers being allocated to India for its unrestricted use, subject to limited and tightly constrained exceptions; the waters of the Western Rivers being allocated to Pakistan for its unrestricted use, subject to limited and tightly constrained exceptions.

1.11. The third bargain, most directly engaged by the present dispute, is the **Western Rivers Run-of-River Hydro Bargain** ("**Hydro Bargain**"), i.e., the bargain between the Parties, reflected in the Article III rule of "let flow", non-interference and no storage of water on the Western Rivers, by which India is bound, subject to the exception (for present purposes), for India's benefit, of the entitlement to generate hydroelectric power, subject to the narrowly framed provisions of Part 3 of Annexure D of the Treaty. While, though, it is the Hydro Bargain that is most directly engaged by the present dispute, this Bargain cannot be fully understood without an appreciation of the broader bargains under which, and pursuant to which, the Hydro Bargain in intended to operate.

1.12. The Court of Arbitration in the *Kishenganga* case had a sense of these bargains, even if they were not articulated in those proceedings in these terms, and even though the dispute before that Court did not, perhaps, require an appreciation of all of the moving parts of the Treaty in the same way as is required by the dispute of which this Court is seised. In setting out the background to the dispute in its Partial Award, the *Kishenganga* Court described with care the origins of the Treaty and its purpose, going back to 1947–48.[4] Addressing the territorial scope of the Treaty, the *Kishenganga* Court noted as follows:

> "The Treaty was negotiated and concluded amid difficulties in the relations between India and Pakistan. One of the most profound and sensitive issues between the Parties was (and remains) the question of sovereignty over Jammu and Kashmir. […] The Court thus has no doubt that the manner in which the Treaty expresses the Parties' rights and obligations represents a conscious effort to reach a definitive apportionment of the use of the waters of the Indus system of rivers, while avoiding entirely the matter of sovereignty over the areas through which those waters flow. To this end, the Treaty focuses on the right of each Party to the *use* of some of the waters of the Indus system of rivers without going into the question of sovereignty over the territory of Jammu and Kashmir through which some of those rivers transit."[5]

1.13. While not in name, this is the prism of the Peace Bargain.

1.14. Addressing the Treaty directly, in the context of its analysis of the Second Dispute of which it was seised (concerning drawdown flushing), the *Kishenganga* Court proceeded to examine the issues "within the context of the Treaty as a whole—in particular, against the

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[4] *Indus Waters Kishenganga Arbitration (Pakistan v India)*, Partial Award (2013) XXXI RIAA 55 ("***Kishenganga* arbitration, Partial Award**"), **PLA-0003**, ¶¶ 130–139.
[5] *Id.*, ¶ 360 (emphasis original).

background of permissible uses and the allocation of rights on the Western Rivers."[6] It went on to observe that:

> "[…] one of the primary objectives of the Treaty is to limit the storage of water by India on the Western Rivers (and, correspondingly, to prohibit entirely the storage of water by Pakistan on the upper reaches of the Eastern Rivers). […] The outcome was significant in that it achieved a careful balance between the Parties' respective negotiating positions, allowing India hydro-electric use on the waters of the Western Rivers while protecting Pakistan against the possibility of water storage on the upstream reaches of those Rivers having an unduly disruptive effect on the flow of water to Pakistan."[7]

1.15. This, in high-level summary, is the Treaty Bargain.

1.16. Addressing the requirements for Run-of-River Plants under Annexure D of the Treaty, the *Kishenganga* Court found as follows:

> "The right to generate hydro-electric power (provided that such generation is conducted in accordance with Annexure D or E) is an express exception to India's obligation to let flow the waters of the Western Rivers. Annexure D provides comprehensive criteria for the design and operation of new Run-of-River Plants."[8]

1.17. The Court's subsequent analysis of the operation of Annexure D makes it clear that it apprehended—if not in name, certainly in substance—a Western Rivers Run-of-River Hydro Bargain, i.e., a bargain rooted in Article III and its hydro power exception elaborated in Annexure D.

1.18. Pakistan makes these points of detail in these opening observations of this Memorial as the *Kishenganga* Court's appreciation of the context, character and systemic place of the Treaty in Pakistan–India relations is heavily at odds with the approach adopted by the Neutral Expert in his *Baglihar* Determination of February 2007. In that Determination, the Neutral Expert began his analysis with a detailed elaboration of "which rules of international law should guide the proper interpretation of the Treaty"[9]—taking him, in Pakistan's view, immediately beyond the scope of his competence under Annexure F of the Treaty.[10] He went on to eschew the need

[6] *Id.*, ¶ 503.
[7] *Id.*, ¶ 504.
[8] *Id.*, ¶ 376.
[9] *Baglihar Hydroelectric Plant (Pakistan v India)*, Indus Waters Treaty Annexure F, Neutral Expert Determination ("**Baglihar Determination**"), **PLA-0002**, ¶ 1.
[10] Pakistan recalls, in this regard, the observations of the Court in its Award on Competence that "[a] neutral expert is a 'highly qualified engineer' who[se] […] competence is limited to a prescribed list of technical questions, set out in Part 1 of Annexure F, that are appropriate for determination by a person with expertise in hydrology, dam operation, and dam design." Award on the Competence of the Court, 6 July 2023 ("**Competence Award**"), ¶ 190.

to "qualify" the Treaty in terms sensitive to any conception of a Peace Bargain.[11] He rejected the interpretative relevance of circumstances surrounding the conclusion of the Treaty[12] and went on to adopt a theory of interpretation that turned on present day scientific knowledge[13] and a conception of notions of integration and effectiveness.[14]

1.19. It its Partial Award, the *Kishenganga* Court expressly rejected both the interpretative approach and pivotal conclusions of the *Baglihar* Determination. Addressing India's admissibility objection in respect of the Second Dispute of which that Court was seised, on the ground that the issue had been addressed and resolved by the *Baglihar* Determination, the *Kishenganga* Court, rejecting India's objection, found as follows:

> "[The question of whether drawdown flushing is permitted by the Treaty] is a legal question and, in the Court's view, not an indispensable part of the question of 'whether or not the design of a Plant conforms to the criteria set out in Paragraph 8,' for which a neutral expert would be competent. The Court accepts, of course, that such an expert may have to interpret the Treaty in the process of rendering a determination on the matters put before him. But where a legal issue (such as the permissibility of reservoir depletion) is contested and does not fall within a question identified for the neutral expert, the Court considers that it would be incumbent on such an expert to refer the matter back to the Commission to be handled as a dispute."[15]

1.20. Rejecting the conclusions of the *Baglihar* Determination with regard to reservoir drawdown,[16] which had involved an analysis by the Neutral Expert that took him a considerable way beyond the provisions of the Treaty engaged by his competence, the *Kishenganga* Court found as follows:

> "In carrying out this evaluation, the Court emphasizes that it is not considering whether the development of hydro-electric power without recourse to drawdown flushing is *preferable* for India. It is not for the Court to apply 'best practices' in resolving this dispute. India has quite understandably argued in these proceedings for a right to the optimal design and operation of its hydro-electric installations on the upstream stretches of the Western Rivers. However, any exercise of design involves consideration of a variety of factors—not all of them technical. Hydrologic, geologic, social, economic, environmental and regulatory considerations are all directly relevant, and the Court considers the Treaty restraints on the construction and operation by India of reservoirs

[11] *Baglihar* Determination, **PLA-0002**, ¶ 6.
[12] *Id.*, ¶ 18.
[13] *Id.*, ¶¶ 8–10.
[14] *Id.*, ¶¶ 11–21.
[15] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 490.
[16] *Baglihar* Determination, **PLA-0002**, at §§ 5.3, 5.5, 5.6, and 6.3. The Neutral Expert determined that, to protect the capacity of the Live Storage against sedimentation, "'maintenance' of the Live Storage and of the Dead Storage should be carried out, having recourse to the various known processes of sedimentation control, and in particular, sluicing and flushing *with reservoir drawdown*. This process of 'maintenance', which is necessary to ensure the 'sustainability' of the scheme is not excluded by the Treaty." (*Id.*, p. 97 (emphasis added)).

> to be such a regulatory factor. *For the Court, the optimal design and operation of a hydro-electric plant is that which can practically be achieved within the constraints imposed by the Treaty*."[17]

1.21. Echoing a point that Pakistan made abundantly clear in the *Kishenganga* proceedings, Pakistan is not seeking, in these proceedings, a reversal of the *Baglihar* Determination, nor appealing that Determination with respect to the Baglihar HEP. Paragraph 11 of Annexure F of the Treaty is clear that the *Baglihar* Determination is final and binding "in respect of the particular matter on which the decision is made", namely, the differences between the Parties with respect to the Baglihar HEP. But, as the *Kishenganga* Court made equally clear, the *Baglihar* Plant-specific determination has no binding force beyond the scope of the "particular matter on which the decision is made."[18]

1.22. The dispute of which this Court is seised unavoidably implicates the *Baglihar* Determination and India's wish to elevate the interpretative methodology and conclusions of that decision beyond the Neutral Expert's Plant-specific remit for purposes of applying it more widely. As the Court observed in its Competence Award, the Parties' difference over the relevance and application of the *Baglihar* Determination beyond the Baglihar HEP was a key element of disagreement in the Permanent Indus Commission (the "**Commission**" or "**PIC**"), a disagreement that subsequently crystallised into the dispute that Pakistan referred to this Court for settlement.[19]

1.23. Pakistan emphasises this point in opening this Memorial as the *Baglihar* Determination, and what Pakistan considers are its fundamental interpretative and methodological flaws, has cast a long shadow over relations between the Parties on Indus waters matters from 2007 to this day. India's absence from these proceedings, Pakistan speculates, is in large part because it both recognises the critical flaws in the *Baglihar* methodology but also wants to keep relying upon that Determination for purposes of its significant wider Run-of-River construction programme. And it is precisely because of India's approach that Pakistan was moved, in its correspondence to India of 25 February 2016, to conclude that India's positions—on pondage, on drawdown flushing, and on other issues—"present legal questions of Treaty interpretation that will inevitably recur as India proceeds with other HEP projects on the Western Rivers".[20]

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[17] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 522 (emphasis added).
[18] *Id.*, ¶ 11.
[19] Competence Award, (*inter alia*) ¶¶ 185–188 and 209.
[20] Letter No. WT(132)/(7531-A)/PCIW (with enclosure) from the PCIW to the ICIW dated 25 February 2016, **Exhibit P-0023**, ¶ 7.

As Pakistan stated in that correspondence, it was "in the interests of efficiency, economy, and finality" that the issues in question should be referred to a Court of Arbitration "which can render an award of general applicability for the parties' future guidance".[21]

1.24. It is this systemic dispute over the interpretation of the Treaty, and of the relevance, interpretation and application of the *Baglihar* Determination and the *Kishenganga* awards, that is now before the Court in this First Phase on the Merits. Mindful of the terms of the Court's Procedural Order No. 6 (Decision on Further Proceedings) ("**PO6**"), Pakistan does not, in this Memorial, put before the Court any information regarding the Kishenganga HEP ("**KHEP**") and the Ratle HEP ("**RHEP**") other than to contextualise and illustrate Pakistan's case "concerning the overall interpretation or application of Article III of the Treaty and paragraph 8 of Annexure D thereto" and related questions posed in PO6.[22] Nor does Pakistan make any requests specific to the KHEP and RHEP in this phase of the proceedings. These will be for the Neutral Expert to address, in the parallel proceedings, or perhaps for this Court, in a second phase on the merits.

1.25. Mindful of the proceedings before the Neutral Expert, and the Neutral Expert's Supplemental Rules of Procedure, Pakistan does not, in this Memorial, put before the Court any material submitted by India in the Neutral Expert proceedings. While, for the reasons addressed below, Pakistan has made efforts to set out India's case on the various issues engaged by the questions posed by the Court, it has done so by reference to Indian statements of position on the issues in question that have been made in the Commission and elsewhere, and it avers, insofar as it is possible for it to do so, that its characterisation of India's case on these issues is fair and accurate.

1B CONSIDERATIONS INFORMING THE PREPARATION OF THIS MEMORIAL

1.26. Three considerations have informed the preparation of this Memorial. The **first** is to address the issues raised by the questions posed by the Court in PO6 and, in doing so, to remain attentive to the general duty of mutual respect and comity that the Court identified and prescribed as applicable to both its own proceedings and the parallel proceedings of the Neutral Expert.

[21] *Id.*.
[22] Procedural Order No. 6, 6 July 2023 ("**PO6**"), ¶ 35.

1.27. The **second** consideration is that, unless India has a change of heart, which Pakistan would welcome, and decides to participate in these proceedings, this First Phase on the Merits will unfold without the Respondent. This is far from ideal, both from Pakistan's perspective and from the perspective of the Court. It is not ideal from Pakistan's perspective for multiple reasons, the first of which is that the presence and participation of the respondent invariably sharpens and hones the submissions of the applicant. A second consideration is that, absent participation by India, there is unlikely to be a second round of written submissions, a usual feature in international adjudicatory proceedings that enables the parties' submissions to be narrowed and sharpened, and in some cases allows points of agreement to emerge. The present Memorial must therefore do the work that would usually be done by two pleadings.

1.28. India's absence from the proceedings challenges the work of the Court as the Court will not have before it India's case in India's voice. This challenges the adjudicatory character of the proceedings and may incline the Court to caution for reasons of uncertainty about what it may be missing, what may not be visible.

1.29. Pakistan appreciates these issues and has endeavoured, accordingly, to set out its case in unusual detail—certainly for a first round pleading—that includes presentation of the key elements of India's case, as Pakistan has come to understand these over almost two decades of dispute and exchanges with India in the Commission and elsewhere, including in the *Baglihar* proceedings, the methodology and conclusions of which India has largely adopted, and in the *Kishenganga* proceedings, the methodology and conclusions of which India has rejected. The detail of Pakistan's Memorial is also an endeavour on Pakistan's part, in the absence of the Respondent, to provide the Court with as full a picture as possible, both context and detail, going to the issues that the Court will have to decide. Pakistan accepts that there may be issues that the Court will consider relevant or important which this Memorial (inadvertently) may not address. Pakistan will endeavour to address any such issues in response to inquiry from the Court at or in advance of the hearing and also, if so directed, in writing. As with the Competence phase, Pakistan does not shrink from inquisitorial scrutiny by the Court, and, indeed, would welcome it.

1.30. Regrettably, the absence of the respondent from proceedings such as this is not so unusual. As the Court addressed in its Competence Award, this does not undermine the Court's competence to address the issues of which it is seised. It should not, either, incline the Court to caution in its approach to addressing the substance of the issues before it as to do so would, in effect, be to give the absent respondent a measure of veto—a chilling effect—on the proceedings simply because of its refusal to take part. India's absence is a choice, informed, no doubt, by an assessment of the strength of the arguments it would be able to muster and the repercussions of an unfavourable outcome in proceedings in which it had participated. The Court should not let India's absence dampen its inclination to engage fully with the issues.

1.31. The **third** consideration informing the preparation of this Memorial is that there are both legal and engineering issues engaged by this phase of the proceedings, and the Court is composed of both lawyers and engineers. Lawyers addressing lawyers, or engineers addressing engineers, may be able to engage by way of a shorthand that is born of a familiarity with the issues and the concepts. That is less likely to be the case when it comes to lawyers addressing engineers, and vice versa. With this in mind, this Memorial endeavours to meet the challenge of explaining engineering issues to lawyers and legal issues to engineers, at the cost of brevity and with the risk that neither will be satisfied. Pakistan hopes that the Court will indulge these efforts.

1C THE SCHEME OF THE MEMORIAL

1.32. This Memorial has four Parts and five Appendices (as well as Exhibits and Legal Authorities). The Appendices are bound together in Volume 2 of the Memorial.

1.33. In **Part I**, following this Introduction, **Chapter 2** will address the disputes of which the Court is seised, pursuant to Pakistan's Request for Arbitration, as amended ("**Pakistan's Arbitration Request**"), in their historical and procedural context. While some of this will be familiar to the Court from the preliminary phase on competence, there will be elements that are new. The Part I discussion is supplemented by **Appendix A**, which addresses the *travaux préparatoires* and circumstances of the conclusion of the Treaty relevant to this phase of the proceedings.

1.34. **Part II** contains four chapters (Nos. 3, 4, 5 and 6) and is supplemented by three Appendices (B, C and D). **Chapter 3** addresses issues of topography, hydrology, demography, water security and climate change relevant to and affecting the Indus Basin. It is supplemented by **Appendix D**, which contains flow data of the Indus River and its principal tributaries in Pakistan. The telling conclusion of this Chapter, underpinned by evidence, is that Pakistan is overwhelmingly reliant on the free flow of the waters of the Western Rivers and that India's ambitious agenda of what Pakistan says is Treaty-inconsistent HEP construction on these rivers risks pushing Pakistan's limited water resource past breaking point. As follows from this Chapter, the dispute before the Court is neither technical nor abstract. It goes to Pakistan's lifeblood.

1.35. **Chapter 4** addresses how run-of-river hydropower plants work. It is not a statement of Pakistan's position, and does not contain argument. It is intended as a primer, largely for lawyers, or perhaps for engineers who do not spend their working days in hydroelectric plants, on how these plants operate and their various design components. It endeavours to avoid contention and is intended to provide a foundation for the unavoidably technical discussion that will follow in later chapters that address the interpretation and application of the Treaty, and in particular Paragraph 8 of Annexure D. Pakistan anticipates that careful review of this chapter in advance of the site visit to the Neelum Jhelum HEP ("**NJHEP**") will prove useful as it will acquaint the Court with the various parts of run-of-river HEPs.

1.36. **Chapter 5** addresses India's hydropower programme on the Wester Rivers and its impact. It is complemented by Appendices C1 and C2, which list (**Appendix C1**) and show the locations of (**Appendix C2**) the various HEPs discussed in the Chapter. The headline point from this Chapter is that, if India's planned HEP construction is carried out in full, it would result in a network of 201 HEPs on the Western Rivers. The takeaway conclusion from this Chapter, backed by independent expert opinion, is that India's HEP plans for the Western Rivers amounts to "a looming train wreck on the Indus, with disastrous consequences".[23] As one expert commentator put it: "The cumulative live storage [on the Western Rivers] will be large, giving India an unquestioned capacity to have major impact on the timing of flows into Pakistan. Using Baglihar as a reference, simple back-of-the-envelope calculations suggest that once it has constructed all of the planned hydropower plants on the Chenab, India will have an ability to effect major damage on Pakistan."[24]

1.37. **Chapter 6** addresses the scheme of the Treaty and its operation in practice. It draws on, and develops, the Statement of Pakistan's Commissioner for Indus Waters ("**PCIW**"), Mr Syed Muhammad Mehar Ali Shah, which is found at **Appendix B**. Given Mr Shah's first-hand experience and vantage point, the Statement is unusual in that it is part expert report and part witness statement of fact. The first sections of Mr Shah's Statement address how the

[23] J. Briscoe, "War or peace on the Indus?", *The News International*, 3 April 2010, available at: https://johnbriscoe.seas.harvard.edu/files/johnbriscoe/files/108._john_briscoe_war_or_peace_on_the_indus_201004.pdf (last accessed 18 March 2024), **Exhibit P-0325**, p. 1.
[24] *Id*., p. 2.

Treaty is meant to work, shining a light on its various moving parts, and the Treaty's complexity. The concluding part of his Statement addresses how the Treaty is working—or, rather, not working—in practice, as India has acted to frustrate the intended operation of the Treaty. Drawing on Mr Shah's Statement, Chapter 6 incorporates into the Memorial the issues advanced as evidence in that Statement for the purpose of making submissions pertinent to Pakistan's case.

1.38. **Part III** contains three Chapters (Nos. 7, 8 and 9). These are primarily legal, intended to lay the foundation for the detailed argument on the issues of interpretation of Paragraph 8 of Annexure D that follow in Part IV. **Chapter 7** addresses the three bargains at the heart of the Treaty, noted above, placing them both in their historical and Treaty context. The Chapter dwells in particular on an explanation of the Peace Bargain and the Treaty Bargain, which, though not directly engaged by these proceedings, are fundamental to an understanding of the Western Rivers Run-of-River Hydro Bargain. The key takeaway from the Chapter is that Pakistan was prepared to give up access to the Eastern Rivers—which had historically met nearly all its irrigation and hydropower needs—in order to bring about water independence via unrestricted use of the Western Rivers.

1.39. **Chapter 8** addresses principles of treaty interpretation, not in the abstract, although some abstract foundational discussion is necessary, but more acutely focused on the principles and elements of interpretation that will be directly relevant to the Court's task. To this end, it addresses the central importance of the findings of the *Kishenganga* Court, the terms of the Treaty relevant to questions of interpretation, and the operation of the general rule of treaty interpretation and the use of supplementary means of interpretation in the circumstances of this case. A key issue addressed in this Chapter is the relationship, for interpretative purposes, between a headline obligation—a "rule"— and exceptions to that rule, this being the approach adopted in Article III of the Treaty and Annexure D. As addressed in this Chapter, accepted canons of treaty interpretation require that exceptions are construed narrowly. This is the case with regard to the exception for hydroelectric power generation in Article III(2)(d) of the Treaty, which falls to be construed in the light of the headline "let flow", non-interference, and no storage obligation upon India in Article III(1), the *chapeau* of Article III(2) and Article III(4). Annexure D, and in particular (for present purposes) Part 3 of Annexure D, which addresses new Run-of-River Plants ("**Annexure D.3 HEPs**"), is an elaboration of the detailed criteria and requirements with which India is bound to comply if it is to take advantage of the hydropower generation exception in Article III(2)(d). As an interpretative matter, the provisions of Part 3 of Annexure D, in which Paragraph 8 is located, thus fall to be construed restrictively. Chapter 8 also responds to the Court's question (a) put to the Parties in paragraph 35 of PO6.

1.40. **Chapter 9**, building on Chapters 7 and 8, addresses the Western Rivers Run-of-River Hydro Bargain, highlighting its various moving parts. It addresses in greater detail the various provisions of Article III, and those of Part 3 of Annexure D, and the relationship between these provisions. It will also acquaint the Court with the special meaning given by the Treaty, in Part 1 of Annexure D, to various technical terms which will be familiar from the Chapter 4 primer on Run-of-River HEPs but which are, in a number of important instances, subject to special definition for purposes of the Treaty. This applies in particular to the terms "Dead Storage", "Pondage", "Run-of-River Plant" and "Firm Power", all of which are integral to the issues at the heart of this case. The interaction between these definitions and the mandatory design criteria for new Run-of-River Plants in Paragraph 8 of Annexure D is fundamental to an understanding of the Hydro Bargain that is at the core of the Treaty. Chapter 9 also addresses the Court's Question (b) on resort to non-Treaty-based design and operational practices.

1.41. **Part IV** contains four chapters (Nos. 10, 11, 12 and 13). These chapters are the nub of Pakistan's response to the questions posed by the Court in paragraph 35 of PO6. **Chapter 10** addresses the interpretation of Paragraphs 8(d), (e) and (f) of Annexure D, which impose stringent constraints in respect of the location and placement of outlets, gated spillways and power intakes, respectively, as well as a size constraint in respect of outlets. These Paragraphs are closely related, both in their focus and, in key aspects, in their terms, and also for the reason that gated spillways (addressed in Paragraph 8(e)) and power intakes (addressed in Paragraph 8(f)) are particular forms of "outlets" (addressed in Paragraph 8(d)). As such, Paragraph (d) is both the headline and the controlling provision, with its mandatory rule that "[t]here shall be no outlets below Dead Storage Level" save in circumstances in which India can bring itself within the exception set out later in that provision. These Paragraphs are at the heart of the Parties' dispute about sediment management, engaging both the (flawed) *Baglihar* Determination on this issue and the repudiation thereof by the *Kishenganga* Court.

1.42. **Chapter 11** addresses the interpretation of Paragraph 8(c), concerning the calculation of the maximum allowable Pondage. This is technically the most complex of the provisions in

Paragraph 8, in large part because of the steps and the calculations required to address the issue, turning on the calculation of "Firm Power", defined in Paragraph 2(i) of Annexure D, which is derived from the calculation of the "Minimum Mean Discharge" at the site of any given HEP. The calculation required of this provision is also faced with an apparent gap in the Treaty, insofar as the Treaty does not expressly state the period of time to be used for calculating the Pondage required for Firm Power. As the Chapter explains, however, the period in question—24 hours—is readily deducible from the Treaty. Chapter 11 is supplemented by **Appendix E**, a technical annex that underpins the legal argument with verifying mathematical formulae that will be comprehensible to an engineer. The issues engaged by this Chapter also go to the heart of the Parties' dispute about the shortcomings and relevance of the *Baglihar* Determination on Pondage.

1.43. **Chapter 12** addresses the interpretation of Paragraph 8(a) of Annexure D insofar as it concerns the Parties' dispute regarding the freeboard of an Annexure D.3 HEP. Paragraph 8(a) precludes India from designing an Annexure D.3 HEP in a way that would make it "capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design."

1.44. **Chapter 13** completes the Memorial with some concluding observations and Pakistan's requests for relief.

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CHAPTER 2: THE DISPUTES IN THEIR HISTORICAL AND PROCEDURAL CONTEXT

2.1. A proper appreciation of the systemic questions before the Court requires an understanding of the wider context of the disputes—both in relation to their history (as this **Chapter 2** addresses), and in relation to their geographical/geological, political, technical, and legal context (as addressed primarily in **Part II** of this Memorial). This **Chapter 2** provides an overview of the historical, and more recent procedural, context in which the disputes are situated.

2.2. There are three principal aspects to this historical and procedural context. First, is the factual background which led to the negotiation of the Treaty itself. This is addressed at length in **Appendix A** to this Memorial, but some of the most pertinent aspects of that history are set out in this **Chapter 2**. Second, is the more recent history of the disputes themselves. This history will be relatively familiar to the Court, as Pakistan has already made extensive submissions on this topic, particularly in Appendix A to Pakistan's Response on Competence (which Pakistan adopts in this phase of the proceedings). The more recent history of the disputes is thus addressed in this **Chapter 2** at a relatively high level, and—where relevant—with reference to the Court's own findings of fact in its Competence Award (as well as in Pakistan's Response and, in particular, Appendix A thereto). Third, is the more recent procedural history of the disputes. Again, this procedural history will by now be familiar to the Court, and is addressed here summarily and primarily for completeness. In this respect again, the Chapter makes reference to the Competence Award, where relevant.

2.3. With this scheme in mind, this Chapter provides an overview of:

(a) Pakistan's fundamental dependence on irrigation and the need for timely delivery of water (**Section A**).

(b) The origins of the disputes in the Commission (**Section B**).

(c) The *Baglihar* Neutral Expert proceedings in so far as they are relevant to the disputes before the Court (**Section C**).

(d) How the disputes evolved in the Commission after the *Baglihar* Neutral Expert proceedings and in the run-up to the *Kishenganga* arbitration (**Section D**).

(e) The relevant aspects of the Court's four decisions in the *Kishenganga* arbitration: namely, the Order on Interim Measures; the Partial Award; the Decision on India's Request for Clarification or Interpretation; and the Final Award (**Section E**).

(f) The history of how the disputes subsequently evolved in the PIC (**Section F**).

(g) The procedural history of the present proceeding and the parallel proceeding before the Neutral Expert (**Section G**).

2A CONTEXTUALISING THE DISPUTES: PAKISTAN'S DEPENDENCE ON IRRIGATION AND ITS NEED FOR TIMELY DELIVERY OF WATER

2.4. Pakistan's dependence on irrigation is existential. As David Lilienthal, the founding chairman of the Tennessee Valley Authority[25], noted in a 1951 article in *Collier's Magazine*:

> "Pakistan includes some of the most productive food-growing lands in the world in western Punjab […] and the Sind. But without water for irrigation this would be desert. 20,000,000 acres would dry up in a week, tens of millions would starve. No army, with bombs and shellfire, could devastate a land as thoroughly as Pakistan could be devastated by the simple expedient of India's permanent shutting off the sources of water that keep the fields and people of Pakistan alive. India has never threatened such a drastic step, and indeed denies any such intention – but the power is there nonetheless.
>
> Except during the brief monsoon rains which run off in violence and torrent, there is almost no rain in Pakistan or in the adjoining part of India, the area that is a part of the basin of the great Indus River, which is made up of six tributaries. Life depends upon irrigation canals, some of them hundreds of years old. Not only farms depend on irrigation; as great a city as Lahore takes her drinking water from a canal."[26]

2.5. The "basin of the great Indus River" is shared between India and Pakistan. It has been a major source of contention between the States ever since Sir Cyril Radcliffe's Boundary Commission drew the line of Partition across Punjab in August 1947, creating a newly independent India and a newly created Pakistan.

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[25] The Tennessee Valley Authority was established in 1933 as a public corporation whose purpose was, among other things, "[t]o improve the navigability and to provide for the flood control of the Tennessee River" (Tennessee Valley Authority, "Our History", available at: https://www.tva.com/about-tva/our-history (last accessed 18 March 2024), **Exhibit P-0232**). It supervised a vast system of navigation, flood, control, and electricity generation in Tennessee.

[26] D. E. Lilienthal, "Another 'Korea' in the Making?", *Collier's Magazine*, 4 August 1951 ("**Lilienthal, 1951**"), **Exhibit P-0233**, pp. 7–8.

2.6. The dependence of Pakistan's people on the water supply of the Indus Basin was at the forefront of Pakistan's negotiators' minds throughout the negotiations of the Indus Waters Treaty, as further detailed in **Appendix A** to this Memorial. Etched in the memories of its people were the then recent events of April 1948, when East Punjab (an Indian state from 1947 to 1956) severed the water supply to West Punjab (a province of Pakistan from 1947 to 1955),[27] depriving substantial areas of Pakistan of water when the summer crops were about to be sown. Lahore was simultaneously deprived of its main source of municipal water as well as power from the Mandi Hydroelectric scheme.[28]

2.7. Mr Lilienthal observed the lasting effects of the April 1948 crisis in the psyche of Pakistan's people when he visited Pakistan in 1951. He recalled that:

> "I saw the source of water supply for Lahore and the surrounding farming country near the border when (probably for some operating reason) India had cut down the flow; every passer-by could see how low the canal's waters had fallen. An hour later I talked to Pakistanis so furious and worried they were ready to fight with their bare hands. Later in the day, the waters were up again; but the fear was still there. In the spring of 1948, during international negotiations as to the allocation of water for irrigation, India cut off most of the supply of water to Pakistan for a month, causing distress, loss of crops and general disruption. This rankles and makes Pakistan fearful of the future."[29]

2.8. Mr Lilienthal's article caught the attention of Mr Eugene R. Black, then President of the World Bank.[30] Subsequent discussions between Mr Lilienthal and Mr Black prompted the Bank, in 1951, to offer its "good offices for the discussion of the dispute and negotiation of a settlement."[31] Early in 1952, the Parties accepted.[32] A working group of leading technical experts from Pakistan, India and the Bank, was formed and began work on a detailed plan for water-sharing and economic development that could be put forward to the two Governments.

2.9. The teams were unable to agree, so ultimately the Bank proposed that each delegation put forward its own comprehensive plan.[33] The two plans were close together in their estimates of the total amount of usable water available for irrigation, but their proposals for how to divide

[27] *See* also Competence Award, ¶¶ 56–58.
[28] A. A. Michel, *The Indus Rivers: A Study of the Effects of Partition* (Yale University Press, 1967) ("**Michel, 1967**"), **Exhibit P-0234**, p. 196.
[29] Lilienthal, 1951, **Exhibit P-0233**, p. 8.
[30] Michel, 1967, **Exhibit P-0234**, p. 224.
[31] *Id.*, p. 225.
[32] *Id.*, p. 227.
[33] *Id.*, pp. 228–230.

that usable water "differed fundamentally"[34], such that there was no prospect that further discussions in the working group would be fruitful.[35] So in February 1954, the Bank put forward its own proposal for the resolution of the waters dispute between India and Pakistan (the Bank's "**1954 Proposal**").

2.10. The Bank's 1954 Proposal embodied two fundamental principles: first, that "historic withdrawals of water must be continued, but not necessarily from existing sources";[36] and second, that of mutual independence, achieved by dividing control of the waters (Western Rivers to Pakistan, Eastern Rivers to India[37]).[38] The division of control of the Western and Eastern Rivers would give each an "independent and separate supply",[39] "minimizing friction between the two countries"[40]. Justifying this fundamental principle of independence, the Bank stated that it was "desirable", in its view:

> "so far as practicable, *to avoid control by India over waters on which Pakistan will be dependent*, and to enable each country to control the works supplying the water allocated to it and determine in its own interests the apportionment of waters within its own territories".[41]

2.11. The 1954 Proposal further explained that the "mutual independence", achieved by locating "works serving each country on territories under its control", and by the provision of "assurances against interference by either country with the supplies on which the other depends", should "reduce the chances of disputes"[42] and "promote the development of the entire basin."[43]

2.12. Pakistan did not immediately accept the 1954 Proposal, owing to its (well-founded) concerns that the Western Rivers, without storage facilities, would be inadequate to meet replacement uses at certain times of year.[44] It thus secured an adjustment to the 1954 Proposal, which was reflected in an *aide memoire* from the Bank dated 21 May 1956 ("**1956 Aide**

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[34] Proposal by the International Bank Representative for a Plan for the Development and Use of the Indus Basin Waters, 5 February 1954 (the "**1954 Proposal**"), **Exhibit P-0130**, ¶ 14. The plans themselves – and the amount of "usable supplies" allocated to each State under India's and Pakistan's Plans respectively, is set out in ¶ 2 of the 1954 Proposal.
[35] *Id.*, ¶ 16.
[36] *Id.*, ¶ 21.
[37] *Id.*, ¶¶ 24, 24.a and 24.b.
[38] *Id.*, ¶ 22. *See* also, Competence Award, ¶ 59.
[39] Michel, 1967, **Exhibit P-0234**, p. 235.
[40] 1954 Proposal, **Exhibit P-0130**, ¶ 22.
[41] *Id.*, ¶ 22 (emphasis added). *See* further, *id.*, ¶ 40.
[42] *Id.*, ¶ 41.
[43] *Id.*, ¶ 42.
[44] Michel, 1967, **Exhibit P-0234**, p. 244; *see* further, **Appendix A**.

Memoire").[45] Thereafter, negotiations between the parties proceeded on the basis of the 1954 Proposal, subject to the adjustments set out in the 1956 Aide Memoire.[46]

2.13. A chronic water shortage in the first half of 1958, which Pakistan blamed on India cutting off water supplies to Pakistan, cast a dark shadow over the ongoing negotiations and threatened to derail their entire course.[47] The shortage caused a mass evacuation of affected areas and turned "millions of acres" of otherwise fertile land to desert.[48] Pakistan saw this as the materialisation of a threat India had been making since late 1957 "to completely cut off water supplies to Pakistan from 1960 whether she is or not able to make alternative arrangements by that time."[49] Pakistan believed that this water shortage was an attempt by India "to sabotage the prospects of a peaceful and amicable solution", and "part of the Indian campaign to terrorise this country into giving up of her natural and rightful claims".[50] A conciliatory letter from Prime Minister Nehru of India to Prime Minister Khan Noon of Pakistan on 10 June 1958, assuring him that "it has always been our [India's] desire that we should avoid taking any action which might cause injury to the agriculturalists in Pakistan", appears to have gone some way in enabling the parties to move forward.[51]

2.14. Pakistan's imperative of maintaining its water supply, and correspondingly, of minimising India's ability, as upstream riparian, to control and manipulate the flow of waters of the Western Rivers, was a constant feature of the negotiations leading to the conclusion of the Treaty.[52] Nonetheless, the negotiating history shows that India sought to make inroads into one of the foundational principles of the Bank's 1954 Proposal, namely that the "entire flow" of the Western Rivers, save for "the insignificant volume of Jhelum flow presently used in Kashmir", would go to Pakistan.[53] Pakistan vehemently objected at each juncture, and India's success in securing exceptions to that principle was limited and tightly constrained. As

[45] International Bank for Reconstruction and Development, Aide Memoire of 21 May 1956 ("**1956 Aide Memoire**"), **Exhibit P-0131**.
[46] *See* further, **Appendix A**.
[47] *Id.*.
[48] Embassy of Pakistan (Washington, D.C.), Press Release No. 34 "India's Stoppage of Canal Water Leads to Mass Evacuation From Affected Areas. Millions of Acres Turned Desert visited by Journalists", 14 June 1958, **Exhibit P-0235**, p. 1.
[49] Embassy of Pakistan (Washington, D.C.), Press Release No. 35 "Stoppage of Canal Waters New Threat to Pakistan's Lifelines", 18 June 1958, **Exhibit P-0236**, p. 1.
[50] *Id.*, pp. 1–2.
[51] Letter from Prime Minister Nehru to Prime Minister Khan Noon, 10 June 1958, **Exhibit P-0237**, p. 1. *See* Letter from Mr Sivasankar, Embassy of India to the United States, to Mr Iliff, 20 June 1958, enclosing Letter from Prime Minister Khan Noon to Prime Minister Nehru, 16 June 1958, **Exhibit P-0238**.
[52] *See* generally, **Appendix A**.
[53] 1954 Proposal, **Exhibit P-0130**, ¶¶ 24.a and 26. *See* generally, **Appendix A**, **Section 3A.2**.

Pakistan correspondence from the time demonstrates, Pakistan maintained throughout that unless the final bargain fulfilled the promise of "mutual independence" reflected in the Bank's 1954 Proposal, Pakistan would not be able to accept it.[54]

2.15. The fundamental imperative of maintaining Pakistan's access to the natural flow of the waters of the Western Rivers, free of Indian interference, was enshrined in the scheme of the Treaty. Article III provides the general rule that India is "under an obligation to let flow" and "not permit any interference with" the waters of the Western Rivers. This language imposes "the treaty obligation on India to allow to flow down <u>all</u> waters of the Western Rivers, except those required for the uses to be permitted under the terms of Article III (2)".[55] India's obligation, and Pakistan's entitlement, in respect of the Wester Rivers was the *quid pro quo* for Pakistan's reciprocal obligations in respect of the Eastern Rivers (ultimately addressed in Article II of the Treaty), as envisaged in the Bank's 1954 Proposal.

2.16. Notwithstanding India's attempts during the course of negotiations at ever-increasing encroachment on this general rule, the exceptions to India's "let flow" obligation that made their way into the final Treaty text—including for the generation of hydro-electric power (Article III(2)(d))—were carefully circumscribed. Annexure D, for its part, sets strict limits on the design, construction, and operation of hydroelectric power plants, which (if respected) minimise India's ability to control and manipulate the flow of waters of the Western Rivers. The principle at the heart of the design and operation criteria for new run-of-river HEPs, set out in Part 3 of Annexure D, is to control and limit the storage of water on the Western Rivers—and thus India's ability to interfere with or deprive Pakistan of that water—in accordance with the overarching requirements of Article III of the Treaty. As explained in more detail below, the *Kishenganga* Court recognised as much in its Partial Award.[56]

2.17. The questions that are now before the Court pursuant to paragraph 35 of its PO6 have arisen in the context of disputes between Pakistan and India concerning the interpretation of various parts of the Treaty governing the design of HEPs on the Indus, Jhelum, and Chenab rivers and their tributaries—collectively, the "Western Rivers," as defined in the Treaty. As the Court will by now fully appreciate, the Parties' disagreements go beyond Plant-specific

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[54] *See* generally, **Appendix A**.

[55] Letter from Mr Iliff to Mr Shoaib, 5 February 1960, **Exhibit P-0239**, p. 2 (emphasis original). Mr Iliff later showed his letter to Mr Gulhati, and "he voiced no dissent from its terms" (Letter from Mr Iliff to Mr Mueenuddin, 2 April 1960, **Exhibit P-0240**).

[56] *See Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 504.

disputes to wider questions of systemic interpretation of the Treaty. These wider questions have crystallised sharply around two hydroelectric projects, the Kishenganga Hydroelectric Plant (KHEP) on the Kishenganga/Neelum River (a tributary of the Jhelum River) and the Ratle Hydroelectric Plant (RHEP) on the Chenab River. The locations of the KHEP and the RHEP are shown on the following map (Map A to Pakistan's Arbitration Request).

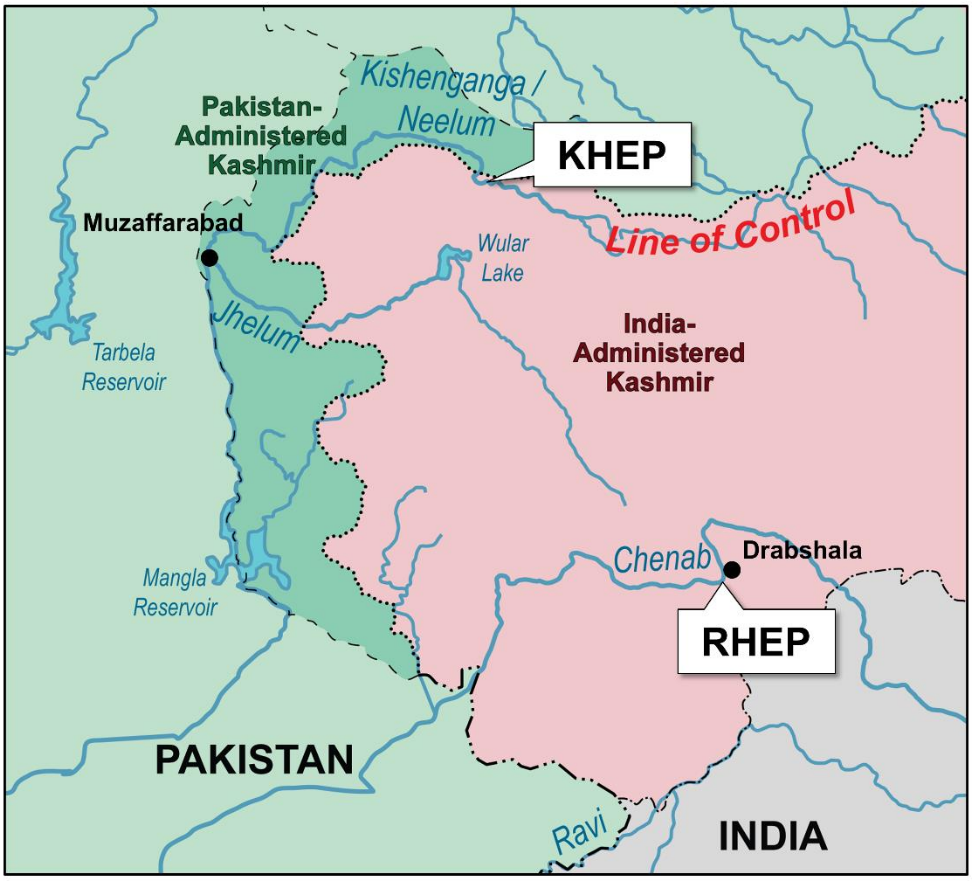

Figure 2.1 - Location of the KHEP and the RHEP

2.18. The origins of the disputes concerning the KHEP and the RHEP are set out in **Section B** below. However, the issues of "overall interpretation or application of Article III of the Treaty and paragraph 8 of Annexure D thereto", set out in questions (b) to (g) of paragraph 35 of PO6, have wider significance in the light of India's ambitious HEP-building programme on the Western Rivers. An introduction to that programme is set out in **Section B.3** below, and addressed in further detail in **Chapter 5**.

2B ORIGINS OF THE DISPUTES IN THE PERMANENT INDUS COMMISSION

2.19. This Section recalls the origins of the disputes in the Commission. Pakistan has already, during the Competence phase, addressed the Court on many of the relevant facts.[57] The Court, in its Competence Award, made various findings of fact regarding the "origins" of the "current controversy" and its evolution to the present day.[58] This Section makes reference to, and supplements where necessary, those findings.

2B.1 The Kishenganga Hydroelectric Plant (KHEP)

2.20. The KHEP is a run-of-river HEP located on the Kishenganga River near the town of Gurez in Indian-administered Jammu and Kashmir. The Kishenganga is a tributary of the Jhelum, one of the three Western Rivers as defined in the Treaty. As shown in **Figure 2.1** above, the KHEP is approximately 12 km upstream of where the Kishenganga crosses the Line of Control, downstream of which the Kishenganga is known as the Neelum River. As the Court of Arbitration observed in its Partial Award in *Kishenganga*:

> "The flow in the Kishenganga/Neelum River is strongly seasonal. The highest flows occur from May to August, associated with seasonal snowmelt in the upper catchment, and monsoon rain in the lower reaches. In contrast, there is a long low flow season from early October to the middle of March."[59]

2.21. As currently designed by India, the KHEP will have an installed generating capacity of 330 MW. As depicted on **Figure 2.1**, this power will be generated by diverting the water of the Kishenganga/Neelum via a dam near Gurez through a 24-kilometer-long tunnel to a powerhouse located near Bandipura. From the powerhouse, the water is discharged into the Bonar Nallah, another tributary of the Jhelum. From there, the water flows into Wular Lake and is then discharged into the Jhelum. The water diverted from the Kishenganga/Neelum at Gurez ultimately joins back with its own waters at the confluence of the Jhelum with the Kishenganga/Neelum at Muzaffarabad.

2.22. Under India's rendering, the KHEP consists of a 35-meter-high concrete-faced rock-filled dam across the Kishenganga/Neelum and a reservoir with a designed Pondage of 7.55 Mm^3. The KHEP design provides for an orifice (or fully submerged) spillway consisting of

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[57] *See* especially, Appendix A (The origins and procedural background of the dispute) to the Response of Pakistan on the Competence of the Court and the Operation of Article IX of the Indus Waters Treaty, 24 March 2023 ("**Pakistan's Response**").
[58] Competence Award, Part III.E.
[59] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 129.

three gated openings located on the left abutment of the dam.[60] The invert (or bottom) of the orifice spillway, where the bottom of the gates rest in their normal closed position, is 20 meters below the KHEP's Full Pondage Level and almost 15 meters below the KHEP's Dead Storage Level (as computed by India). The power intake for the KHEP is also submerged and is located on the left bank of the reservoir upstream of the gated orifice spillway and consists of two openings located nearly 6 meters below the KHEP's Dead Storage Level.

2.23. As is typical for Himalayan rivers, the river flow data for the Kishenganga/Neelum shows wide variations between years as well as very large variations between seasons. In general terms, the average monthly flow at Gurez during the winter season is approximately 18 to 50 cubic meters per second (cumecs), as compared to an average monthly flow of approximately 70 to 270 cumecs during the summer.

2.24. The early history of the Parties' dispute over the KHEP is set out in Appendix A (Section II) to Pakistan's Response (paragraphs 1–3) and the Court's Competence Award (paragraph 70). The subsequent evolution of the disputes relating to the KHEP after the *Baglihar* Determination is addressed in **Sections D-F** below.

2B.2 The Ratle Hydroelectric Plant (RHEP)

2.25. The RHEP is under construction by India on the Chenab River. As shown in **Figure 2.1** above, the RHEP is located near the town of Drabshala in Indian-administered Jammu and Kashmir. The details of the RHEP set out in this Section are based on data that Pakistan has received from India to date through the Commission, or has otherwise ascertained through public sources.

2.26. As currently designed by India, the RHEP will have an installed generating capacity of 850 MW, over twice that of the KHEP. This energy will be generated by constructing a 111-meter-tall concrete dam on the Chenab at Drabshala and delivering water to a powerhouse just downstream of the dam. The RHEP's reservoir has a designed Pondage of approximately 24 Mm3. The RHEP's design includes an orifice spillway consisting of five gated openings located in the dam.[61] The invert (or bottom) of the orifice spillway, where the bottom of the gates rest in their normal closed position, is 44 meters below the RHEP's Full Pondage Level and over 30 meters below the RHEP's Dead Storage Level (as computed by India). The power

[60] *See* India's Design for the Kishenganga Hydroelectric Plant, **Exhibit RFA-1**.
[61] India's Design for the Ratle Hydroelectric Plant, **Exhibit RFA-2**.

intake for the RHEP is located 14 meters below the RHEP's Dead Storage Level. India's proposed design for the RHEP provides for 2 meters of freeboard between the Full Pondage Level and the top of the dam.

2.27. The river flow data for the Chenab near Drabshala also exhibits the wide variations between years and seasons typical of Himalayan rivers. The average monthly flow at the Premnagar gauging site (13 km downstream of the proposed dam site) during the winter season is approximately 110 to 250 cumecs, whereas it ranges from approximately 700 to 1,700 cumecs during the summer season.

2.28. The legal and technical disputes over the RHEP "resemble[], to a considerable degree" those regarding the KHEP.[62] The early history of the Parties' dispute over the RHEP is set out in paragraph 84 of the Court's Competence Award. The subsequent evolution of the disputes relating to the RHEP is addressed in **Section F** below.

2B.3 Additional Indian Hydroelectric Plants on the Western Rivers in overview

2.29. In addition to the KHEP and the RHEP, India is planning to design and construct many additional run-of-river HEPs on the Western Rivers. India's hydropower programme on the Western Rivers, and its impact on Pakistan, is further described in **Chapter 5** below. In essence, India's HEP-building programme is and always has been "an existential issue" for Pakistan.[63] And it has become all the more pressing in recent years. As further described in **Chapter 5**, India's construction of new run-of-river HEPs was relatively modest in the first fifty years of the life of the Treaty, but since then there has been an explosion of activity. The latest analysis conducted by the Office of Pakistan's Commissioner for Indus Waters indicates that, if India achieves its current plans, India will have more than 200 HEPs in operation on the Western Rivers (of which only 52 are already completed).[64]

2.30. As set out in more detail in **Chapter 5**, Pakistan anticipates that India intends to design and build many of its projects using the same approach employed at the KHEP and RHEP, in violation of the Treaty: excessive Pondage, submerged power intakes, deep orifice spillways with gated openings below Dead Storage Level, and excessive freeboard. All of these elements

[62] Competence Award, ¶ 84.
[63] *See*, for example, *Indus Waters Kishenganga Arbitration (Pakistan v India)*, Order on the Interim Measures Application of Pakistan dated June 6, 2011, 23 September 2011, (2013) XXXI RIAA 6 ("***Kishenganga* arbitration, Order on Interim Measures**"), **PLA-0042**, ¶ 116.
[64] *See* generally, **Chapter 5B** and **Appendix C**.

give India ever greater influence on the timing and nature of flows in the Western Rivers, and accordingly render Pakistan ever more vulnerable to its interference with them, on an individual HEP basis. The impact on a cumulative basis is greater still.

2C THE *BAGLIHAR* NEUTRAL EXPERT PROCEEDINGS

2.31. The present proceedings before the Court are the third occasion in which the Parties have resorted to the third-party dispute settlement mechanisms under the Treaty. The first such proceeding—the *Baglihar* proceeding, before Neural Expert Professor Raymond Lafitte—arose out of Pakistan's objections to various design features of India's Baglihar Hydroelectric Plant. Pakistan argued that the design of the Baglihar HEP on the Chenab Main did not conform to the criteria of Paragraphs 8(e) and (a) of Annexure D, relating to gated spillways and freeboard; Paragraph 8(c), regarding the calculation of pondage; and Paragraph 8(f), the location of turbine intakes.[65]

2.32. The Neutral Expert began his Determination by observing that his decision was:

> "based on the premise that the terms of the Treaty, in accordance with the general rules of treaty interpretation, allow him to have recourse to rules of science and technology and to state-of-the-art practices in his assessment of the concept and design of the Baglihar […] Plant".[66]

2.33. As will become clear from this Memorial, this statement of the Neutral Expert is emblematic of his overall approach, which was an impermissible foray into a wholesale, and fundamentally flawed, interpretation of the Treaty under international law.[67] Applying this impermissible and flawed methodology, the Neutral Expert reached the wrong result. He concluded that "the rights and obligations of both Pakistan and India" under the Treaty "should be read in the light of new technical norms and new standards as provided for by the Treaty."[68]

2.34. The Neutral Expert then compounded his flawed approach to interpretation by applying it serially to the individual provisions engaged in the differences before him. On the specific points of difference, the *Baglihar* Neutral Expert made the following Determinations:

(a) Relating to the issue of gated or ungated spillway:

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[65] *Baglihar* Determination, **PLA-0002**, p. 6.
[66] *Id*., p. 12 (*see* also p. 19).
[67] *See* generally, *id*., § 5.1, and **Chapter 8C** below.
[68] *Baglihar* Determination, Executive Summary, **PLA-0020**, p. 5.

> "The NE considers, in conformity with the state of the art, that the conditions at the site of the Baglihar plant require a gated spillway. An analysis done by the NE on 13,000 existing spillways in the world shows that 89% of these structures, having a design discharge higher than 14,000 m^3/s, are gated."[69]

(b) Relating to the issue of the level of the spillway gates:

> "Sound operation of the outlets [at Baglihar] will necessitate carrying out maintenance of the reservoir with drawdown sluicing each year during the monsoon season. […] This is in conformity with the Treaty, which provides that the "'*Dead Storage' means that portion of the storage which is not used for <u>operational purpose</u>*". Operational purpose means power generation […]. The reservoir drawdown below the Dead Storage Level will be done for <u>maintenance purposes</u>. It is commonly agreed in practice that maintenance is an absolute necessity, with its ultimate objective of ensuring the <u>sustainability of the scheme</u>."[70]

(c) Relating to the artificial raising of the water level:

> "In the application of the provisions of the Treaty, the NE considers that the dam crest elevation should be set at the lowest elevation compatible with a sound and safe design based on the state of the art."[71]

(d) Relating to the volume of the Pondage:

> "Applying the provisions of the Treaty and based on the state of the art, the NE considers that the first objective of pondage is to regulate the flow of the river to meet consumer demand.
>
> He considers also that the values for maximum pondage stipulated by India as well as by Pakistan are not in conformity with the criteria laid down in the Treaty."[72]

2.35. On the last issue, Pondage, the *Baglihar* Neutral Expert decided that he could not agree to the Pondage calculation presented by Pakistan, which he said "has been done with the objective of operating the plant at constant power, while regulating the fluctuations in the river flow." He also rejected the Pondage calculation presented by India, which, he said, "is done with the objective of operating the plant with a constant river flow, while regulating the fluctuations in power." However, he agreed "with the principle, but not with the hypothesis concerning the time peak load hours on which the calculation should be based". In his view, this "hypothesis […] is not clearly justified".[73]

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[69] *Id.*, p. 10 (extract from Determination D 2).
[70] *Id.*, p. 13 (extract from Determination D 3) (emphasis original).
[71] *Id.*, p. 15 (extract from Determination D 4).
[72] *Id.*, p. 17 (extract from Determination D 5).
[73] *Id.*, p. 16.

2.36. Notwithstanding the clear limits of application of the *Baglihar* Determination under Paragraph 11 of Annexure F, India has seized on it to support its Treaty-inconsistent designs of the KHEP and the RHEP. Having tried this strategy during the *Kishenganga* arbitration,[74] the *Kishenganga* Court flatly rejected both the *Baglihar* Neutral Expert's "best practices" approach and any precedential effect of the *Baglihar* Determination. On the former, the Court found that it was "not for the Court to apply 'best practices' in resolving [the] dispute", adding that "the optimal design and operation of a hydro-electric plant is that which can practically be achieved within the constraints imposed by the Treaty".[75] On the precedential effect of determinations of a neutral expert, the *Kishenganga* Court was clear that:

> "The effect of a neutral expert's determination is restricted to the elements of the design and operation of the specific hydro-electric plant considered by that Expert. […] *Baglihar* is binding for the Parties in relation to the Baglihar project; the present decision, by contrast, is binding in respect of the general question presented in these proceedings."[76]

2.37. Yet India has continued to hold the Determination up as an engineering paragon whose judgment must be followed without question. India's rigid reliance on the *Baglihar* Determination is particularly evident with respect to the issue of Pondage. A prime example can be found in the Parties' correspondence of summer 2015, wherein the ICIW continued to maintain—notwithstanding the *Kishenganga* Court's clear decision regarding the effect of a neutral expert's determination—that the *Baglihar* Determination had settled the process for calculation of the Operating Pool for the KHEP and the RHEP.[77]

2.38. The theory of Treaty interpretation that the Neutral Expert in *Baglihar* purported to develop is therefore at the heart of India's justifications for its Treaty-impermissible designs of the KHEP and RHEP, and India continues to rely upon it to suit its domestic—and HEP-building—needs. Pakistan has been forced to remind India repeatedly that the Determination applies only as regards the Baglihar HEP itself, and has no binding effect in relation to other HEPs. The *Baglihar* Determination is clearly inconsistent with the Treaty, interpreted in accordance with the rules of treaty interpretation under international law, and in no way can inform the Court's approach to the disputes at issue in these proceedings. It led the *Baglihar*

[74] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 185; *see* also, India's application of the Neutral Expert's approach to treaty interpretation to the issue of drawdown flushing at *id.*, Chapter III.B.2.
[75] *Id.*, ¶ 522.
[76] *Id.*, ¶ 470 (citations omitted).
[77] Letter No. Y-20014/1/2015-16/2152 from ICIW to PCIW dated 16 July 2015, **Exhibit P-0012**, p. 2; Letter No. WT(132)/(7496-A)/PCIW from PCIW to ICIW dated 24 July 2015, **Exhibit P-0014**, ¶ 8; and Letter No. Y-11017/2/2015-IT/2155 from ICIW to PCIW dated 21 August 2015, **Exhibit P-0016**, ¶ 9.

Neutral Expert to substantively wrong conclusions on the application of Paragraph 8 of Annexure D. Pakistan will address each of these issues more fully in **Chapter 8** and **Part IV** of this Memorial.

2D SUBSEQUENT EVOLUTION OF THE DISPUTES IN THE COMMISSION PRIOR TO THE *KISHENGANGA* ARBITRATION

2.39. The subsequent evolution in the Commission of the disputes over the KHEP after the *Baglihar* Determination, but before the *Kishenganga* arbitration, is set out in overview in Appendix A (Section II) to Pakistan's Response (paragraphs 3–4) and the Court's Competence Award (paragraphs 70–72).

2.40. On the important issue of calculation of Pondage, it was immediately clear that the *Baglihar* Determination had done nothing to resolve the Parties' differences. The minutes of the 99th Meeting of the Commission held between 30 May and 4 June 2007 record the essence of the Parties' ongoing divergence on this topic as it applied to the KHEP. The PCIW expressed the view that:

> "Paragraph 8(c) of Annexure D […] has been completely ignored in the project design. The basis for the Pondage should be the inflow and not the load of the Plant. Loads keep on changing with the construction of new plants."[78]

2.41. In the PCIW's view, India had not used "Para 8 (c) as the design criterion for computation of Pondage; rather they have used Para 8 (c) just to make twice their Pondage computed using the operation criteria given in Para 15 of Annexure D to the Treaty."[79] The Indian Commissioner argued that India had taken into account Paragraphs 8(c), 2(c) and 15 of Annexure D to the Treaty, and that Paragraph 15 was relevant because "Pondage is to be used for operational purpose *[sic]*".[80]

2.42. Following those discussions, in February 2008, the PCIW wrote to the ICIW stating that in the light of India's May 2007 letter[81] (in which it rejected all of the objections Pakistan had raised to the design of the KHEP in its earlier letter of August 2006[82]), as well as the

[78] Record of the 99th Meeting of the Permanent Indus Commission, 30 May-4 June 2007, dated 4 June 2007, **Exhibit P-0058**, p. 10, ¶ 5.
[79] *Id.*.
[80] *Id.*, p. 12.
[81] Letter No. 3/7/82-IT/1369 (with enclosure) from the ICIW to the PCIW dated 25 May 2007, **Exhibit P-0057**.
[82] Letter No. WT(132)/(6713-A)/PCIW (with enclosures) from the PCIW to the ICIW dated 24 August 2006, **Exhibit P-0056**.

positions taken by India at the 99th PIC Meeting, a number of "questions" arose with respect to the KHEP, which were to be resolved at the PIC under Article IX(1) of the Treaty. These questions covered: (1) the prohibition on the diversion of waters for HEP projects; (2) the excessive freeboard provided in the design (Paragraph 8(a), Annexure D); (3) the erroneous pondage calculation and the resulting placement of power intakes (Paragraph 8(c) and 8(f)); (4) the placement and design of the outlets, taking into consideration the prohibition to deplete the reservoir below Dead Storage Level for sediment management (Paragraph 8(d)); and (5) the type (un-gated or deep orifice gated) and placement of the spillways (Paragraph 8(e)).[83] A sixth, more general and separate question, regarding (6) the prohibition on full depletion of the reservoir (or "drawdown flushing"), was later deemed necessary.[84]

2.43. As further detailed in Pakistan's Response, Appendix A (paragraph 3) and the Competence Award (paragraphs 70-72), the Commissioners failed to reach consensus over the course of the next year.[85] In March 2009, Pakistan announced that no further purpose would be served by additional discussions at the PIC level,[86] and notified the ICIW and the Government of India that "disputes" had arisen with respect to two questions: namely, the legality under the Treaty of the proposed diversion of the Kishenganga; and the legality of drawdown flushing.[87] These two threshold questions were resolved in 2013 by the *Kishenganga* Court (as further described in **Section E** below).

2.44. Of the remaining four questions, Pakistan took the view that Question No. 2 (re the design of the spillway, and Paragraph 8(a) of Annexure D) "may no longer be relevant", while Questions Nos. 3-5 "were of a technical nature which relate specifically to the broad issue of whether or not the design of the Kishenganga Project conforms to the criteria stipulated in Paragraph 8 of Annexure D." They were put aside for the determination of a Neutral Expert.[88]

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[83] Letter No. WT(132)/(6839-A)/PCIW from the PCIW to the ICIW dated 4 February 2008, **Exhibit P-0059**.

[84] *Id.*, ¶¶ 20 and 30; Record of the 100th Meeting of the Permanent Indus Commission, 31 May-4 June 2008, dated 4 June 2008, **Exhibit P-0060**, pp. 26–28, and Record of the 101st Meeting of the Permanent Indus Commission, 25-28 July 2008, dated 28 July 2008, **Exhibit P-0061**, pp. 12–15.

[85] *See* Record of the 100th Meeting of the Permanent Indus Commission, 31 May-4 June 2008, dated 4 June 2008, **Exhibit P-0060**, and Record of the 101st Meeting of the Permanent Indus Commission, 25-28 July 2008, dated 28 July 2008, **Exhibit P-0061**.

[86] Record of the 101st Meeting of the Permanent Indus Commission, 25-28 July 2008, dated 28 July 2008, **Exhibit P-0061**.

[87] Letter No. WT(132)/(412/413)/PCIW (with enclosure) from the PCIW to the Secretary, Ministry of Water and Power, Government of Pakistan and Secretary, Ministry of Water Resources, Government of India dated 11 March 2009, **Exhibit P-0062**, and Letter No. WT(132)/(6981-A)/PCIW (with enclosures) from the PCIW to the ICIW dated 11 March 2009, **Exhibit P-0063**, ¶ 9.

[88] Letter No. WT(132)/(412/413)/PCIW (with enclosure) from the PCIW to the Secretary, Ministry of Water and Power, Government of Pakistan and Secretary, Ministry of Water Resources, Government of India dated 11 March

These disputes were the subject of further but ultimately unsuccessful discussions between the Parties in the period 2013–2016 (as further described in **Section F** below).

2E THE *KISHENGANGA* ARBITRATION

2.45. On 17 May 2010, Pakistan filed a Request for Arbitration,[89] raising the following two threshold questions:

(a) whether India's proposed diversion of the Kishenganga/Neelum River breached the Treaty ("**First Dispute**"); and

(e) whether India was allowed to deplete the KHEP's reservoir below Dead Storage Level in any circumstances except in the case of an unforeseen emergency ("**Second Dispute**").

2.46. In relation to the First Dispute, Pakistan sought (a) an interim order restraining India from proceeding further with the construction of the KHEP until a final decision of the *Kishenganga* Court; (b) a declaration that the diversion planned breached the Treaty; and (c) a mandatory and permanent injunction restraining India from diverting the river in the manner proposed. In relation to the Second Dispute, Pakistan sought (a) a declaration that under the Treaty, the water level of the reservoir of a Run-of-River Plant may not be reduced below Dead Storage Level except in the case of an unforeseen emergency; (b) a declaration that drawdown flushing for the purpose of sediment removal does not constitute an unforeseen emergency; and (c) a mandatory and permanent injunction restraining India from reducing the water level of the reservoirs of the KHEP except in the event of an unforeseen emergency.[90]

2E.1 Order on Interim Measures

2.47. In its Request for Arbitration in the *Kishenganga* arbitration, Pakistan indicated that it planned to request "interim measures both to safeguard Pakistan's interests under the Treaty with respect to the matters in dispute, and to avoid prejudice to the final solution and aggravation or extension of dispute."[91] It finally submitted that application in June 2011, after

2009, **Exhibit P-0062**, ¶¶ 6 and 8; Letter No. WT(132)/(6981-A)/PCIW (with enclosures) from the PCIW to the ICIW dated 11 March 2009, **Exhibit P-0063**, ¶¶ 8–9.

[89] *Indus Waters Kishenganga Arbitration (Pakistan v India)*, Pakistan's Request for Arbitration ("***Kishenganga* arbitration, Pakistan's Request for Arbitration**"), 17 May 2010, **Exhibit P-0241**.

[90] *Id.*, ¶¶ 54–55.

[91] *Id.*, ¶ 10.

India "refused to confirm that it proceeded at its own risk [in the construction of the KHEP] and […] refused to give an undertaking as to informing the Court and Pakistan of any actual or imminent steps in relation to KHEP."[92]

2.48. The *Kishenganga* Court issued its Order on Interim Measures on 23 September 2011. The Court recalled that, on the last day of the hearing on interim measures, India stated in "unequivocal terms", that "in this case, India is committed to proceed on the 'own-risk' principle of international law."[93] This, the Court said, "reduced the need for the Court to pass [judgment] upon some of Pakistan's claims."[94] However, the ¶ Court found that the specification of interim measures, "albeit not in as far-reaching a form as requested by Pakistan—[was] necessary to 'avoid prejudice to the final solution' of the present dispute" in the Court's eventual Award.[95]

2.49. In that respect, the Court decided that it was "necessary" temporarily to enjoin India's construction of certain elements of the dam at the Kishenganga/Neelum riverbed to avoid prejudice to the Award.[96] In particular, the Court found that:

> "[T]he dam that would eventually enable India to exercise a certain degree of control over the volume of water that will reach Pakistan […]. Moreover, it is the dam that would eventually place India in a position to divert parts or all of the waters of the Kishenganga / Neelum river into the Bonar-Madmati Nallah, thus potentially affecting water supplies in downstream areas of the Neelum valley.
>
> […]
>
> Moreover, even if the Court were ultimately to reject Pakistan's arguments regarding the alleged illegality of the KHEP in all its elements […], the Court at this stage cannot rule out that adjustments to the design of the KHEP dam or related works […] may be required. The entirely unconstrained construction of the KHEP *pendente lite* thus presents a risk of constricting the legal principles to which the Court may have recourse in its Award. Continued construction may also have the effect of foreclosing, delaying

[92] *Kishenganga* arbitration, Order on Interim Measures, **PLA-0042**, ¶¶ 31 and 58. At the First Meeting of the Court, Pakistan indicated that "in reliance upon [the] principle" "applied by the International Court of Justice […] in the *Passage through the Great Belt* case", that "a state engaged in works that may violate the rights of another state can proceed only at its own risk" and that "[t]he court may in its decision on the merits order that the works must not be continued or must be modified or dismantled", it "would not seek interim measures" (*id.*, ¶ 65). The Parties subsequently exchanged correspondence in March 2011, which led to Pakistan's Application for Interim Measures (*Id.*, ¶¶ 65–69).
[93] *Id.*, ¶ 122.
[94] *Id.*, ¶ 127.
[95] *Id.*, ¶ 136.
[96] *Id.*, ¶ 146.

> the implementation of, or rendering disproportionately large the cost of particular remedies that the Court may choose to order."[97]

2.50. Accordingly, the Court ordered India not to "proceed with the construction of any permanent works above the Kishenganga/Neelum riverbed at the Gurez site that may inhibit the restoration of the full flow of that river to its natural channel."[98]

2E.2 Partial Award

2.51. On 18 February 2013, the *Kishenganga* Court delivered its Partial Award. It held, in relation to the First Dispute, that: (i) the proposed design of the KHEP "constitutes a Run-of-River Plant" for the purpose of Paragraph 15 of Annexure D, in particular sub-paragraph (iii) thereof; (ii) India may divert water from the Kishenganga/Neelum River for power generation by the KHEP and may deliver the water released below the power station into the Bonar Nallah; and (iii) India is under an "obligation to construct and operate [KHEP] in such a way as to maintain a minimum flow of water in the [...] River" (with the decision on the minimum flow of water required deferred to its Final Award, as addressed further below).[99]

2.52. In relation to the Second Dispute, the Court held that "the Treaty does not permit reduction below Dead Storage Level of the water level in the reservoirs" except in the case of an unforeseen emergency, which the "accumulation of sediment in the reservoir of a Run-of-River Plant on the Western Rivers does not constitute".[100] The Court instructed India not to "employ drawdown flushing at the reservoir of [KHEP]"[101] and noted that changes in the KHEP design "may be required" to comply with the Award.[102]

2.53. As will be addressed in further detail in other Chapters of this Memorial, the Court made important—and binding—findings with relevance to a number of issues before the Court in the present proceedings. Most notable among these are:

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[97] *Id.*, ¶¶ 146 and 148.
[98] *Id.*, ¶ 152(1)(c).
[99] *Kishenganga* arbitration, Partial Award, **PLA-0003**, *dispositif* A.
[100] *Id.*, *dispositifs* B.1 and B.2.
[101] *Id.*, *dispositif* B.3.
[102] The *Kishenganga* Court said that, "[i]n the case of the KHEP, the Court is cognizant that changes to the design of the project may be required to optimize the management of sediment in light of this Partial Award" (*id.*, **PLA-0003**, fn. 739).

(a) its findings on the proper approach to interpreting and applying the Treaty (addressed further at **Chapter 8** of this Memorial);[103]

(b) the binding or precedential effect of awards of the Court or determinations of the Neutral Expert (also addressed further at **Chapter 8** of this Memorial);[104]

(c) the central importance of India's "let flow" obligation under Article III (addressed further at **Part III** of this Memorial);[105] and

(d) the requirements for the construction, design and operation of Run-of-River Plants under Annexure D (addressed further at **Chapter 9** and **Part IV** of this Memorial).[106]

2E.3 Decision on India's Request for Clarification or Interpretation

2.54. On 20 May 2013, India filed a Request for Clarification or Interpretation, in which it sought clarification or interpretation with respect to the Court's conclusion that "[e]xcept in the case of an unforeseen emergency, the Treaty does not permit reduction below Dead Storage Level of the Water level in the reservoirs of Run-of-River Plants on the Western Rivers."[107] India asked the Court to:

> "clarify that the permissibility of depletion or reduction below Dead Storage Level of the water level in the reservoirs of future Indian Run-of-River plants on the Western Rivers depends on a site-specific analysis of the feasibility of methods of sediment control other than drawdown flushing."[108]

[103] *Id.*, ¶¶ 365, 401–402 and 446, and generally, Sections IV.B.3 and IV.C.3; *Indus Waters Kishenganga Arbitration (Pakistan v. India)*, Decision on India's Request for Clarification or Interpretation (2013) XXXI RIAA 295, ("***Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation**"), **PLA-0021**, ¶¶ 29–30; and *Indus Waters Kishenganga Arbitration (Pakistan v India)*, Final Award (2013) XXXI RIAA 309 ("***Kishenganga* arbitration, Final Award**"), **PLA-0004**, ¶¶ 111–112.

[104] *Kishenganga* arbitration, Partial Award, **PLA-0003**, Chapter IV.C, especially ¶ 470; *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, **PLA-0021**, ¶ 27.

[105] *Kishenganga* arbitration, Partial Award, **PLA-0003**, Chapter IV.B.1, and, for example, at ¶ 410, where the Court concluded that the "inevitable conclusion" of the "deliberate division and allocation of the six main watercourses of the Indus system of rivers between the Parties" is that "Pakistan is given priority in the use of the waters of the Western Rivers, just as India has priority in the use of the waters of the Eastern Rivers."

[106] *Id.*, Chapters IV.B.2-4 and IV.C.

[107] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, **PLA-0021**, ¶ 3, referring to Partial Award, **PLA-0003**, *dispositif* B.1.

[108] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, **PLA-0021**, ¶ 8.

2.55. This was, in the words of Pakistan at the time, a clear "attempt to have the Court's unambiguous reasoning and determinations in respect of the Second Dispute replaced by quite different reasoning and determinations in favour of India."[109]

2.56. India argued that two aspects of the Court's Partial Award merited clarification or interpretation: (1) that the general decision on the permissibility of reservoir depletion for drawdown flushing exceeds the scope of the question presented to it and discussed by the Parties; and (2) that in light of the scope of the question submitted, the permissibility of drawdown flushing at future Run-of-River Plants, other than the KHEP, must depend on the conduct of a further, site-specific analysis.[110]

2.57. The Court rendered its decision on 20 December 2013. In addressing the merits of India's Request, the Court found it "beyond doubt" that the permissibility of drawdown flushing was put before the Court as a general issue.[111] In that regard, it referred to the Court's specific finding that the Second Dispute, as framed by Pakistan, and argued by both Parties, "concerns India's right to use drawdown flushing at any Run-of-River Plant that India may construct on the Western Rivers in future", and that the Court's Decision on that issue "will apply to other Run-of-River Plants to be built, as well as to the KHEP."[112] It added that the Court's answer to the question of interpretation at the heart of the Second Dispute was "general […] and not limited to the KHEP".[113]

2.58. The Court also confirmed that the Treaty's prohibition on drawdown flushing did not require a site-specific analysis in order to determine if the prohibition would apply to any given HEP. Rather, the prohibition was a "regulatory consideration", that would need to be taken into account by India when making an assessment of whether "a particular site will be available as a practical matter to India for hydro-electric development."[114]

2E.4 Final Award

2.59. In the Partial Award, the Court decided to defer to a Final Award, after further written submissions by the Parties, its determination of the appropriate "minimum flow of water" that

[109] *Id.*. In its Decision, the Court confirmed that it was not its function, "when asked to interpret or clarify its prior decision, to revise that decision." (*Id.*, ¶ 23).
[110] *Id.*, ¶ 24.
[111] *Id.*, ¶ 25.
[112] *Id.*, ¶ 26, referring to Partial Award, **PLA-0003**, ¶ 468.
[113] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, **PLA-0021**, ¶ 27.
[114] *Id.*, ¶¶ 33–34.

India would be required to maintain in the Kishenganga/Neelum River notwithstanding its construction and operation of the KHEP.[115] The Court issued its Final Award on 20 December 2013.[116] It described its task in the Final Award as being:

> "[T]o determine a minimum flow that will mitigate adverse effects to Pakistan's agricultural and hydro-electric uses throughout the operation of the KHEP, while preserving India's right to operate the KHEP and maintaining the priority it acquired from having crystallized prior to the NJHEP[[117]]. At the same time, in fixing this minimum flow, the Court must give due regard, in keeping with Paragraph 29 of Annexure G, to the customary international law requirements of avoiding or mitigating trans-boundary harm and of reconciling economic development with the protection of the environment."[118]

2.60. The Court took into account the Parties' submissions on the downstream effects of the KHEP on: Pakistan's agricultural uses; Pakistan's hydro-electric uses; and the downstream environment.[119] It confirmed that while its "ultimate decision on the minimum flow is informed by a deep awareness of the critical importance (and shortage) of electricity in both India and Pakistan", "[m]eaningful development in this area need not be at odds with careful consideration of environmental effects."[120]

2.61. The Court's Final Award builds on its Partial Award as regards the Court's approach to interpreting the Treaty pursuant to Paragraph 29 of Annexure G, as will be further addressed in **Chapter 8** below. As regards the issue of "minimum flow", the Court found that "the requirement of an environmental flow (without prejudice to the level of such flow) is necessary in the application of the Treaty". However, it continued:

> "[T]he Court does not consider it appropriate, and certainly not 'necessary,' for it to adopt a precautionary approach and assume the role of policymaker in determining the balance between acceptable environmental change and other priorities, or to permit environmental considerations to override the balance of other rights and obligations expressly identified in the Treaty […] The Court's authority is more limited and extends only to mitigating significant harm. Beyond that point, prescription by the Court is not only unnecessary, it is prohibited by the Treaty. If customary international law were applied not to circumscribe, but to negate rights expressly granted in the Treaty, this would no longer be '*interpretation or application*' of the Treaty but the substitution of customary law *in place of* the Treaty."[121]

[115] *Kishenganga* arbitration, Partial Award, **PLA-0003**, *dispositifs* A.3 and D and ¶¶ 455–463.
[116] *Kishenganga* arbitration, Final Award, **PLA-0004**.
[117] *I.e.*, Pakistan's Neelum-Jhelum Hydro-Electric Project.
[118] *Kishenganga* arbitration, Final Award, **PLA-0004**, ¶ 87.
[119] *Id.*, ¶¶ 92–104.
[120] *Id.*, ¶ 101.
[121] *Id.*, ¶ 112 (emphasis original).

2.62. The Court concluded that a minimum flow criterion of 9 cumecs was "consistent with Pakistan's analysis of environmental flows, given the need to balance power generation with environmental and other downstream uses, and, based on India's data, would maintain the natural flow regime in the most severe winter conditions."122 However, the Court also acknowledged that it was "important not to permit the doctrine of res judicata to extend the life of this Award into circumstances in which its reasoning no longer accords with reality along the Kishenganga/Neelum".123 For that reason, the Final Award made provision for a "review mechanism", allowing either Party to seek reconsideration of the Court's determination of minimum flow, at any time from seven years after the diversion of the Kishenganga/Neelum through the KHEP, through the "[PIC] and the mechanisms of the Treaty."[124]

2F FURTHER EVOLUTION OF THE DISPUTES IN THE COMMISSION

2F.1 Outstanding disputes relating to the KHEP

2.63. Promptly after the *Kishenganga* Partial Award had been rendered, the PCIW wrote to the ICIW to resume discussions to resolve the four questions regarding KHEP that had been left over for discussion once the two threshold disputes had been resolved.[125] The PCIW noted that in the light of "the Court's clear determination on the question of drawdown flushing for maintenance purposes, provision of deep orifice gated spillways can no longer be justified by India" and that "modification of the design is necessitated to ensure compliance of the criterion stipulated at Paragraph 8(e) of Annexure D". Pakistan also asked India to stop the works until all pending questions were resolved.[126]

2.64. At the following meeting of the PIC (108th PIC Meeting), the PCIW reiterated the objections to India's design based on the Treaty and the recent Partial Award (freeboard, Pondage, and placement of the spillways and intakes), offering technical alternatives to overcome the objections.[127] However, the ICIW asserted—in what would become a recurrent

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[122] *Id.*, ¶ 115.
[123] *Id.*, ¶ 117.
[124] *Id.*, ¶ 119.
[125] Competence Award, ¶ 83, referring to Letter No. WT(132)/(7330-A)/PCIW from the PCIW to the ICIW dated 6 March 2013, **Exhibit P-0069**.
[126] Letter No. WT(132)/(7330-A)/PCIW from the PCIW to the ICIW dated 6 March 2013, **Exhibit P-0069**.
[127] The PCIW argued that higher pondage inherently required submerged intakes, a design that would cause the intake to "draw coarser sediment particles which are harmful for the turbines and expose[] it to the risk of overwhelming by the deposited sediments," and suggested that surface intakes be used in the alternative. The PCIW said he would not object to the use of un-gated spillways ("the preferred choice of the Treaty") or to the placement of sediment outlets immediately below the intake "if these are properly sized". In the case of the use of gated spillways, "after the conclusive decision of the Court of Arbitration on the question of drawdown flushing

theme in subsequent discussions and exchanges—that India's design was consistent with the rationale sanctioned by the Neutral Expert in the *Baglihar* Determination.[128] India maintained, *inter alia*, that "an unambiguous neutral view is available in the Baglihar determination which can always serve as guideline [and i]f the same is followed, the issue can be revolved in all run of the river [HEPs] on [the] Western Rivers […]".[129] The PCIW dismissed the reasoning of the Neutral Expert in the *Baglihar* Determination[130] and rejected its purported *erga omnes* effect, by reference to the finding of the *Kishenganga* Court on that issue.[131]

2.65. The subsequent discussions of the Parties regarding the questions raised over the design of the KHEP (including the PCIW's withdrawal of Pakistan's objection to the freeboard contemplated in the KHEP after due consideration of India's technical arguments[132]) during

in the Kishenganga case, there was no justification for providing deep orifice spillways, as these would not provide any incremental sediment flushing/sluicing over the crest gated or un-gated spillways". Finally, the PCIW highlighted that configurations which employ "excessive Pondage, deep intakes, and orifice spillways were not only violative of the Treaty but also were disadvantageous for the owner" as they aggravate sedimentation problems which would require regular drawdown flushing. This approach "would not only cause loss of precious energy during flushing operations but also enhances the risk of rapid filling of the reservoir with sediments due to high incidence of landslides in the reservoir due to repeated fast lowering of water level." *See* Record of the 108th Meeting of the Permanent Indus Commission, 24-25 March 2013, dated 24 September 2013, **Exhibit P-0070**, ¶¶ 5–9. Among other arguments, the ICIW replied that "Pondage does not dictate the type and location of the power intake. Hydraulics, topography, geology, techno-economics and many other factors play a vital role in the decision-making. On the PCIW's statement that a surface intake will be acceptable to him in India's designs, ICIW stated that more often than not, site conditions do not allow surface intake as a techno-economically feasible option". *Id.*, ¶ 20.

[128] In particular, the ICIW alleged that "[a]s defined in the Treaty, and acknowledged by the NE in Baglihar case, the purpose of Pondage is to meet load fluctuations. It has however been Pakistan's view to design Pondage to meet flow variations which is nowhere stated in the Treaty. Such a view also renders Paragraph 15 of Annexure D unnecessary. On PCIW's view that higher Pondage created the requirement of submerged intake, ICIW stated his view that Pondage does not dictate the type and location of the power intake". (Record of the 108th Meeting of the Permanent Indus Commission, 24-25 March 2013, dated 24 September 2013, **Exhibit P-0070**, ¶ 20.)

[129] Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 8.

[130] The PCIW explained at the PIC Meeting "faults in NE's stance on Pondage in Baglihar case [and] elaborated that the NE left the definition of the Firm Power given in the Treaty and picked up a definition from outside of the Treaty which was markedly different from the definition of Firm Power given in the Treaty …. With such a big flaw in application of the Treaty, Pakistan, did not consider the interpretation provided by the NE in Baglihar case as a valid interpretation of the Treaty". *See* Record of the 108th Meeting of the Permanent Indus Commission, 24-25 March 2013, dated 24 September 2013, **Exhibit P-0070**, ¶ 31; *see* also Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 12.

[131] Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶¶ 9, 10 and 12; Record of the 111th Meeting of the Permanent Indus Commission, 31 January-4 February 2015, dated 31 May 2015, **Exhibit P-0025**, ¶¶ 28 *et seq.*; *see also* Letter No. WT(47)/(7464-A)/PCIW from the PCIW to the ICIW dated 30 January 2015, **Exhibit P-0026**, ¶¶ 7–8 (referring to the Court's decision at *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 470).

[132] Pakistan withdrew its objection at the 110th PIC Meeting. Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 43.

the period after the 108th PIC Meeting to January 2015 are detailed in Appendix A to Pakistan's Response, at paragraphs 12–15.[133]

2F.2 Disputes relating to the RHEP

2.66. As regards the RHEP, the legal and technical disputes largely parallel those regarding the KHEP. The early history of the Parties' discussions over the RHEP up to February 2015 are set out in paragraphs 84–87 of the Competence Award, and in further detail in Pakistan's Response, paragraphs 16–24.

2.67. The principal disputes over the design of the RHEP were discussed at the 109th and 110th PIC Meetings in September 2013 and August 2014, as set out in paragraphs 21–24 of Appendix A to Pakistan's Response and reproduced here[134].

2.68. At the 109th PIC Meeting in September 2013, the RHEP design features were discussed again, together with certain Treaty interpretation issues:

(c) **Pondage and Power Intakes**: The PCIW stressed that "differences in interpretation of the clauses […] are quite large and lead to results that are widely divergent [and which have] not been possible to reconcile […] in the Past".[135] Pakistan also asked that the intakes be raised in accordance with the higher Dead Storage Level corresponding to the reduced pondage.[136] The ICIW insisted on referring to load demand rather than river inflow as a basis for pondage calculation, relying on the Baglihar Determination.[137] The ICIW also advanced arguments based on the context of the adoption of the Treaty.

(d) **Spillway and Low Level Outlets:** The PCIW argued in favour of the technical viability of the alternative design proposed by Pakistan (crest gated spillways), addressing the objections raised by the ICIW in his 11 September 2013 letter.[138] The ICIW insisted that India's "location of bottom outlets conforms to ICOLD [International Commission on Large Dams] Bulletin 115" and that site

[133] *See also*, Competence Award, ¶ 83.
[134] Certain formatting changes have been introduced to the text from Appendix A to make it consistent with the style of this Memorial.
[135] Record of the 109th Meeting of the Permanent Indus Commission, 22-25 September 2013, dated 14 July 2014, **Exhibit P-0083**, ¶ 26.
[136] *Id.*, ¶ 38.
[137] *Id.*, ¶¶ 45−47.
[138] *Id.*, ¶¶ 34−37.

conditions (a gorge with limited width) justified India's design, and rendered Pakistan's alternative non-viable.[139]

(e) **Freeboard:** The PCIW argued—with support from a U.S. Government report—that no freeboard is needed in the case of concrete dams and challenged the premises upon which India had calculated freeboard, including design wind speed and calculation of the run-up.[140] The ICIW, in turn, submitted various arguments to justify the amount of freeboard provided in the RHEP design.[141]

2.69. Despite the PCIW insisting several times on the importance of convening at the PIC level and fixing dates for Pakistan to inspect the site,[142] the Parties made no further progress toward resolving the points of dispute at the 110th PIC Meeting.[143] The only new areas of discussion concerned sediment outlets and flood spillways. The PCIW explained that "the separate provisions for sediment outlets and the spillway in Annexure D […] reveal express intention of the framers of the Treaty to deal with the two issues separately to avoid the possibility of excessive control over the inflows and the water stored".[144] The PCIW rejected the applicability of ICOLD Bulletin 115, since it is "by and large applicable on the storage projects" using drawdown flushing for sediment management.[145]

2.70. The ICIW, in turn, argued that "it would not be appropriate to interpret that only the design provided by Pakistan conforms to the Treaty provision and would enable the implementation of Court of Arbitration's ruling".[146]

2.71. After presenting the ICIW with copies of Pakistan's technical specifications for an alternative RHEP design and stressing that India had failed to provide technically substantiated

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[139] *Id.*, ¶ 43.

[140] *Id.*, ¶¶ 19−25. The PCIW concluded that "India's freeboard calculations follow an incorrect procedure mainly in terms of calculation of design wind speed from the fastest mile wind speed and in the calculation of the relative run-up corresponding to the extrapolated wave steepness factor". *Id.*, ¶ 25.

[141] *Id.*, ¶¶ 39−40.

[142] Letter No. WT(51)/(7388-A)/PCIW from the PCIW to the ICIW dated 5 December 2013, **Exhibit P-0084**; *see also* Letter No. WT(51)/(7394-A)/PCIW from the PCIW to the ICIW dated 10 January 2014, **Exhibit P-0073**.

[143] Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**.

[144] *Id.*, ¶ 30. The PCIW also explained that while sediment outlets must be placed at the highest possible level and be of the "minimum size which can provide the required sediment management", spillways should be un-gated unless site conditions require otherwise, in which case "the crest of the spillway should be fixed ... at the highest possible level consistent with sound and economical design and satisfactory construction and operation of the works". *Id.*, ¶¶ 30−31.

[145] *Id.*, ¶ 31.

[146] *Id.*, ¶ 32, *see* generally, ¶¶ 30−35.

replies following PIC meetings and epistolary exchanges,[147] the PCIW submitted that "differences ha[d] arisen concerning provision of excessive freeboard, excessive Pondage, deep orifice spillways, and intakes, and the Commission ha[d] become unable to reach at a resolution or settlement".[148] This was rejected by the ICIW, who insisted that "the issue of pondage may have been under discussion for last 10 years, however, now the guidelines by the third party/Neutral Expert in this regard are available to help achieving convergence".[149] Despite Pakistan's repeated rejection of the *Baglihar* Determination being treated as binding precedent, the ICIW stated that no "difference has arisen" because the "configuration of Ratle given by Pakistan side needs to be examined and further discussed".[150]

2F.3 The evolution of the disputes relating to the KHEP and the RHEP from 2015 up to Pakistan's Arbitration Request

2.72. The subsequent evolution of the disputes relating to the KHEP and the RHEP from 2015 up to Pakistan's Arbitration Request are set out in detail in the Competence Award, paragraphs 88–105, and Appendix A to Pakistan's Response, paragraphs 25–41 and 42–54. What follows is a brief recapitulation, for the purposes of the present phase of these proceedings, of the evolution of the Parties' differences into a dispute.

2.73. As the Court recalled in its Competence Award, it was at the 111th PIC Meeting, held between 31 January and 4 February 2015, that "the Parties first outlined their perceptions of the progress and obstacles to resolving their disagreements".[151] The Court continued:

> "In the case of the KHEP, Pakistan's Commissioner observed that construction was progressing and 'to avoid fait accompli situation, early resolution on the differences on the design need to be achieved'. He added, '[i]f the issues are not resolved then Pakistan would opt for third party for resolution in accordance with the provisions of Article IX of the Treaty.' India's Commissioner responded that 'all the design related issues should be discussed with an endeavor to resolve them amicably without resorting to Article IX of the Treaty'; he later added, with respect to pondage, 'the difference has not arisen as the Pakistan objections can be further discussed and resolved amicably within the ambit of [the Commission]'. The Parties expressed similar positions with respect to the RHEP. On the issue of pondage at the RHEP, Pakistan's Commissioner stated that a 'difference has arisen between the Parties and the matter needs to be dealt with under Article IX of the Treaty', while India's Commissioner stated that 'in his view the difference has not arisen'."[152]

[147] *Id.*, ¶¶ 37–38.
[148] *Id.*, ¶ 39.
[149] *Id.*, ¶ 40.
[150] *Id.*.
[151] Competence Award, ¶ 88 (citation omitted).
[152] *Id.*.

2.74. The PCIW formally notified the ICIW on 3 July 2015 of his intention to ask for the appointment of a Neutral Expert, attaching a statement of the Points of Difference over the KHEP and RHEP designs, and inviting the ICIW to prepare a joint statement per Article IX(3) of the Treaty.[153] The ICIW declined the invitation.[154]

2.75. On 24 July 2015, the PCIW invited both Governments to appoint a Neutral Expert under Paragraph 4(b)(i) of Annexure F of the Treaty.[155] On 21 August 2015, the ICIW re-asserted India's position that the appointment of a Neutral Expert was "premature".[156] In addition to highlighting their stark opposition regarding the ripeness of a reference to a Neutral Expert, this letter and the PCIW's response of 11 September 2015 display the Parties' fundamental disagreement over the effect of the *Baglihar* Determination and the *Kishenganga* Court's findings.[157]

2.76. As the Court recalled in its Competence Award, further correspondence between the PCIW and ICIW in late 2015 and early 2016 failed to yield agreement between the Parties on the ripeness of a reference of the Parties' differences to a Neutral Expert.[158]

2.77. On 25 February 2016, Pakistan formally revoked its invitation to appoint a Neutral Expert.[159] In doing so, the PCIW's letter to the ICIW explained that it had "become apparent […] that the issues over the Kishenganga and Ratle HEPs are substantially, if not predominantly, legal in nature."[160] In that regard, the PCIW referred specifically to India's continued insistence, ***first***, that "the pondage calculation for the Kishenganga and Ratle HEPs should be resolved by reference to the Neutral Expert's pondage determination in the Baglihar case", and ***second***, that a "design with deep orifice spillways for sediment control in both the Kishenganga and Ratle HEPs' configurations that would not be effective unless water can be drawn down to or near the streambed", notwithstanding the *Kishenganga* Court's decisions in its Partial Award.[161] These issues, and other related disputes, presented, the PCIW said, "legal questions of Treaty interpretation that will inevitably recur as India proceeds with other HEP

[153] *Id.*, ¶ 89.
[154] *Id.*, ¶ 90. *See* also, Pakistan's Response, Appendix A, ¶ 28.
[155] Competence Award, ¶ 91.
[156] *Id.*, ¶ 93.
[157] Pakistan's Response, Appendix A, ¶¶ 31–35.
[158] Competence Award, ¶¶ 94–98; *see also*, Pakistan's Response, Appendix A, ¶¶ 37–40.
[159] Competence Award, ¶ 98.
[160] *Id.*, referring to Letter No. WT(132)/(7531-A)/PCIW (with enclosure) from the PCIW to the ICIW dated 25 February 2016, **Exhibit P-0023**.
[161] *Id.*.

projects on the Western Rivers".[162] For that reason, in Pakistan's view, they should "be resolved by a full Court of Arbitration, comprised of experts trained in both law and engineering, which can render an award of general applicability for the parties' future guidance, and—as the Court of Arbitration clarified—'binding on the general question presented' (Partial Award, ¶ 470)."[163]

2.78. Further correspondence, in which India variously rejected Pakistan's request for adjudication by a Court of Arbitration, ensued.[164] On 29 March 2016, Pakistan proposed via Note Verbale to India that the governments hold negotiations pursuant to Article IX(4), and appointed negotiators.[165] Inter-governmental negotiations were ultimately held in India on 14-15 July 2016, but no significant change in positions or compromise was achieved.[166] And while India proposed a tour of the KHEP "in the near future",[167] no such tour has yet taken place.[168]

2.79. On 11 August 2016, the ICIW acknowledged for the *first time* the seven points of contention that it had repeatedly denied[169] and indicated his intent to request the appointment of a Neutral Expert for the resolution of what he asserted were "purely technical" issues.[170] As the Court has already observed, the points of difference appended to the ICIW's letter "were essentially identical to those that Pakistan had enclosed with its 3 July 2015 letter expressing its intention to seek the appointment of a neutral expert".[171]

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[162] *Id.*.
[163] *Id.*.
[164] Competence Award, ¶¶ 99–100; Pakistan's Response, Appendix A, ¶¶ 44–48.
[165] Competence Award, ¶ 101; Pakistan's Response, Appendix A, ¶ 49.
[166] Competence Award, ¶ 104; Pakistan's Response, Appendix A, ¶ 50.
[167] Minutes of Secretary Level Meeting on Kishenganga and Ratle Hydroelectric Plants held in New Delhi, 14-15 July 2016, dated 15 July 2016, **Exhibit P-0031**, ¶ 5.
[168] *See* Record of the 113th Meeting of the Permanent Indus Commission, 20-21 March 2017, dated 29 March 2018, **Exhibit P-0103**, ¶¶ 48–50.
[169] Pakistan's Response, Appendix A, ¶ 51, referring to Merged Statement of Points of Dispute, **Exhibit RFA-3**, which presents both formulations side-by-side, for ease of reference.
[170] Letter No. Y-11017/2/2015-IT/2202 (with enclosure) from the ICIW to the PCIW dated 11 August 2016, **Exhibit P-0032**, ¶ 5. *See also*, Competence Award, ¶ 105; Pakistan's Response, Appendix A, ¶ 51.
[171] Competence Award, ¶ 105.

2G THE PROCEDURAL HISTORY OF THE PRESENT PROCEEDINGS AND THE PARALLEL PROCEEDINGS BEFORE THE NEUTRAL EXPERT

2.80. The initiation of these proceedings, and those of the parallel Neutral Expert proceedings, are recounted in the Competence Award at paragraphs 106–111.[172] What follows is a brief recapitulation of that procedural history.

2.81. Pakistan served its (original) Request for Arbitration on India on 19 August 2016 via Note Verbale, noting the failure of the 14-15 July 2016 talks and stating that "Pakistan has come to the conclusion that the Disputes are not likely to be resolved by further negotiation per Article IX(5)(b)" such that the way to the Court of Arbitration was clear.[173] The ICIW responded on 6 September 2016, "express[ing] surprise at Pakistan's Request for Arbitration, noting that Pakistan had previously stated that the issues under discussion 'fall within the purview of a Neutral Expert'"[174]—a position that India has maintained to this day.[175]

2.82. Also on 6 September 2016, the ICIW wrote to Pakistan and India (with the PCIW in copy) to ask that they jointly appoint a Neutral Expert under Paragraph 4(b)(i) of Annexure F. In so doing, he invoked Paragraph 5(c) of Annexure F—thereby purporting to indicate that the formal request for a Neutral Expert determination was on foot.[176]

2.83. India's transmitted its Request for the Appointment of a Neutral Expert under Annexure F of the Treaty ("**Neutral Expert Request**") to the World Bank on 4 October 2016.[177] On 18 October 2016, the President of the Bank announced that the Bank was in the "unprecedented" situation of being "seized of two requests".[178] The Bank imposed the Pause on 12 December

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[172] *See also*, Pakistan's Response, Appendix A, ¶¶ 55–62.
[173] Note Verbale No. KA(II)-2/11/2016 from Pakistan to India dated 19 August 2016, **Exhibit P-0034**.
[174] Competence Award, ¶ 109.
[175] Ministry of External Affairs, Government of India, "Matters pertaining to the Indus Waters Treaty", 6 July 2023, **Exhibit P-0242**, available at:
https://www.mea.gov.in/press-releases.htm?dtl/36761/Matters+pertaining+to+the+Indus+Waters+Treaty (last accessed 18 March 2024); Ministry of External Affairs, Government of India, "Meeting of Neutral Expert proceedings on the Indus Waters Treaty", 21 September 2023, **Exhibit P-0243**, available at:
https://www.mea.gov.in/pressreleases.htm?dtl/37133/Meeting+of+Neutral+Expert+proceedings+on+the+Indus+Waters+Treaty#:~:text=Ministry%20of%20External%20Affairs%20Government%20of%20India&text=The%20meeting%20was%20convened%20by,representatives%20of%20India%20and%20Pakistan (last accessed 18 March 2024).
[176] Letter No. Y-11017/2/2015-IT/2209 (with enclosure) from the ICIW to the Secretary, Ministry of Water Resources, Government of India and Secretary, Ministry of Water and Power, Government of Pakistan dated 6 September 2016, **Exhibit P-0105**, ¶ 13.
[177] India's Request for the Appointment of a Neutral Expert ("**Neutral Expert Request**"), 4 October 2016, **Exhibit P-0156**.
[178] Competence Award, ¶ 112, referring to Letter from the World Bank to the Parties dated 18 October 2016, **Exhibit P-0038**, ¶¶ 4–5.

2016.[179] The Pause remained in place until 31 March 2022.[180] Pakistan objected to the Pause at the time of its imposition.[181] Related to these series of events, the Court made a number of observations about "the role of the World Bank in the dispute resolution architecture of the Treaty" in its Competence Award.[182]

2.84. A "handover meeting" between the Chair of the Court of Arbitration and the World Bank took place on the afternoon of 21 November 2022, which had been immediately preceded by a similar such meeting with the Neutral Expert.[183]

2.85. Following India's letter to the World Bank of 21 December 2022,[184] and the First Meeting of the Court, the Court resolved that it would conduct a preliminary phase of the proceedings to consider, on an expedited basis, the competence of the Court and the operation of Article IX of the Treaty.[185] Pakistan submitted its Response on Competence on 24 March 2023. In its Competence Award, the Court held that it is competent to consider and determine all of the disputes set forth in Pakistan's Arbitration Request.[186]

2.86. At the same time, the Court issued PO6, in which it decided to "conduct these proceedings in a phased manner, bearing in mind the status of, and developments concerning, the proceedings taking place before the Neutral Expert."[187] It held that the present phase of these proceedings, to which this Memorial relates, will address a number of questions that arise from Pakistan's Arbitration Request and which concern:

> "the overall interpretation or application of Article III of the Treaty and paragraph 8 of Annexure D thereto, as well as a related general question […] concerning the legal effect of past decisions issued by dispute resolution bodies established pursuant to Article IX of the Treaty upon the Parties and upon subsequent dispute resolution bodies".[188]

2.87. Due to the lapse of time between Pakistan's (original) Request for Arbitration and the Competence Award, which had been occasioned by the Bank-imposed Pause, certain aspects

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[179] Competence Award, ¶ 115.
[180] *Id.*, ¶ 117.
[181] *Id.*, ¶ 116.
[182] *Id.*, ¶¶ 262–266.
[183] *Id.*, ¶ 119.
[184] Letter No. Y-18012/1/2020-Indus from India to the World Bank enclosing an Explanatory Note (Enclosure 'A'), dated 21 December 2022, **Exhibit P-0001**.
[185] Competence Award, ¶¶ 25, 27 and 30.
[186] *Id.*, ¶ 318, *dispositif* H.
[187] PO6, ¶ 34.
[188] *Id.*, ¶ 35.

of Pakistan's original Request for Arbitration were out of date. Pakistan therefore requested, and was granted, leave to amend its original Request for Arbitration.[189] Pakistan submitted an Amended Request for Arbitration on 17 August 2023.

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[189] Pakistan's Application for Leave to Amend Pakistan's Request for Arbitration, 28 July 2023; Procedural Order No. 8, 10 August 2023.

PART II: THE INDUS BASIN, RUN-OF-RIVER HYDROPOWER PLANTS, INDIA'S HYDROPOWER PLANT PROGRAMME, AND THE SCHEME OF THE INDUS WATERS TREATY

II.1. **Part II** is composed of four chapters, supplemented by three Appendices. It brings to life the characteristics and usage of the Indus Basin, explains how Run-of-River Plants work, and describes India's programme of developing such Plants on the Western Rivers. The final chapter in this Part, drawing directly on the knowledge and experience of Pakistan's Commissioner for Indus Waters, links these features with the scheme and actual operation of the Indus Waters Treaty.

II.2. **Chapter 3** covers the physical and social geography and hydrology of the Indus Basin, water usage in Pakistan and the impacts of climate change, which in turn give rise to concerns around water security. A striking reality underlies this dispute: the Indus Basin contributes 95% of the total water resources in Pakistan. Since the allocation of the Eastern and Western Rivers to India and Pakistan (respectively) under the Treaty, two-thirds of Pakistan's water resources is derived from the inflows of the Western Rivers. The Indus Basin is the lifeblood of the country's water supply. The Indus Basin is the only river basin of any consequence within Pakistan's territory, making the entire population dependent on its water. India, by contrast, relies on over twenty different river basins for its water needs.

II.3. **Appendix D** supplements **Chapter 3** by analysing flow data of the Indus River and its principal tributaries in Pakistan. The overall picture is of a reduction in flows. Moreover, the evidence shows that climate change is projected to decrease the vast glacial mass that feeds the waters of the Indus Basin and negatively impact crop yields. The future is one in which Pakistan's available water resource steadily shrinks, while its water needs rise exponentially. Pakistan is therefore overwhelmingly reliant on the free flow of the waters of the Western Rivers. The critical nature to Pakistan, today and in the future, of the "let flow"/non-interference/no storage rules in the Treaty cannot be over-stated.

II.4. **Chapter 4** is a primer on how Run-of-River hydropower plants work. It sets out (1) the basic features of Run-of-River HEPs, including the process by which they use the hydraulic energy of water to produce electricity, and (2) the hydrological and geographical features of the Indus Basin which are relevant to the design and operation of HEPs under the Treaty. It lays the groundwork for the technical discussion in Part IV on the interpretation and application of the Treaty, and in particular Paragraph 8 of Annexure D. It includes a number of figures to provide context and examples of hydropower plant operation in advance of the Court's site visit to the NJHEP.

II.5. With a clear understanding of how of run-of-river hydropower plants work having been established, **Chapter 5** focuses on India's hydropower programme on the Western Rivers and its impact. Its purpose is to contextualise Pakistan's systemic concerns about the consequences of India's approach to the interpretation and application of the Treaty. The sobering conclusion of this chapter is that if India's HEP construction programme is carried out in full, it would result in a network of 201 HEPs on the Western Rivers. This has been described by an independent expert as "a looming train wreck on the Indus, with disastrous consequences".[190] It is not just the scale and cumulative effects of India's programme, but also its design and construction of Treaty-inconsistent HEPs that do not respect the object and purpose of the Treaty, as will be elaborated in **Parts III** and **IV**.

II.6. **Chapter 5** is complemented by **Appendices C1** and **C2**, which list (**Appendix C1**) and show the locations on each river system of (**Appendix C2**) the various HEPs discussed in the Chapter.

II.7. **Chapter 6** introduces the overall scheme and operation of the Treaty. This is to be read with the Statement of Syed Muhammad Mehar Ali Shah, Pakistan's Commissioner for Indus Waters (**Appendix B**). Mr Shah is the long-standing PCIW and a high-ranking and highly experienced engineer in the fields of hydrology and water use. He provides expert insight into the way in which the Treaty ought to operate between the Parties; and a factual account of how the Treaty provisions are in fact operating and the implications that flow from this. He illuminates the various moving parts of the Treaty, including how the information-sharing obligations are inextricably linked to design criteria for HEPs, which in turn form an integral part of the bargains at the heart of the Treaty. Crucially, Mr Shah explains how the Treaty is working—or not working—in practice. He describes a situation of dysfunction, in which India has repeatedly frustrated the intended operation of the Treaty. That dysfunction is genuine, enduring and becoming more severe. However, these proceedings present an opportunity for the alignment of the Parties on the proper interpretation and application of the Treaty.

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[190] J. Briscoe, "War or peace on the Indus?", *The News International*, 3 April 2010, available at: https://johnbriscoe.seas.harvard.edu/files/johnbriscoe/files/108._john_briscoe_war_or_peace_on_the_indus_201004.pdf (last accessed 18 March 2024), **Exhibit P-0325**, p. 1.

CHAPTER 3: THE INDUS BASIN – TOPOGRAPHY, HYDROLOGY, DEMOGRAPHY, WATER SECURITY AND CLIMATE CHANGE

3.1. As PO6 acknowledged,[191] the Court is seised of a dispute that requires the determination of certain general (or systemic) questions concerning the interpretation or application of the Indus Waters Treaty. Those systemic questions are not before the Neutral Expert. Nor have they previously been the subject of dispute resolution under the Treaty because each of the previous court and neutral expert proceedings under Article IX concerned only specific aspects of India's Kishenganga and Baglihar projects. The generic issues before the Court are thus unique and exceptional in their scope and importance.

3.2. In order to resolve the systemic questions that are exclusively before the Court—and, specifically, those questions related to the design and operational requirements established by Part 3 of Annexure D of the Treaty for Indian HEPs on the Western Rivers that are the subject of this phase—the Court will find it helpful to have an understanding of the characteristics and usage of the Indus Basin and the Western Rivers. Such characteristics and usage frame the obligations enshrined in Article III and Annexure D of the Treaty and make India's obligations with respect to the Western Rivers as critical today as they were in 1960, if not more so.

3.3. Specifically, any understanding of India's concomitant "let flow", "non-interference" and associated obligations under Article III and Annexure D of the Treaty, requires an appreciation of:

(a) **Section A** details the physical and social geography of the Indus Basin, including demographics;

(b) **Section B** addresses the hydrology, sedimentation characteristics, and irrigation network of the Indus Basin;

(c) **Section C** set out details on water usage in Pakistan, including agricultural, domestic, industrial and hydroelectric usages, and water storage practices on the Western Rivers; and

[191] PO6, ¶ 24 *et seq.*.

(d) **Section D** explains the impacts of climate change on the Indus Basin and the resultant threats to water sustainability.

3.4. This Chapter addresses each of these issues in turn, before making, in **Section E**, some brief concluding remarks.

3A THE PHYSICAL AND SOCIAL GEOGRAPHY OF THE INDUS BASIN

3A.1 The course of the Western and Eastern Rivers

3.5. The Indus River is 3,200 kilometres long and its basin encompasses a total area of approximately 862,706 square kilometres.[192] The Indus Basin can be subdivided into ten major sub-basins, which are drained by twenty-seven major tributaries and numerous lower-order tributaries.[193] The Indus Basin area in Pakistan comprises the Indus River and six major tributaries: the Chenab, Jhelum, Ravi, Sutlej and Beas rivers that enter Pakistan from the east and the Kabul River which enters Pakistan from Afghanistan in the west.[194]

3.6. This Chapter will focus on the rivers entering Pakistan across its eastern border with India. For the purposes of the Treaty, these rivers have been denominated as the "Western Rivers" (i.e., the Indus, Chenab, and Jhelum) and "Eastern Rivers" (i.e., the Ravi, Sutlej, and Beas). Pursuant to the Treaty, the individual rivers include "the named river […] and all its Tributaries";[195] this means that reference to the Jhelum River, for instance, includes the

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[192] This figure represents the total drainage area of the Indus Basin and was computed using data on the rivers of the Indus Basin and their catchment areas available on the HydroSHEDS database in the Google Earth platform, *see* 'Datasets tagged hydrosheds in Earth Engine', Earth Engine Data Catalog, available at: www.developers.google.com/earth-engine/datasets/tags/hydrosheds (data sourced 1 November 2023). The HydroSHEDS database "offers a suite of global digital data layers in support of hydro-ecological research and applications worldwide. Its various hydrographic data products include catchment boundaries, river networks, and lakes at multiple resolutions and scales", *see* 'HydroSHEDS', available at: www.hydrosheds.org (last accessed 18 March 2024). Please note that commentators differ on the exact size of the drainage area of the Indus Basin, with alternative calculations of 1.12 million square kilometres or higher. In Pakistan's submission, the accurate size of the drainage area is 862,706 square kilometres. Other calculations sometimes erroneously include an area that runs along the left bank of the Indus Basin (falling within the territory of both Pakistan and India) of approximately 400,570 square kilometres. However, this area is an 'outfall drain' that flows along the Indus and drains directly into the Arabian Sea and does not form part of the Indus Basin drainage area and has been therefore excluded from Pakistan's calculation.

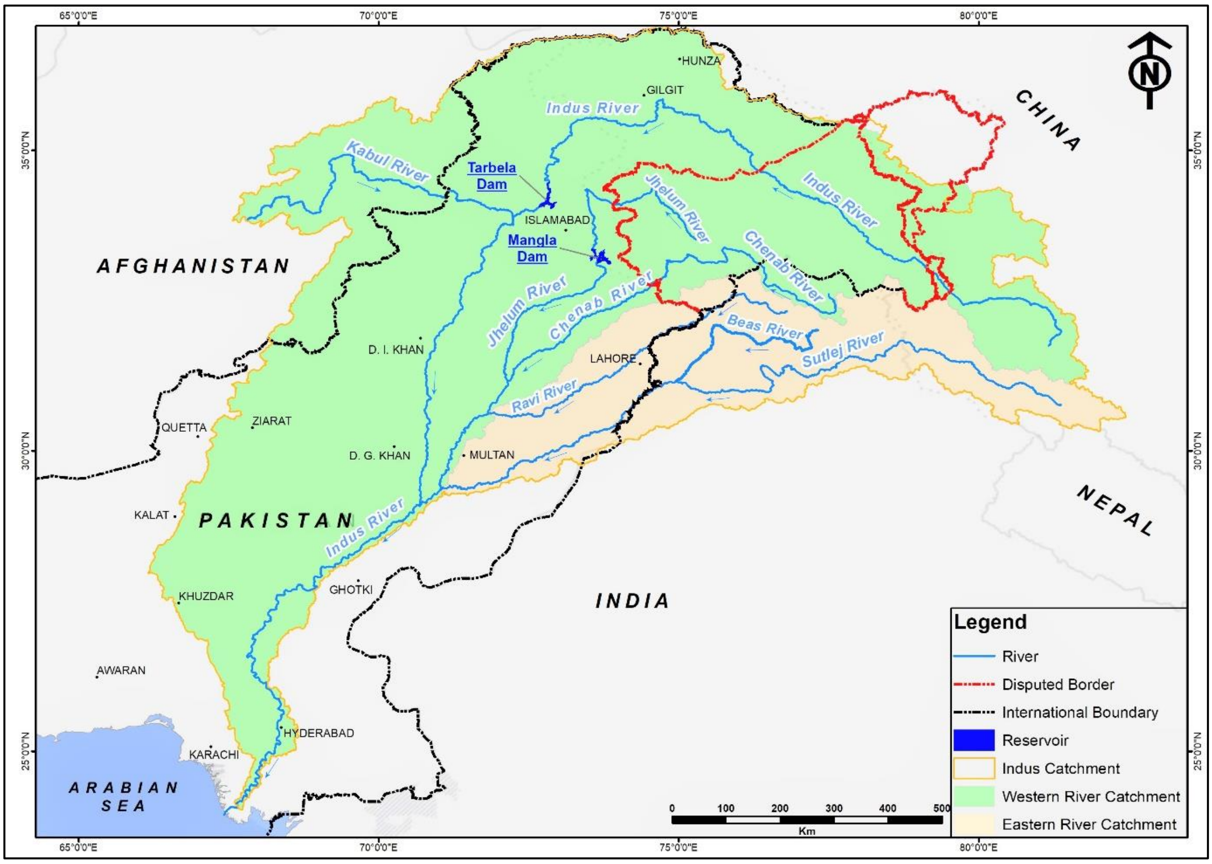
[193] A. Khan and M. H. Idrees, "The Impact of Climate Change on the Indus Basin: Challenges and Constraints" in M. Ahmad (*ed.*), *Water Policy in Pakistan* (Springer 2023) ("**Khan and Idrees, 2023**"), **Exhibit P-0244**, p. 227. In this Memorial, when a reference is made to the **"Indus Basin"** it is intended to refer to the *whole* Indus Basin as described here. Further, the Memorial also uses the term "**Indus system of rivers**", which includes the Western Rivers and the Eastern Rivers and their tributaries and connecting lakes, as implied by the use of the term in the Treaty (*see* Indus Waters Treaty 1960, **PLA-0001**, Preamble).

[194] U. Z. Alam, "Water Rationality: Mediating the Indus Waters Treaty", Ph.D. Thesis, Geography Department, University of Durham, September 1998 ("**Alam, 1998**"), **Exhibit P-0245**, p. 29.

[195] Indus Waters Treaty 1960, **PLA-0001**, Article I(3).

Neelum/Kishenganga tributary of the Jhelum. Further, each river has its own sub-basin (catchment area) within the larger Indus Basin.

3.7. The Western Rivers are the focus of India's obligations under the Treaty that are the subject of this arbitration. However, as will be explained, an understanding of the "Eastern Rivers" (i.e., the Ravi, Sutlej, and Beas) and their usage by India following the conclusion of the Treaty is also critical to an overall understanding of the Indus Basin and the practical operation therein of the Treaty. A schematic representation of the principal rivers of the Indus Basin and the catchment areas of the Eastern and Western Rivers is presented below.



Map 3.1 - The principal rivers of the Indus Basin and catchment areas of the Western and Eastern Rivers[196]

3.8. The Treaty imposes a let flow and non-interference obligation upon India in respect of the Western Rivers subject only to limited and tightly controlled exceptions. The Western Rivers comprise, first, the Indus River, which rises in the Tibetan highlands of western China,

[196] The map was prepared using data on the rivers of the Indus Basin and their catchment areas available in the HydroSHEDS database on the Google Earth platform, *see* 'Datasets tagged hydrosheds in Earth Engine', Earth Engine Data Catalog, available at: www.developers.google.com/earth-engine/datasets/tags/hydrosheds (data sourced 1 November 2023).

flows through India-administered Kashmir, and enters Pakistan through Gilgit-Baltistan, where it passes through the provinces of Khyber Pakhtunkhwa, Punjab, and Sindh before discharging into the Arabian Sea near the city of Karachi. Second is the Chenab River, a tributary to the Indus that originates in Himachal Pradesh state in India and passes through India-administered Kashmir before flowing into the Punjab province in Pakistan. The third and last of the Western Rivers, the Jhelum River, is a tributary of the Indus that originates in India-administered Kashmir and is joined by the Neelum/Kishenganga tributary in Pakistan-administered Kashmir, before flowing south into Pakistani Punjab and merging with the Chenab.[197]

3.9. The Treaty allocated the use of the waters of the Eastern Rivers to India. So extensive is India's use of the waters of these rivers that Pakistan now receives almost no water from them. Of the Eastern Rivers, the Ravi and Beas Rivers both rise in Himachal Pradesh, with the Ravi flowing through India's Punjab province, where it "follow[s] the India-Pakistan border for some distance" before entering Pakistan and converging with the Chenab.[198] The Beas, on the other hand, flows into Indian Punjab and merges with the Sutlej before entering Pakistan.[199] The Sutlej, like the main Indus River, rises in the Tibetan highlands, before flowing through Himachal Pradesh and Indian Punjab (where it merges with the Beas), eventually entering Pakistani Punjab and joining with the Chenab.[200]

3.10. The Chenab River (including the waters of the Jhelum and Ravi Rivers) and the Sutlej River (including the waters of the Beas River) come together to form the *Panjnad* ("**five rivers**")[201] near the Pakistani city of Bahawalpur.[202] The Panjnad River continues to flow southwards and joins with the Indus River near the town of Mithankot in the south of Pakistani Punjab.[203] The Indus River then continues its course through Pakistani Punjab and Sindh and "finally merg[es] with the Arabian Sea through the Indus River Delta near the city of Karachi."[204]

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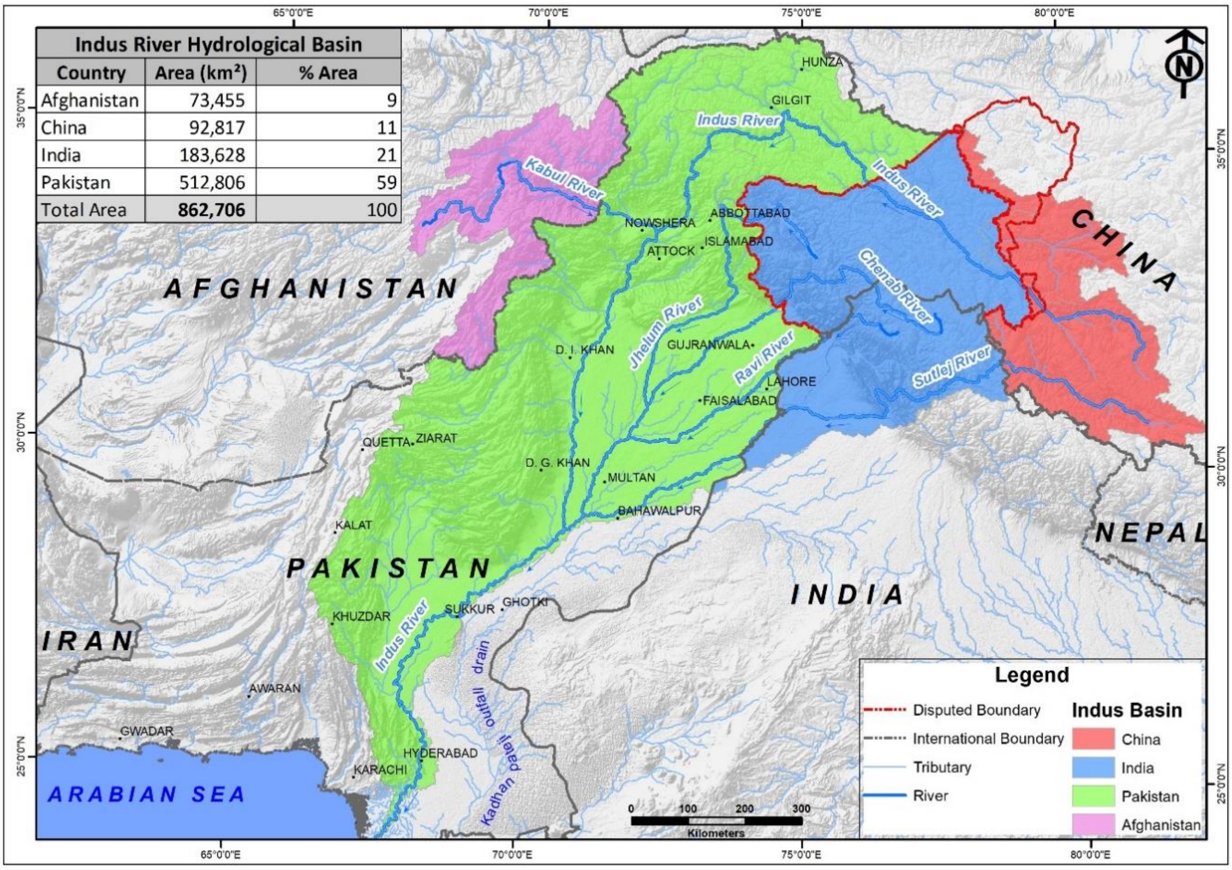
[197] A. B. Soofi, "Filling the Missing Gaps in the Indus Water Treaty" (April 2016), *Institute of Strategic Studies Islamabad*, Exhibit **P-0246**, p. 4.
[198] Khan and Idrees, 2023, **Exhibit P-0244**, p. 229.
[199] *Id.*.
[200] *Id.*.
[201] Derived from the Sanskrit words "*pancha"* meaning five and "*nadī́"* meaning river, *id*., p. 228.
[202] A. B. Soofi, "Filling the Missing Gaps in the Indus Water Treaty" (April 2016), *Institute of Strategic Studies Islamabad*, **Exhibit P-0246**, p. 4.
[203] *Id.*.
[204] *Id.*.

3A.2 Demography of the Indus Basin

3.11. While both countries share the Indus Basin resource, Pakistan is disproportionately reliant on the waters from the Basin to sustain its water needs. As will be seen below, Pakistan has the largest part of the Indus Basin's surface area, the largest portion of the Indus Basin's population, and the largest portion of the Indus Basin's irrigated area and agricultural water need. The Indus Basin is also Pakistan's only river basin of any consequence, as compared to India, which can rely on over twenty basins to serve its water demands. This means that the entire population of Pakistan is reliant on water from the Indus Basin and, specifically, the Western Rivers. Thus, India's obligation under the Treaty to "let flow all the waters of the Western Rivers"[205] is of overriding importance to the people and economy of Pakistan, as elaborated below. The fundamental important of this overarching principle—and the concomitant principle of non-interference by India—was evident also throughout the negotiations of the Treaty, as detailed in **Appendix A** to this Memorial.

3.12. The Indus Basin falls within territories under the control of four States: Pakistan, India, Afghanistan, and China. Approximately 59% of the surface area of the Basin is located in Pakistani territory (including Pakistan-administered Kashmir), while approximately 21% of the surface area falls within Indian territory (including India-administered Kashmir). The remaining 30% of the surface area of the Basin is divided almost equally between Afghanistan and China. The map below shows the entire Indus Basin and the areas of the Basin falling within the territories under control of each country.

[205] Indus Waters Treaty 1960, **PLA-0001**, Article III(2).



Map 3.2 - Indus Basin areas within national jurisdictions and area of control[206]

3.13 Hydrologists divide the territory of Pakistan into "three hydrological units". By far the largest of these is the Indus Basin, which covers 65% of Pakistan's land territory; the two other hydrological units are the "endorheic basin" in the Kharan desert in western Balochistan (which has no outlet to the sea), and the "arid Makran coast along the Arabian Sea".[207] The Indus Basin contributes about 95% of the total water resources in Pakistan,[208] making it the lifeblood of the country's water supply. Since the allocation of the Eastern and Western Rivers to India

[206] The map was prepared using data on the rivers of the Indus Basin and their catchment areas available in the HydroSHEDS database on the Google Earth platform (*see* 'Datasets tagged hydrosheds in Earth Engine', Earth Engine Data Catalog, available at: www.developers.google.com/earth-engine/datasets/tags/hydrosheds (data sourced 1 November 2023)), and the international boundaries and lines of control were sourced from topographic maps of the Survey of Pakistan and the World Bank's database of official boundaries (*see* 'World Bank Official Boundaries' available at: www.datacatalog.worldbank.org/search/dataset/0038272/World-Bank-Official-Boundaries (data sourced 1 November 2023)). The HydroSHEDS data was further processed using Shuttle Radar Topography Mission (STRM) 90m elevation data in ESRI's ArcHydro tool to delineate the boundaries of the catchment areas, *see* 'SRTM Digital Elevation Data Version 4', Earth Engine Data Catalog, available at: www.developers.google.com/earth-engine/datasets/catalog/CGIAR_SRTM90_V4 (data sourced 1 November 2023).

[207] K. Frenken (*ed.*), "Irrigation in Southern and Eastern Asia in figures", AQUASTAT Survey – 2011, FAO Water Reports (37), **Exhibit P-0247**, p. 379.

[208] L. Lytton and others, "Groundwater in Pakistan's Indus Basin: Present and Future Prospects" (2021), Water Global Practice, World Bank Group, Washington DC, **Exhibit P-0248**, p. 2.

and Pakistan (respectively) under the Treaty, the overwhelming majority of Pakistan's water resource is derived from the inflows of the Western Rivers (66% of the total, as set out in **Figure 3.1** below).

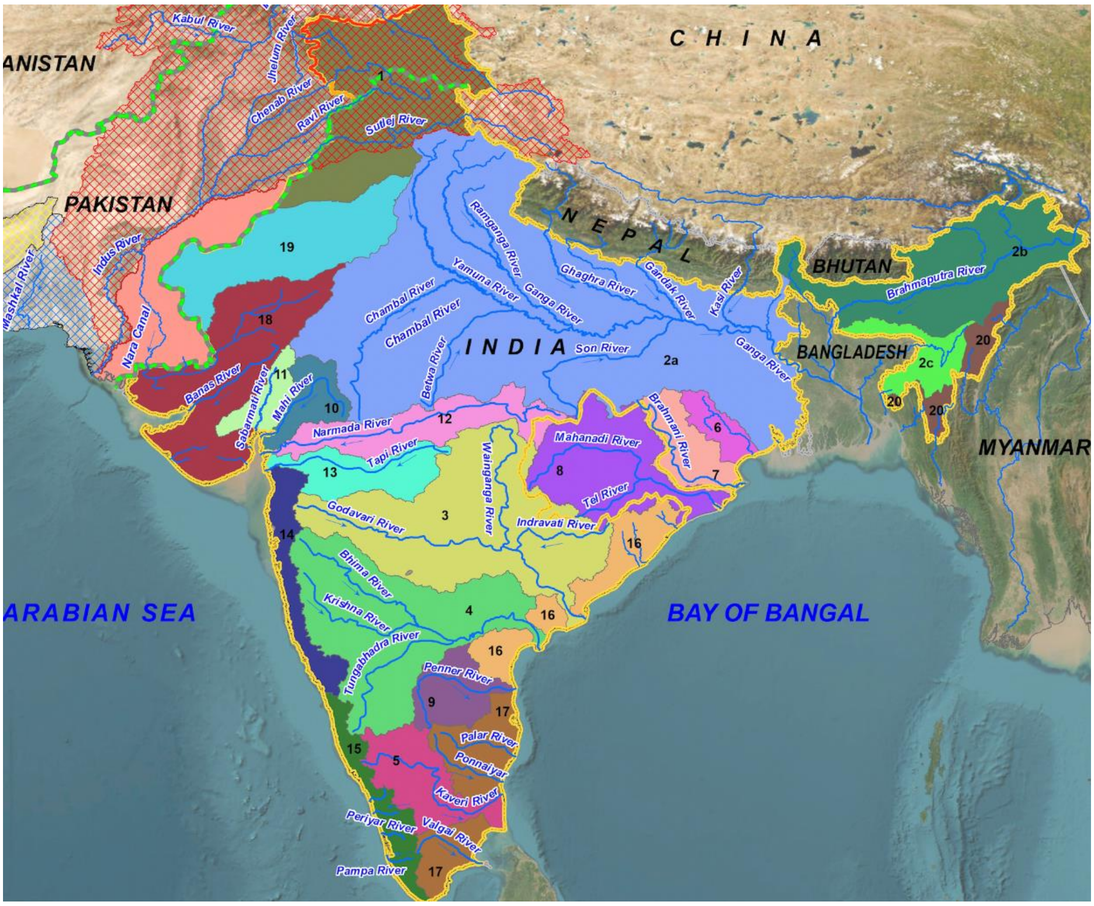
Basin	**Surface Runoff, BCM**[209]	**Groundwater Recharge by Rainfall, BCM**	**Total, BCM**	**Percent of Total**
Indus – external inflows				
Western Rivers			151.1	66.0
Eastern Rivers			3.3	1.5
Kabul River[210]			19.4	8.5
Indus – internal	32.6	12.7	45.3	19.8
Kharan Desert	5.5	0.7	6.2	2.7
Makran Coast	2.9	0.6	3.5	1.5
Grand Total			**228.8**	**100%**

Figure 3.1 - Contributions to Pakistan's average annual renewable water resource[211]

3.13. By comparison, India relies on over twenty different river basins for its water needs. A map illustrating the river basins in India is below. These basins include the Ganges-Brahmaputra-Meghna which, like the Indus Basin, drains from the Himalayas. The Ganges-Brahmaputra-Meghna accounts for almost 60% of India's water resources.[212] By contrast, the Eastern Rivers, allocated to India under the Treaty, contribute only 4% of India's water resources.[213] A profile of India's water resources, prepared by the USAID Sustainable Water

[209] BCM = billion cubic metres.
[210] The average annual flow of the Kabul River has been calculated based on flow data of the Kabul River for 1961-2023 collected by the Water and Power Development Authority, Government of Pakistan ("**WAPDA**") at Warsak dam.
[211] This table is based on research by the World Bank in 2019, *see* W. J. Young and others, "Pakistan: Getting More from Water" (2019) Water Security Diagnostic, World Bank Group, Washington DC, **Exhibit P-0249**, p. 5. As noted by the World Bank study, "this resource estimate is based on data for different time periods, for different parts of the total resource, and quoted by different sources using differing assumptions. There is no complete, consistent published total national resource estimate."
[212] K. Frenken (*ed.*), "Irrigation in Southern and Eastern Asia in figures", AQUASTAT Survey – 2011, FAO Water Reports (37), **Exhibit P-0247**, p. 265.
[213] *Id.*.

Partnership in 2021, concluded that "[t]he Indus Basin does not contribute much to India's total renewable water supply, but its flows are critical to downstream water users in Pakistan."[214]

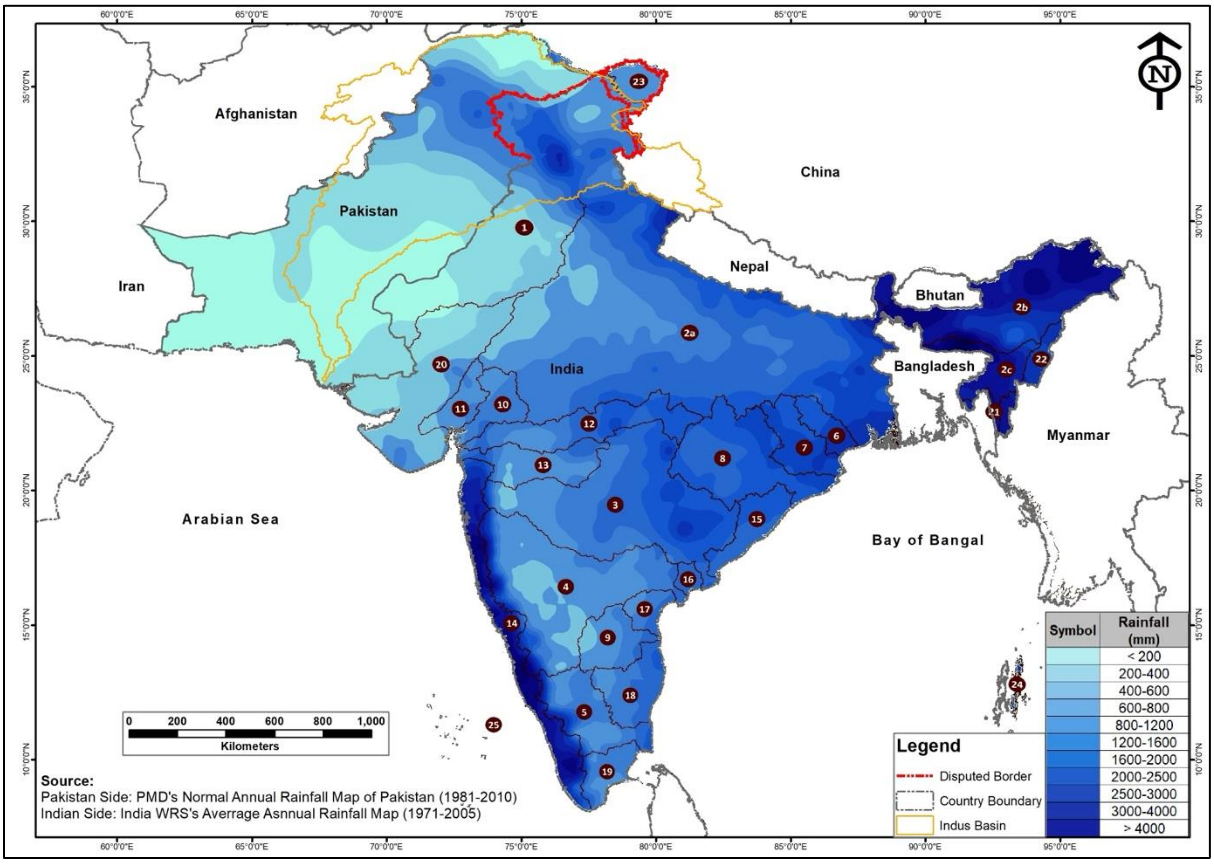


Map 3.3 - River basins of India[215]

3.14. Pakistan is also at a disadvantage to India in terms of rainfall. As of 2020, according to data maintained by the World Bank, the average annual precipitation depth in India was 1,083 mm/year,[216] whereas in Pakistan the average was only 494 mm/year.[217] This makes rainfed agriculture far more viable in India than in Pakistan. This rainfall discrepancy is also evident when the major drainage basins are compared. The Indus Basin, on which Pakistan

[214] USAID Sustainable Water Partnership, Country Profile – India (2021), **Exhibit P-0250**, p. 4.
[215] The map was prepared based on maps titled 'Hydrology of India' and 'CWC Basins' issued by India, *see* Ministry of Water Resources, Government of India, "River Basin Atlas of India" (2012), available at: www.indiawris.gov.in/wris/#/atlas (last accessed 18 March 2024), **Exhibit P-0251**, pp. B.12 and B.14.
[216] World Bank, "Average precipitation in depth (mm per year) – Pakistan, India" (*World Bank*), available at: https://data.worldbank.org/indicator/AG.LND.PRCP.MM?end=2020&locations=PK-IN&most_recent_value_desc=true&start=1961&view=chart (last accessed 18 March 2024), **Exhibit P-0252**.
[217] *Id.*.

relies, receives on average only 423 mm/year, while the Ganges and Brahmaputra Basins supplying India receive, respectively, 1,035 and 1,071 mm/year.[218]



Map 3.4 - Annual rainfall depth in Pakistan and India[219]

3.15. Not only is Pakistan more reliant on the Indus Basin than India for its total water resources, as demonstrated above, but it also must service the needs of a significantly larger population using the waters supplied by the Basin as compared to India.

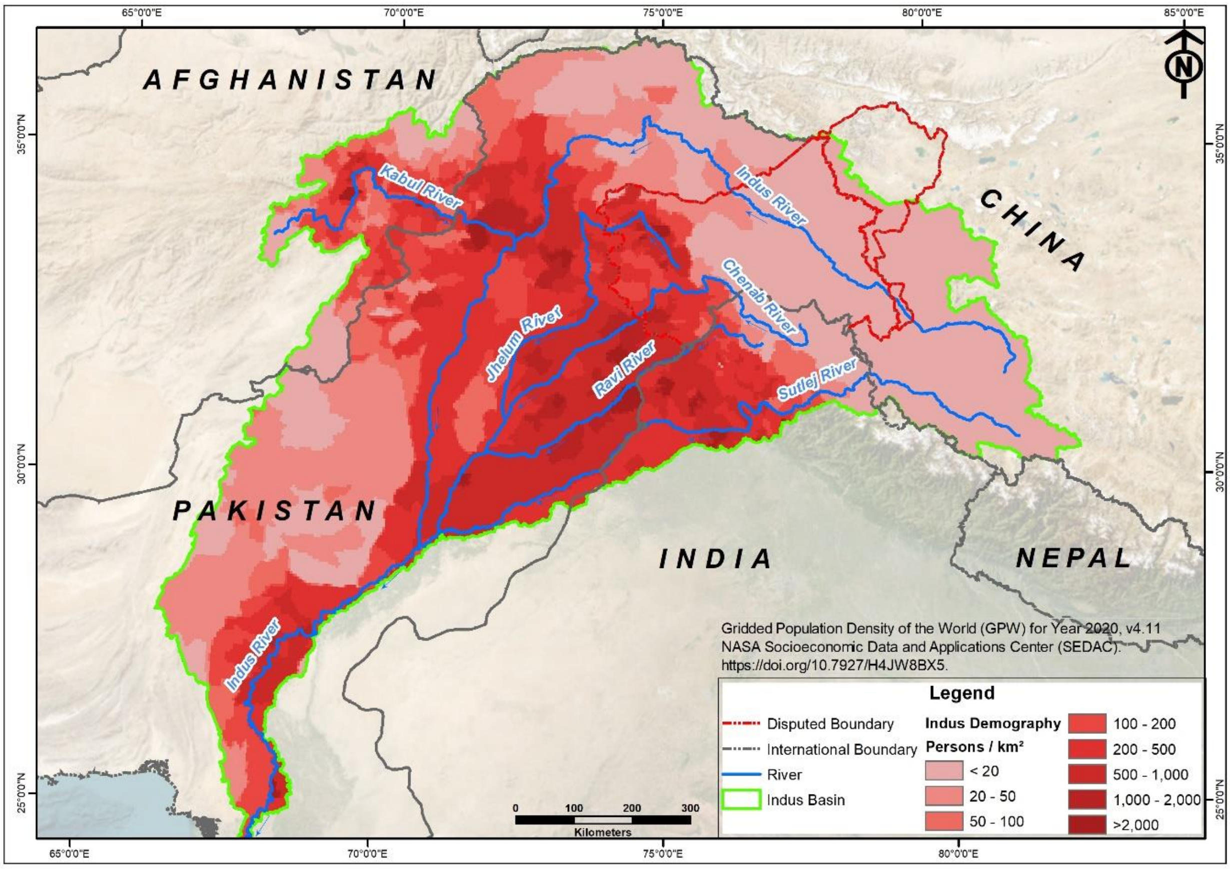
3.16. As of 2020 the Indus Basin was home to a population of at least 240 million people, of whom 78% lived in Pakistan and 17% lived in India.[220] That population is rapidly increasing,

[218] T. Bolch and others, "The State and Fate of Himalayan Glaciers" (2012) (336) *Science*, **Exhibit P-0253**, Supplementary Text, Table S7, p. 15.

[219] Map of Pakistan prepared using Pakistan Meteorological Department's Normal Annual Rainfall Map of Pakistan (1981-2010), **Exhibit P-0254**; and map of India prepared using India-Water Resource Information System (WRIS) Average Annual Rainfall Map (1971-2005), **Exhibit P-0255**.

[220] The figure for the total population of the Indus Basin was computed using population data for 2020 sourced from the Gridded Population of the World database, *see* 'Gridded Population of the World (GPW) database v. 4.11', NASA Socioeconomic Data and Applications Center (SEDAC), available at: https://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-count-rev11 (data sourced 12 December 2023). The population of the Indus Basin is located in four countries: 186.4 million in Pakistan, 41.9 million in India, 11.5 million in Afghanistan, and 0.1 million in China.

with research projecting that the population of the Basin will rise to 383 million by 2050.[221] The map below shows population density for the Indus Basin as of 2020.



Map 3.5 - Population density in the Indus Basin[222]

3.17. The fact that 95% of Pakistan's total renewable water resource is derived from the Indus Basin, as discussed above, means that effectively the entire population of Pakistan is reliant on the waters of the Basin, and thus of the Western Rivers.

3.18. From 1961, shortly after the Treaty was concluded, Pakistan has seen its population rise at approximately 2.8% annually, from 42.98 million (according to 1961 census data)[223] to

[221] A. N. Laghari and others, "The Indus basin in the framework of current and future water resources management" (2012) 16(4) *Hydrology and Earth System Sciences*, **Exhibit P-0256**, p. 1069.

[222] The map was prepared using population data for 2020 sourced from the Gridded Population of the World database, *see* 'Gridded Population of the World (GPW) database v. 4.11' NASA Socioeconomic Data and Applications Center (SEDAC), available at: https://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-count-rev11 (data sourced 12 December 2023).

[223] Ministry of Home & Kashmir Affairs, Government of Pakistan, "Census of Pakistan Population 1961 – Volume 1", **Exhibit P-0257**, p. II-1. Please note that the correct population figure for sake of comparison with the current population in Pakistan is the figure for West Pakistan (42,978,261) since East Pakistan became the independent State of Bangladesh in 1971.

241.50 million (according to 2023 census data).[224] This represents a population increase of 462% over the life of the Treaty. By 2050, forecasts predict a further rise of 67%, to reach an estimated Pakistani population of 403 million people.[225] By comparison, while India has a larger population than Pakistan overall, it has seen a significantly smaller (229%) increase in the period since the Treaty was concluded,[226] and by 2050 forecasts predict a further rise of only 17%.[227]

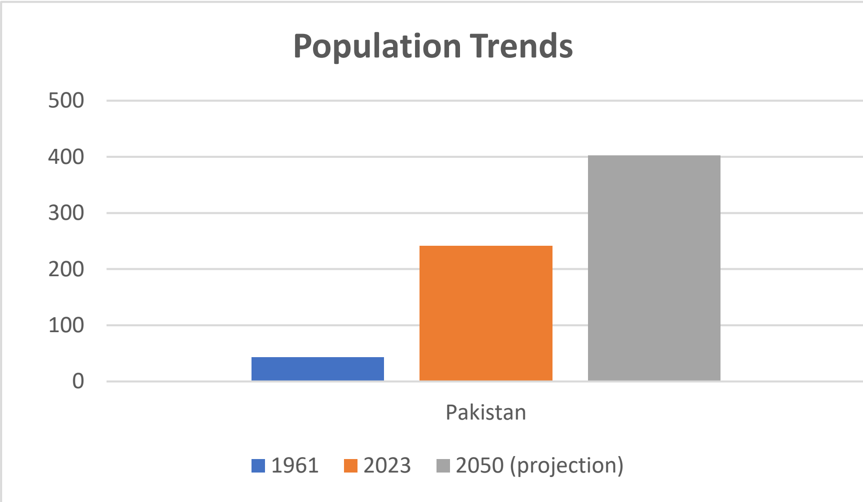


Figure 3.2 - Population growth in Pakistan

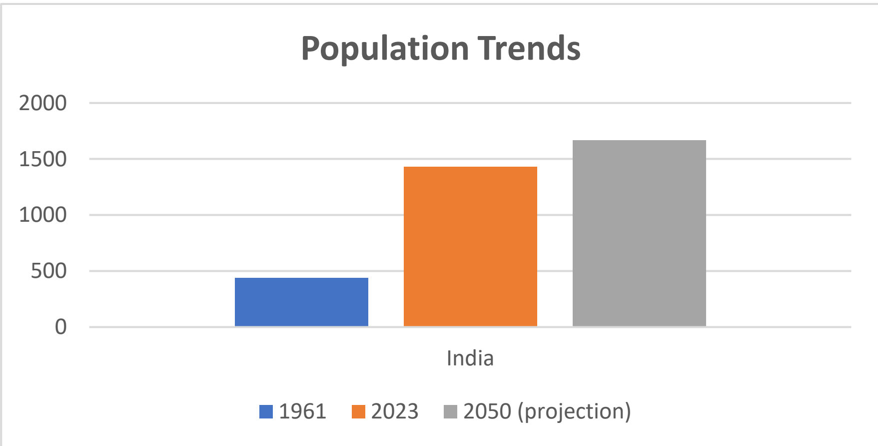


Figure 3.3 - Population growth in India

[224] Pakistan Bureau of Statistics, Government of Pakistan "7th Population & Housing Census 2023", **Exhibit P-0258**.
[225] United Nations Population Fund – Pakistan, "State of World Population Report provides infinite possibilities for Pakistan", United Nations Population Fund, 23 May 2023, **Exhibit P-0259**.
[226] This represents a rise from 434.88 million in 1961, *see* Ministry of Home & Kashmir Affairs, Government of Pakistan, "Census of Pakistan Population 1961 – Volume 1", Exhibit **P-0257**, p. II-2, to 1.43 billion in 2023, *see* World Population Review, "India", **Exhibit P-0260**, p. 3.
[227] This represents a rise from 1.43 billion in 2023 (as above) to 1.67 billion in 2050, according to data presented by the United Nations Population Fund, *see* M. Paul and N. Venkatesan, "On top of the world: India most populous" *Mint* (Delhi, 19 April 2023), **Exhibit P-0261**.

3.19. Since the Treaty was concluded, Pakistan has also seen a significant rise in its urban population, both in absolute terms and as a proportion of the population. In 1961, only 22.5% of the population (9.65 million people) lived in urban areas.[228] By 2023, 38.8% of the population (93.75 million people) lived in urban areas.[229] The share of Pakistan's urban population is projected to rise further, to over 50% of the total population by 2050.[230]

3.20. The growing population of Pakistan will generate higher food demands, putting strain on the country's agricultural output. As the Treaty allocated the use of the waters of the Eastern Rivers to India, it was necessary for Pakistan to construct large link canals to divert a substantial portion of the flows from the Western Rivers into areas of Pakistan previously irrigated from the Eastern Rivers, thus stretching water supplies over a larger irrigation area.[231] The increase in Pakistan's urban population will also increase water demand for industrial and household uses, impacting the availability of both surface and groundwater sources within the Indus Basin available for agriculture.

3B THE HYDROLOGY, SEDIMENTATION CHARACTERISTICS, AND IRRIGATION NETWORK OF THE INDUS BASIN

3B.1 Flow of water in the Indus Basin

3.21. The rivers addressed in the Treaty originate in the Karakoram and Himalayan ranges. The major contributor of flows in those rivers is meltwater from snow and glaciers in those mountain ranges.[232] The Hindu Kush range contributes water to the western part of the Indus Basin, but not to areas within Treaty jurisdiction. As of 2012, the Indus Basin had 18,495 glaciers, spanning an area of 21,193 square kilometres.[233] **Map 3.6** below (turn over page) shows areas of glacier and permanent snow cover in the Indus Basin.

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[228] Ministry of Home & Kashmir Affairs, Government of Pakistan, "Census of Pakistan Population 1961 – Volume 1", **Exhibit P-0257**, p. II-16.

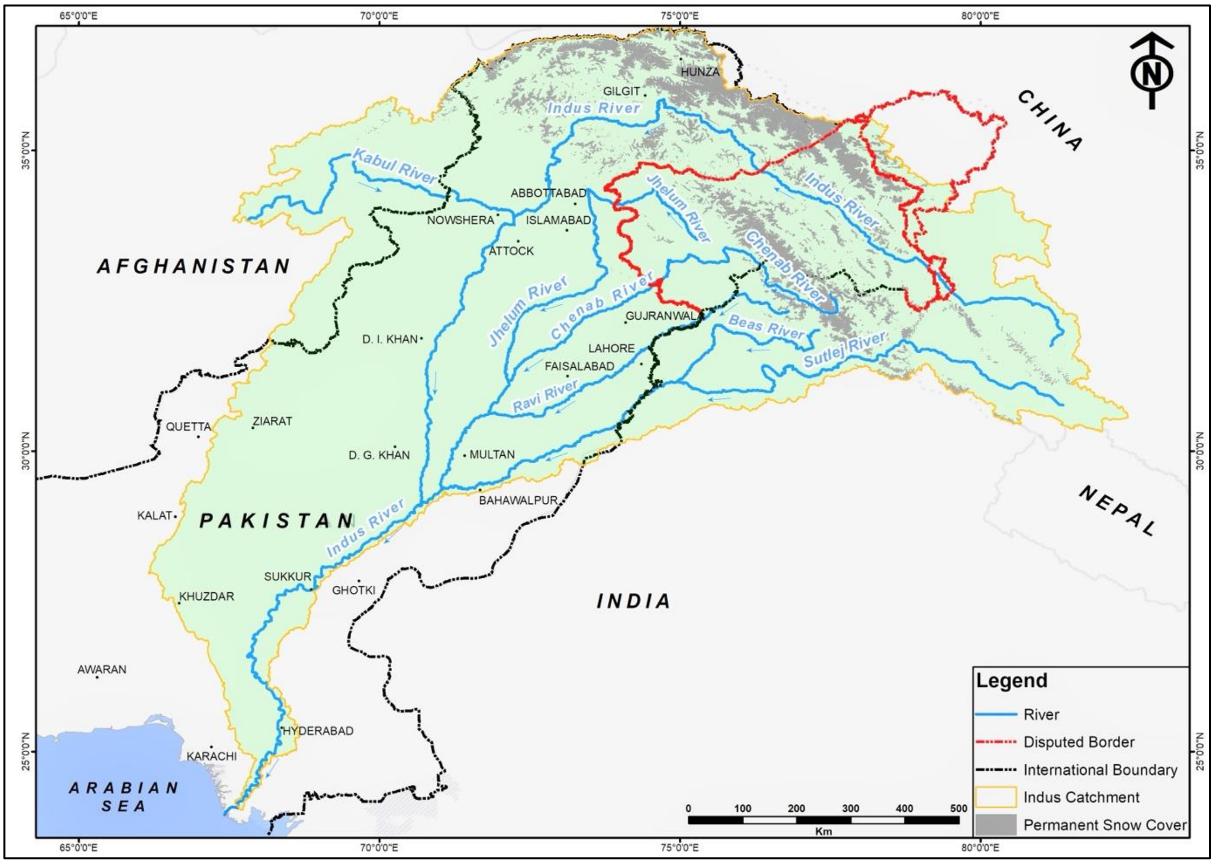
[229] Pakistan Bureau of Statistics, Government of Pakistan "7th Population & Housing Census 2023", Exhibit **P-0258**.

[230] "50% population will be living in urban areas by 2050", *The Express Tribune* (Karachi, 13 October 2022), **Exhibit P-0262**.

[231] *See* further **Appendix A**, **Section 5C.4**.

[232] M. J. M. Cheema and M. U. Qamar, "Transboundary Indus River Basin: Potential Threats to Its Integrity" in S. I. Khan and T. E. Adams III (*eds.*) *Indus River Basin: Water Security and Sustainability* (Elsevier 2019) ("**Cheema and Qamar, 2019**"), **Exhibit P-0263**, p. 184.

[233] D. Michel and others, "Connecting the Drops: An Indus Basin Roadmap for Cross-Border Water Research, Data Sharing, and Policy Coordination" (2013) Observer Research Foundation, Stimson Center, and Sustainable Development Policy Institute ("**Michel and others, 2013**"), **Exhibit P-0264**, p. 45, figure 11. The exact number



Map 3.6 - Areas of glacier and permanent snow cover in the Indus Basin[234]

3.22. Most precipitation in the Indus Basin occurs at higher elevations, and the combination of snow and glacier melt accounts for about 72%[235] to 80%[236] of total flows in the Basin's rivers. This makes the Indus one of the most meltwater-dependent river basins in the world.[237] As a result of the heavy reliance on snow and glacier melt, flows in the Indus Basin are subject to substantial seasonal variations. The remaining flows in the Basin are contributed by rainfall.[238]

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of glaciers depends on the minimum size incorporated into the analysis, as there are many more small glaciers than large ones.

[234] The map was prepared using data for glacier coverage in the area obtained from the Global Land Ice Measurements from Space (GLIMS) glacier database (*see* 'GLIMS Glacier Database', National Snow Ice and Data Center, available at: http://glims.colorado.edu/glacierdata/ (data sourced 1 November 2023)), and data for snow cover for 2000-2020 obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) snow cover database available on the Google Earth platform (*see* 'MODIS Collections in Earth Engine', Earth Engine Data Catalog, available at: https://developers.google.com/earth-engine/datasets/catalog/modis (data sourced 1 November 2023)).

[235] A. Giese and others, "Indus River Basin Glacier Melt at the Subbasin Scale" (2022) (10) *Frontiers in Earth Science*, **Exhibit P-0265**, p. 2.

[236] Cheema and Qamar, 2019, **Exhibit P-0263**, p. 184.

[237] Khan and Idrees, 2023, **Exhibit P-0244**, p. 227.

[238] Cheema and Qamar, 2019, **Exhibit P-0263**, p. 184.

3.23. Climate patterns vary considerably across the length of the Indus Basin. In the Upper Indus Basin, which includes the areas in the Himalayan, Karakoram, and Hindu Kush ranges, "[m]ost of the precipitation occurs in winter and spring, much of it falling as snow, particularly at higher elevations".[239] The Lower Indus Basin has a "subtropical arid and semi-arid to temperate sub-humid" climate, where most of the precipitation is due to the monsoon rains from July to September.[240]

3.24. As a whole, the Indus Basin experiences annual average precipitation (comprising both rain and snow) ranging from "100-500 millimetres (mm) in the lowlands to 2,000 mm and above in the Himalayan foothills and the higher mountains."[241]

3.25. Flows in the Indus River Basin are highly seasonal, with low flows in the dry winter months and high flows during the summer wet season. The summer flows are derived from a combination of snow and glacier melt (which supply the vast majority of the flow, as described above) and seasonal rainfall. Meltwater begins flowing as the weather warms in the spring, whereas monsoon rains typically occur in summer and into September. The Indus Basin is also influenced by upper atmospheric phenomena. The extensive 2022 flooding in Pakistan, which displaced 7.6 million people, was attributed to two atmospheric rivers[242] that passed over southern Pakistan.[243]

3B.2 Flows of the Western Rivers into Pakistan

3.26. The Indus River has the highest flows of any of the Western Rivers and its flows depend in large part on the 13,014 glaciers in the Kabul and Upper Indus sub-basins.[244] Data collected at the Tarbela monitoring station indicates that the river has experienced average annual flows

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[239] Michel and others, 2013, **Exhibit P-0264**, p. 13.
[240] *Id.*.
[241] *Id.*.
[242] Atmospheric rivers are described as "relatively long, narrow regions in the atmosphere – like rivers in the sky – that transport most of the water vapor outside of the tropics. While atmospheric rivers can vary greatly in size and strength, the average atmospheric river carries an amount of water vapor roughly equivalent to the average flow of water at the mouth of the Mississippi River. Exceptionally strong atmospheric rivers can transport up to 15 times that amount", *see* "What are atmospheric rivers?", U. S. National Oceanographic and Atmospheric Administration (NOAA), **Exhibit P-0266**.
[243] J. S. Nanditha and others, "The Pakistan Flood of August 2022: Causes and Implications" (2023) (11(3)) *Earth's Future*, **Exhibit P-0267**. As explained in the study, "[u]sing observations, satellite data, and reanalysis products, we show that the [2022 flood] event was caused by multiday extreme rainfall on wet antecedent conditions. The extreme rainfall was associated with the two atmospheric rivers that transported significant moisture from the Arabian Sea. The flood was primarily driven by the extreme precipitation and other factors (glacier-melt) played a secondary role."
[244] Michel and others, 2013, **Exhibit P-0264**, p. 45.

of 59.13 million acre feet[245] ("**MAF**") in the last 30 years.[246] There are two cropping seasons in Pakistan, the *kharif* season (which runs April-September), and the *rabi* season (which runs October-March). Almost 85% of the flow of the Indus River occurs during the *kharif* season, and the remaining 15% during the *rabi* season.[247]

3.27. The Chenab sub-basin has 2,039 glaciers,[248] and the Chenab River has experienced average annual flows of 23.98 MAF in the last 30 years, based on data collected at the Marala monitoring station.[249] Similar to the Indus, almost 81% of the flow of the Chenab River occurs during the *kharif* season, and the remaining 19% during the *rabi* season.[250] The graphic below illustrates 10 years of daily discharges in the Chenab River and daily discharges in the Indus River above Tarbela dam, showing the consistently strong seasonality of their flows.

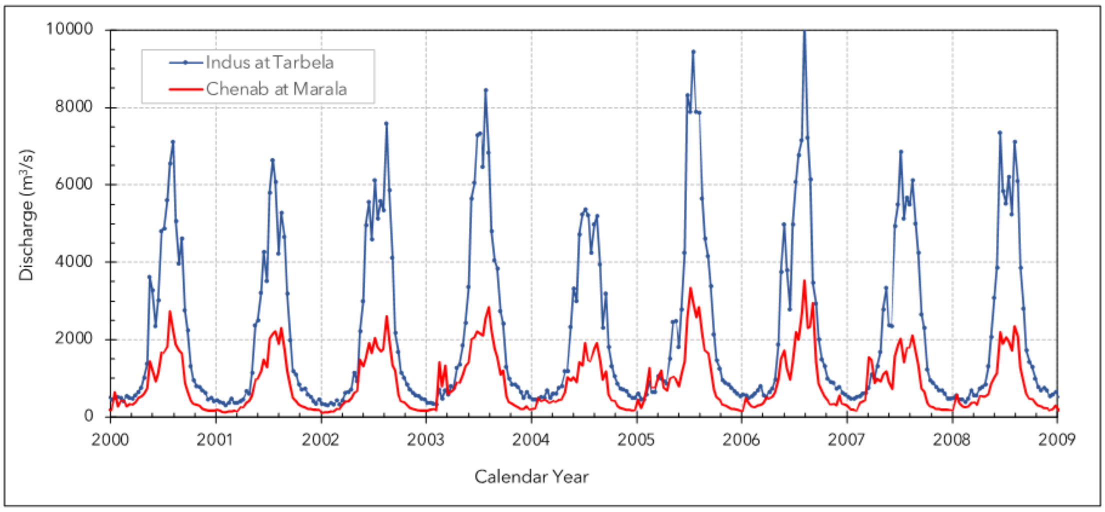

Figure 3.4 - 10-year 10-day discharges of the Indus and Chenab Rivers[251]

3.28. The Jhelum River has a similar volume of flow as the Chenab River, with average annual flows of 20.88 MAF in the last 30 years, based on data collected at the Mangla

[245] Acre-feet (AF) are the standard measuring unit for storage under Paragraph 7 of Annexure E, regulating India's capacity to construct Storage Works. One AF of water equals approximately 1,233.5 m^3. One million m^3 equals 810.71 AF.
[246] **Appendix D: Flow data of the Indus River and its principal tributaries** ("**Appendix D**"), p. 3. Please note that data collected at the Tarbela monitoring station excludes flows from the Kabul, Jhelum, and Chenab tributaries.
[247] *Id.*.
[248] Michel and others, 2013, **Exhibit P-0264**, p. 45.
[249] **Appendix D**, p. 3.
[250] *Id.*.
[251] This graphic was prepared based on daily discharge data for the Indus River at Tarbela dam and the Chenab River at the Marala monitoring station, collected by WAPDA.

monitoring station.[252] Again, 81% of the flows occur during the *kharif* season and the remaining 19% in the *rabi* season.[253] The Jhelum sub-basin has 733 glaciers.[254]

3.29. Across the Western Rivers, the data shows a downward trend in the annual volumes of flows since conclusion of the Treaty. This trend is seen in **Figure 3.5** below. The trendline in the figure indicates that flows in the Western Rivers have declined from 111.8 MAF in 1961 to 102.5 MAF in 2022, representing an 8.3% reduction.[255] As will be addressed further below, climate change is likely to impact the long-term volumes of flows in the Indus Basin especially as it relates to warming and glacier loss. While the entire Basin is dependent on glaciers for its flows, the Western Rivers will be disproportionately affected as 85% of the total glaciers in the Indus Basin fall within the Western River sub-basins.[256]

3.30. As described above, the majority of the flows in the Western Rivers occur in the *kharif* season. Research indicates that even within the *kharif* season, most of the flow in the Indus River and its tributaries (including the Eastern Rivers) occurs during the 90-day period from mid-June to mid-September.[257] This highlights the importance of the "let flow" obligation of the Treaty, in order to provide sufficient irrigation for planting of *kharif* crops earlier in the spring when river flows remain low.

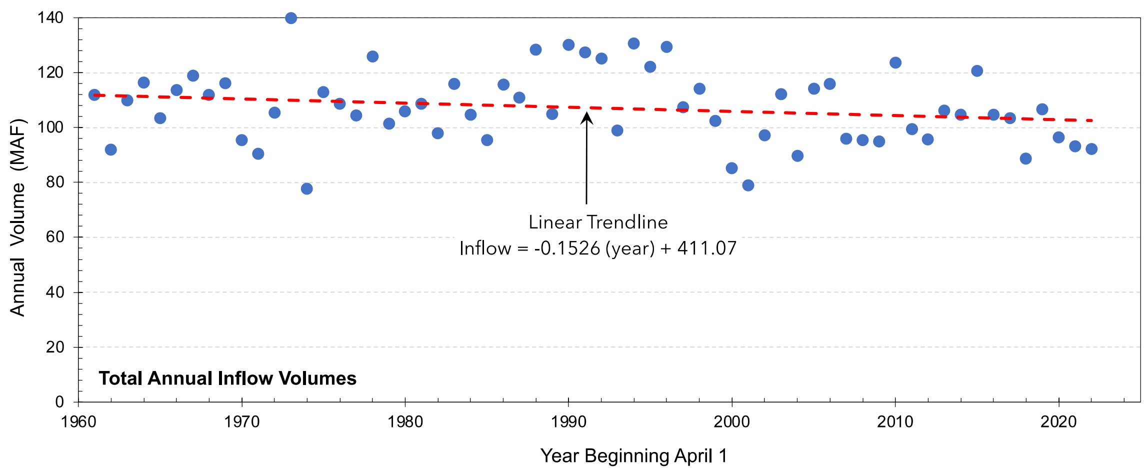

Figure 3.5 - Annual inflow volumes of the Western Rivers from 1961-2022[258]

[252] **Appendix D**, p. 3.
[253] *Id.*.
[254] Michel and others, 2013, **Exhibit P-0264**, p. 45.
[255] **Appendix D**, p. 3. This trend is statistically significant at the 90% level of confidence based on the Mann-Kendall test, *see id.*, pp. 5–6.
[256] Michel and others, 2013, **Exhibit P-0264**, p. 45.
[257] M. A. Rasheed and D. Ahmad, "Storage and Hydropower" in M. Ahmad (*ed.*), *Water Policy in Pakistan* (Springer 2023), **Exhibit P-0268**, p. 192.
[258] **Appendix D**, p. 4.

3B.3 Flows of the Eastern Rivers entering Pakistan

3.31. Since the conclusion of the Treaty, Pakistan has received negligible inflows from the Eastern Rivers because India has diverted almost all water to meet its domestic irrigation needs. Studies show that, by 2010, there had been a 92% reduction in average flow of the Eastern Rivers (Ravi and Sutlej) entering Pakistan, as compared with the period prior to the Treaty.[259] In the last 30 years, the average annual volumes of the Ravi and Sutlej rivers have diminished to just 2.46 MAF in total, with 91% of those flows occurring during the *kharif* season / flood periods.[260] The Eastern Rivers now remain dry in Pakistan for almost 335 days per year, which has caused severe degradation of downstream Eastern River ecosystems in Pakistan, in addition to the loss of irrigation water.[261]

3.32. Allocation of the waters of the Eastern Rivers to India under the Treaty has created substantial pressure on the flows of the Western Rivers, as they must now meet unaided the irrigation needs of large agricultural areas in Pakistan previously fed by the Eastern Rivers, plus other water demands. This is addressed further below.[262]

3B.4 Sedimentation characteristics of the Indus Basin

3.33. The rivers of the Indus Basin flow from the high mountains to the sea, carrying both water and sediment. The Himalayan mountains are tectonically active and have very high erosion rates due to a combination of natural processes including glaciation, landslides, surface and channel erosion, often accelerated by anthropogenic factors including deforestation, cultivation and roadbuilding. For example, the sediment yields per unit of area of 1,195 tons per square kilometre per year ("**t/km^2/year**") for the Indus River at the Besham Qila gauge (above Tarbela dam)[263], is greater than the yield registered from 92% of the total drainage area

[259] Cheema and Qamar, 2019, **Exhibit P-0263**, pp. 190–191.
[260] **Appendix D**, p. 3.
[261] Cheema and Qamar, 2019, **Exhibit P-0263**, p. 191. Pakistan expressly reserves it position on whether India's use of the waters of the Eastern Rivers is Treaty-compliant. This issue, though, is not within the scope of the present proceedings.
[262] Pakistan anticipated this concern during negotiations of the Treaty and consistently opposed India's attempts to make inroads on the allocation of the Western Rivers to Pakistan, *see* **Appendix A**, **Section 4A.3**.
[263] Information on sediment yields in the Indus River is taken from the sediment rating curve in a report prepared for WAPDA in July 2013 by two engineering consultancy firms, *see* Mott Macdonald and HR Wallingford, 'Sediment Management Study of Tarbela Reservoir', July 2013, **Exhibit P-0269**, Volume 1 – Main Report, p. 50.

included in the United Nations ("**UN**") Food and Agriculture Organisation's ("**FAO**") AQUASTAT database of 862 river gauge stations worldwide.[264]

3.34. Sampling data throughout the Himalaya show that most eroded sediments are transported downstream during the wet season when the rivers run muddy. In contrast, during the winter dry season the rivers of the Indus Basin run clear, carrying very little sediment. For example, analysis of 30 years of daily flow and sediment data at the Besham Qila gauge in the Indus River upstream of Tarbela reservoir shows that 97% of the total sediment load is discharged between 15 May and 15 September each year versus 76% of the flow of water.[265] The graphs below show that, while appreciable water flows are sustained throughout the winter dry season, sediment discharge drops to essentially zero during that same period.

[264] This conclusion is based on a comparison between the Indus River and all other rivers in the FAO database for which there was information on sediment load and drainage area, *see* "Databases", AQUASTAT – FAO's Global Information System on Water and Agriculture, available at: www.fao.org/aquastat/en/databases/maindatabase/ (data sourced 21 December 2023).

[265] These calculations are based on data collected by WAPDA on discharge at Besham Qila gauge for 2000-2022 and the suspended sediment rating curve for the Indus River (*see* Mott Macdonald and HR Wallingford, 'Sediment Management Study of Tarbela Reservoir', July 2013, **Exhibit P-0269**, Volume 1 – Main Report, p. 50).

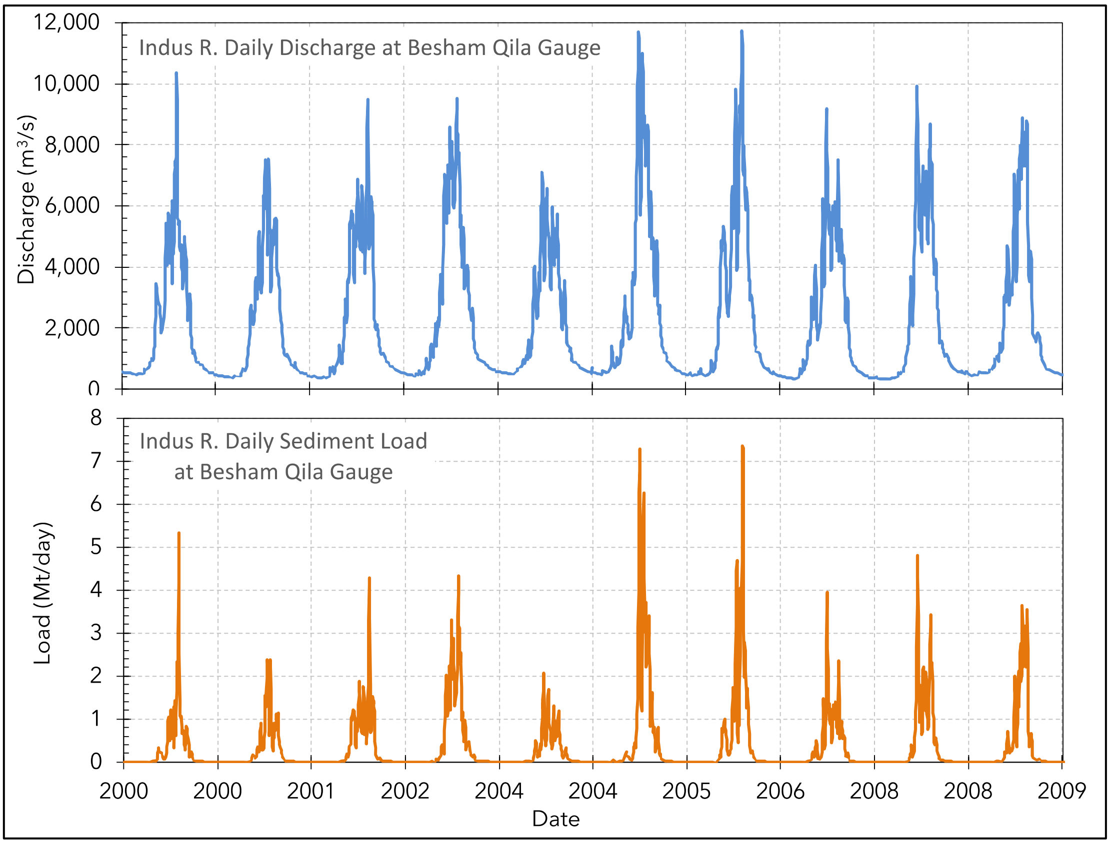

Figure 3.6 - Comparison of daily flow (top graph) and sediment load in million tons/day (bottom graph) of Indus River at Besham Qila gauge[266]

3.35. The Indus and its tributaries transport sediments with a wide range of grain sizes. The smallest particles, clays, occur in very limited quantities. Most Indus sediments consist of silts and fine sands.[267] In the mountain areas, where most hydropower plants are constructed, both sand and silt are maintained in suspension by the turbulent flow, but they can settle out and accumulate once they enter reservoirs where flow velocity and turbulence diminish. Because these sediment particles are freshly eroded from the parent rock, the sand particles carried in mountain rivers are highly angular with sharp points and edges. This angularity makes them highly abrasive to hydropower turbines and other hydro-mechanical equipment.[268]

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[266] The graphs are based on data collected by WAPDA on discharge at Besham Qila gauge for 2000-2022 and the suspended sediment rating curve for the Indus River, *id.*

[267] Data at the Besham Qila gauge indicates that most sediment particles are smaller than 1 mm in diameter, making them silts and fine sands according to Wentworth scale (*see* **Chapter 4C.3** below, **Figure 4.10**), Mott Macdonald and HR Wallingford, 'Sediment Management Study of Tarbela Reservoir', July 2013, **Exhibit P-0269**, Volume 1 – Main Report, p. 54.

[268] T. Nozaki, "Estimation of Repair Cycle of Turbine Due to Abrasion Caused by Suspended Sand and Determination of Desilting Basin Capacity" (1990), **Exhibit P-0270**.

3.36. In steep mountain rivers the riverbeds consist primarily of larger stones such as cobbles and even boulders. These large stones are mobilized and transported downstream only by the largest flood flows.

3.37. The significance of the particular sediment characteristics of the mountain rivers in the Indus Basin as it relates to the design and operation of hydroelectric dams is explained at **Chapter 4** below.

3B.5 Irrigation in the Indus Basin

3.38. The Indus Basin is home to one of the world's largest irrigation networks. Given the aridity of Pakistan's climate, its agricultural sector is especially reliant on this irrigation network. The network comprises a vast collection of canals, dams, and reservoirs that have, since the allocation agreed in the Treaty, been predominantly fed by the Western Rivers. It supplies water to 21 million hectares of agricultural land in Pakistan.[269]

(a) History of the development of the irrigation network in Pakistan

3.39. The history of irrigation in Pakistan dates to the Indus Valley Civilisation in c. 2,500 BCE. That ancient civilisation relied on "inundation irrigation", based on the natural rise and fall of the Indus River and its tributaries.[270] This technique of annual inundation irrigation persisted during the initial period of British colonial occupation of India.[271]

3.40. In the late 19th century, the British expanded and modernised the irrigation system in the Indus Basin. By the early 1900s, an extensive network of canals had been developed throughout the Basin. This included the Chenab Canal, described following its completion as "one of the [most] efficient and successful canal systems in India, if not the world", which converted 2.9 million acres of previously barren land into productive cotton and wheat fields.[272]

[269] The figure for the total agricultural land in Pakistan being irrigated by the Western Rivers was calculated on the basis of the Normalized Difference Vegetation Index (NDVI), using remotely sensed data of Sentinel-2 for the years 2017-2022, along the rivers and canals in the Indus Basin area in Pakistan, India, Afghanistan, and China. The Sentinel-2 data is available at the Google Earth platform, *see* 'Sentinel-2', Earth Engine Data Catalog, available at: www.developers.google.com/earth-engine/datasets/catalog/sentinel-2 (data sourced 5 December 2023). Sentinel-2 provides "data suitable for assessing state and change of vegetation, soil, and water cover".
[270] Alam, 1998, **Exhibit P-0245**, p. 33.
[271] *Id.*.
[272] F. J. Fowler, "Some Problems of Water Distribution between East and West Punjab" (1950) 4 *Geo Rev* 583, **Exhibit P-0271**, p. 585.

3.41. After independence in 1947, the Pakistani Government continued to invest in the irrigation system. This included building a barrage project at Kotri to improve deliveries to the inundation canals in Sindh, and opening the Balloki-Suleimanke, Dera Ghazi Khan, and Muzaffargarh canals.[273] More significant developments came following the conclusion of the Treaty in 1960, when Pakistan became especially dependent on the Western Rivers.

3.42. The post-independence water dispute between India and Pakistan, which led to negotiation of the Treaty, provides important context to the irrigation system which now transports huge volumes of water from the Western Rivers to areas of Pakistan previously supplied by the Eastern Rivers. Summary details of the dispute and its relevance to the negotiations and ultimate content of the Treaty were set out in **Chapters 1** and **2** above, and are further elaborated in **Chapter 7** and **Appendix A**. Further details of the crisis and its impact on Pakistan's available water resource and irrigation network follows.

3.43. The partition of British-occupied India meant that the previously unified province of Punjab was split between the two newly independent States of Pakistan and India. The line of partition cut off Pakistani Punjab from the headwaters of the Chenab, Ravi, and Sutlej rivers, and the entirety of the Beas River.[274] The headworks at Madhopur and Ferozepur, on which Pakistani Punjab's irrigation substantially depended, were also located in Indian territory. The question of water deliveries from Indian Punjab to Pakistani Punjab was left unaddressed at the time by both the Radcliffe Boundary Commission (for Punjab) and the arbitral tribunal[275] charged with resolving post-Partition questions.[276]

3.44. On 1 April 1948, the day after the arbitral tribunal handed down its post-Partition awards, India severed the supply of water to Pakistani Punjab. This deprived almost 8% of Pakistan's cultivable agricultural land of water, just as the *kharif* crops were about to be

[273] Alam, 1998, **Exhibit P-0245**, p. 36, Table 2.2.
[274] The Indus has its headwaters in China and the Jhelum has its headwaters in Kashmir. Both, like the Chenab, enter Pakistani Punjab through Kashmir, with the upper reaches of these rivers falling under Indian control by November 1947.
[275] An arbitral tribunal headed up by Sir Patrick Spens (also known as the "Spens Tribunal") was set up in August 1947 to decide on various matters relating to partition, including the division of assets and liabilities between the two new countries and specifically East Bengal (Pakistan) and West Bengal (India) and East Punjab (India) and West Punjab (Pakistan), *see* P. Spens, "The Arbitral Tribunal in India 1947–48" (1950) 36 *TGS* 61, **Exhibit P-0272**.
[276] J. G. Laylin, "Principles of Law Governing the Uses of International Rivers: Contributions from the Indus Basin" (1957) 51 *ASIL Proc* 20 ("**Laylin, 1957**"), **Exhibit P-0273**.

sown.[277] The situation in Pakistan quickly became desperate. Chaudhry Muhammad Ali, then-Federal Secretary, and later Prime Minister of Pakistan, observed:

> "There was acute distress which, with every day that passed, became more and more intolerable. In large areas where the subsoil is brackish there was no drinking water. Millions of people faced the ruin of their crops, the loss of their herds, and eventual starvation due to lack of water."[278]

3.45. The dispute was temporarily resolved by the conclusion of the Inter-Dominion Agreement in May 1948.[279] That agreement was presented by India to Pakistan as a *fait accompli*, "to be signed without changing a word or a comma".[280] An authoritative historical account of the April 1948 crisis describes India's motivation as follows:

> "Certain of the Indian leaders were completely unreconciled to the emergence of Pakistan as an independent state […]. They had gone along with Partition as the only way to secure Independence, but once Pakistan had been established, they felt entitled to use every means at their disposal to wreck her economy, to demonstrate that she could not succeed alone, and thus to bring her back to India. Denial of vital irrigation water would be one way to expedite the process. Finally, and perhaps most directly, the canal closures of April 1948 were an assertion of India's claim to all the water in all the rivers that flowed through her territory."[281]

3.46. India's weaponisation of its physical control of the waters irrigating Pakistani Punjab— and the threat of a future repeat — necessitated the conclusion of a normative treaty framework to manage the distribution of the two countries' shared water resources. Early in the negotiations for the Treaty, the World Bank put forward its 1954 Proposal, of which the central principle was:

> "It is desirable, as far as practicable, to avoid control by India over waters on which Pakistan will be dependent, and enable each country to control the works supplying the water allocated to it and determine in its own interests the apportionment of waters within its own territories."[282]

3.47. The World Bank's proposal effectively divided the rivers of the Indus Basin between Pakistan and India, as ultimately embodied in the Treaty, to avoid another April 1948 crisis.

[277] Michel, 1967, **Exhibit P-0234**, p. 196.
[278] C. M. Ali, *The Emergence of Pakistan* (Columbia University Press 1967), **Exhibit P-0274**, p. 321.
[279] The text of the Inter-Dominion Water Agreement is set out in the Annex to Annexure A of the Indus Waters Treaty 1960, **PLA-0001**. *See* also Inter-Dominion Agreement between the Government of India and the Government of Pakistan on the Canal Water Dispute between East and West Punjab, 4 May 1948, 54 UNTS 45 ("**Inter-Dominion Water Agreement**"), **PLA-0044**.
[280] *Id*., pp. 320–321.
[281] Michel, 1967, **Exhibit P-0234**, pp. 196–197.
[282] Proposal by the International Bank Representative for a Plan for the Development and Use of the Indus Basin Waters, 5 February 1954, **Exhibit P-0130**, ¶ 22.

The importance of this division of waters, and India's obligation to "let flow" the Western Rivers unimpeded so as to secure vital irrigation in Pakistan, was reiterated by a statement from then-Indian Prime Minister Jawaharlal Nehru:

> "So far as the rivers flowing into Pakistan from Kashmir are concerned, there is no question of reducing the quantity of water which they carry into Pakistan by diversion or any other device."[283]

3.48. The Treaty included a transition period of 10 years, during which the Eastern Rivers would continue to supply Pakistan with waters, albeit the inflows of those rivers into Pakistan would be progressively reduced. In the meantime, Pakistan constructed the works necessitated by the Treaty to transition away from relying on the Eastern Rivers to using exclusively the Western Rivers for its national irrigation needs.[284] Pakistan's transition was enabled by the establishment of the Indus Basin Development Fund in September 1960, to which India was required to contribute GBP 62,060,000 (the equivalent of c. GBP 1.18 billion,[285] or USD 1.50 billion[286] today).[287] In addition to India, several "friendly governments" also contributed to the fund including the United States, the United Kingdom, and Germany.[288]

3.49. By March 1970, Pakistan had completed the necessary irrigation works. Those works included construction of the Mangla dam, five barrages, one syphon and eight inter-river link canals.[289] The Tarbela dam was also part of the transition works but did not start operations until 1975.[290] The replacement irrigation works were described by the Bank as "the largest program of its kind ever to be undertaken anywhere in the world".[291]

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283 Alam, 1998, **Exhibit P-0245**, pp. 178–179.

284 Indus Waters Treaty 1960, **PLA-0001**, Articles II(5)−(6) and Annexure H.

285 Calculated using the Inflation Calculator Tool, Bank of England, available at: www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator (last accessed 18 March 2024), **Exhibit P-0275**.

286 GBP 1 = USD 1.27, UK Pound Sterling/US Dollar FX Spot Rate, *Financial Times*, available at: www.markets.ft.com/data/currencies/tearsheet/summary?s=GBPUSD (last accessed 18 March 2024), **Exhibit P-0276**.

287 Indus Waters Treaty 1960, **PLA-0001**, Article V(1) and V(2).

288 *See* further **Appendix A**, paragraph 176. *See* also Indus Basin Development Fund Agreement between the Governments of the Commonwealth of Australia, Canada, The Federal Republic of Germany, New Zealand, Pakistan, the United Kingdom of Great Britain and Northern Ireland and the United States of America and the International Bank for Reconstruction and Development, 19 September 1960, 444 UNTS 259 ("**IBDF Agreement**"), **PLA-0043**.

289 For details of the irrigation works to be completed during the transition period, *see id.*, Annexure D.

290 K. Frenken (*ed.*), "Irrigation in Southern and Eastern Asia in figures", AQUASTAT Survey – 2011, FAO Water Reports (37), **Exhibit P-0247**, p. 386.

291 *See* World Bank, "Indus Waters Settlement Plan", 18 April 1960, **Exhibit P-0277**, ¶ 7.

(b) Features of the irrigation network in Pakistan today

3.50. The Indus Basin serves a combined irrigated area of c. 25 million hectares, of which c. 21 million hectares are within Pakistan (with 17 million hectares within the Indus Basin catchment area) and only c. 3.6 million hectares within India.[292] Therefore, as elaborated below, Pakistan is far more reliant for irrigation and agriculture purposes on the waters of the Indus Basin than India.

3.51. As described above, the primary source of water in Pakistan is the Indus River and its tributaries. Following India's diversion of the Eastern Rivers to satisfy its own irrigation needs since 1970, virtually all of the Indus Basin waters that supply the irrigation network in Pakistan have come from the Western Rivers.

3.52. Broadly speaking, the irrigation network in Pakistan comprises: the Tarbela and Mangla Dams and their associated storage reservoirs, the Chashma Barrage, twenty-three barrages/headworks/siphons, twelve inter-river link canals, and forty-five canal command areas[293] extending for 60,800 kilometres including communal watercourses, farm channels and field ditches covering another 1.6 million kilometres to serve the watercourses used by over 90,000 Pakistani farmers.[294] The Indus Basin Irrigation Network in Pakistan, as it exists today, is illustrated in the figure below.

[292] This data was calculated on the basis of the Normalized Difference Vegetation Index (NDVI), using remotely sensed data of Sentinel-2 for the years 2017-2022, along the rivers and canals in the Indus Basin area in Pakistan, India, Afghanistan, and China, available at the Google Earth platform, *see* 'Sentinel-2', Earth Engine Data Catalog, available at: https://developers.google.com/earth-engine/datasets/catalog/sentinel-2 (data sourced 5 December 2023).
[293] A "canal command area" is a geographical area that is served by a specific canal network.
[294] Khan and Idrees, 2023, **Exhibit P-0244**, p. 231.

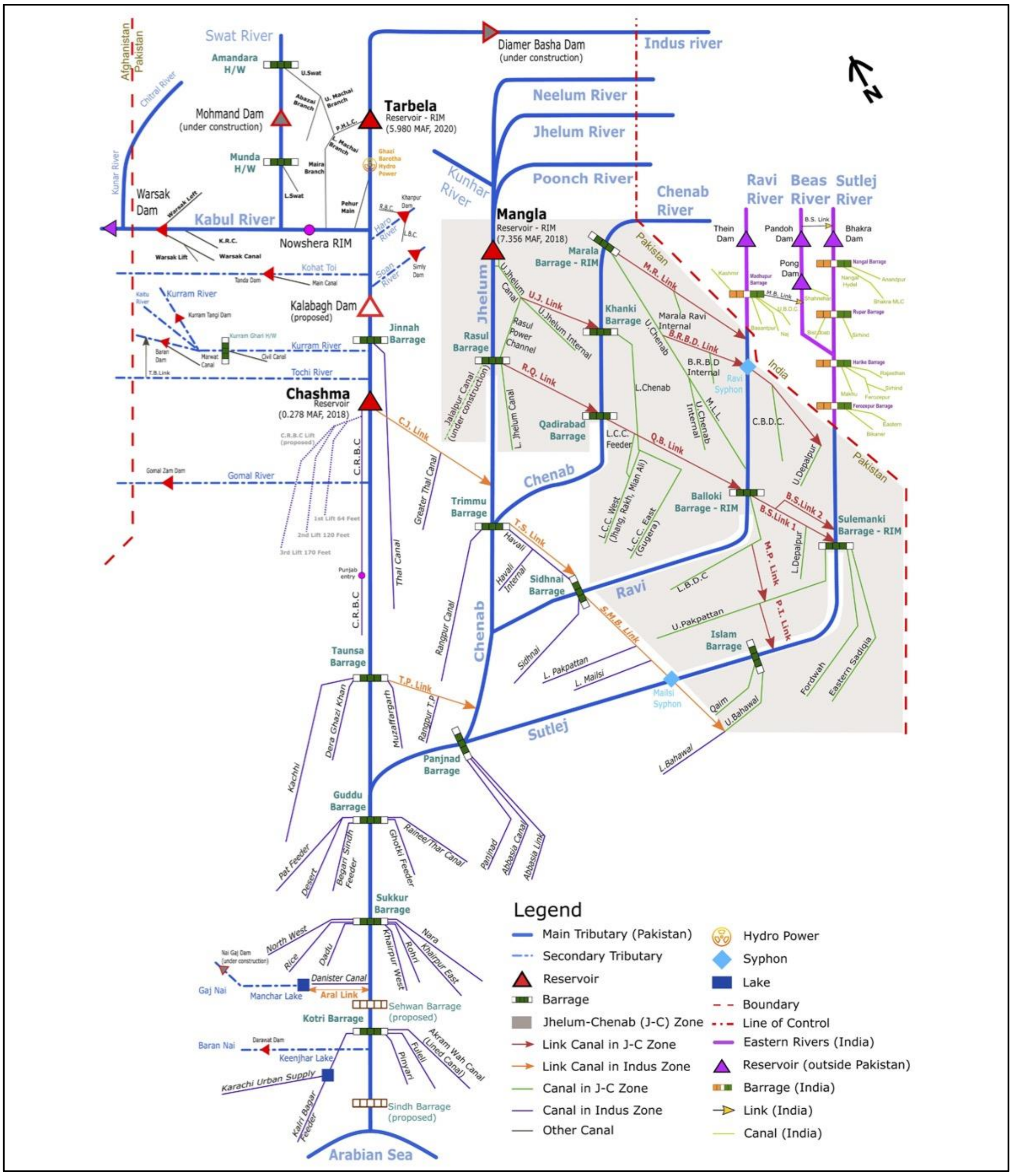

Figure 3.7 - Line diagram of Indus Basin Irrigation Network in Pakistan[295]

3.53. As mentioned previously, Pakistan has two cropping seasons, the *kharif* season (which runs April-September) and the *rabi* season (which runs October-March). Over 80% of the flows of the Western Rivers occur during the *kharif* season. The April-June period, during

[295] M. D. Ahmad and others, "Bringing transparency and consistency to Pakistan's seasonal water planning decisions: 1991 Inter-Provincial Water Apportionment Accord (WAA) Tool User Guide and Reference Manual, Second Edition" (2022), Commonwealth Scientific and Industrial Research Organisation, Canberra, **Exhibit P-0278**, p. 4.

which the *kharif* crops are sown, is a period of low precipitation,[296] making Pakistan particularly reliant during that period on flows from the Western Rivers to meet its critical irrigation demands during this period of planting.

3.54. Irrigated agriculture in Pakistan also relies on the country's groundwater resource to make up for any shortfalls in water available through irrigation canals during the year. According to research by the World Bank, as of 2017, 43.1% of the irrigated area in Pakistan relied on the conjunctive use of canal and groundwater, 32.2% of the area relied exclusively on canal water, and 22.2% relied exclusively on groundwater.[297] Importantly, the distinction between groundwater and canal water is "largely artificial", as "[t]hroughout the [Indus Basin Irrigation System] fresh groundwater exists primarily due to widespread leakage from its canal network."[298] In other words, irrigation by canal water and groundwater both rely on the flows of the Western Rivers.

(c) Irrigation network in India in the Indus Basin

3.55. India's irrigated area in the Indus Basin is substantially smaller than that of Pakistan. India supplies this irrigation area almost exclusively from the waters of the Eastern Rivers, which are available for unrestricted use by India under the Treaty. Additionally, the Treaty also protected India's existing irrigation uses of the Western Rivers in Jammu and Kashmir, by Article III and Annexure C, as an exception to India's "let flow" obligation.

3.56. Official data on India's irrigation network within the Indus Basin is conspicuously absent; information about India's irrigation network is publicly available for the whole country except for the Indus Basin. Therefore, to compare the irrigated area in both jurisdictions, the

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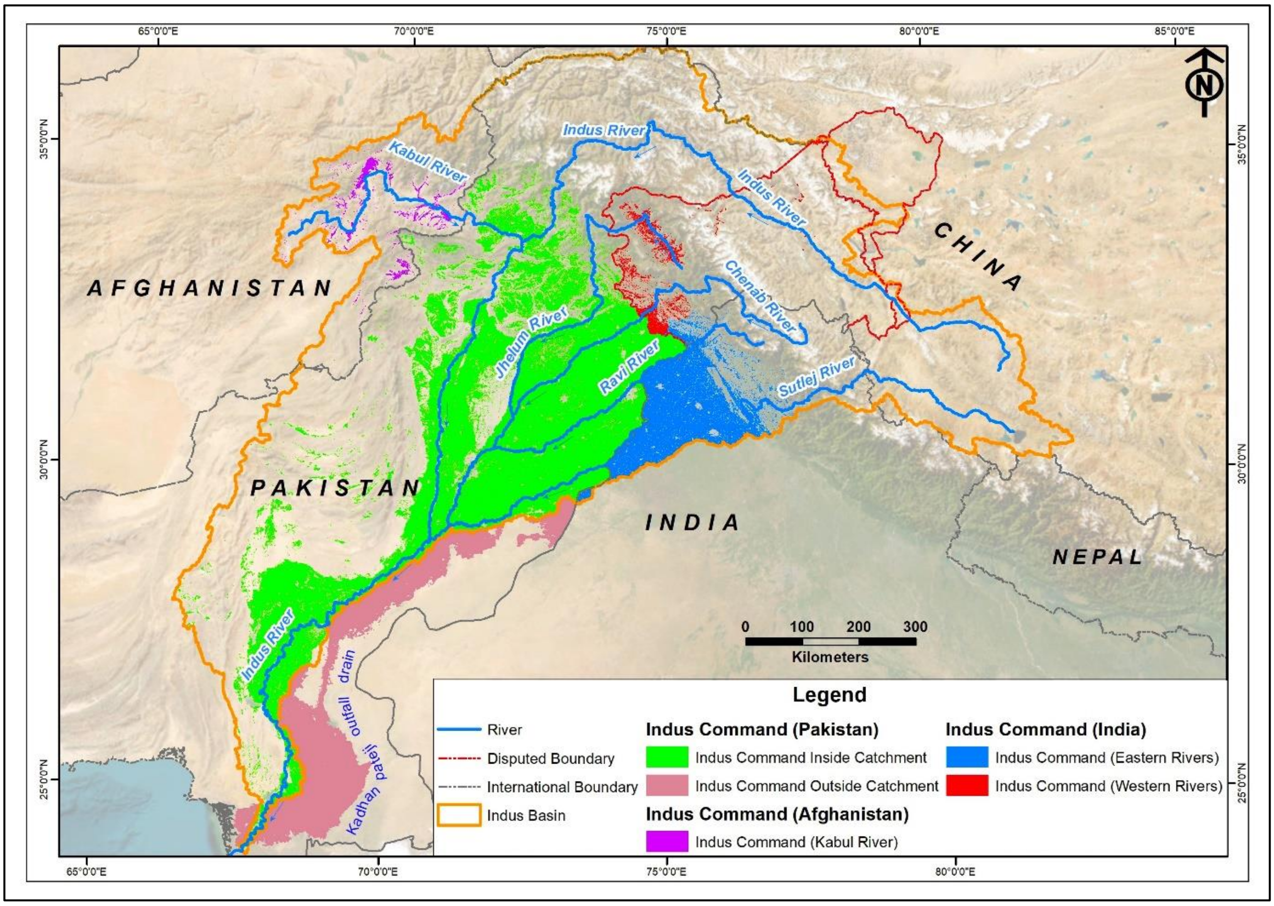
[296] M. A. Rasheed and D. Ahmad, "Storage and Hydropower" in M. Ahmad (*ed.*), *Water Policy in Pakistan* (Springer 2023), **Exhibit P-0268**, pp. 191−192.

[297] L. Lytton and others, "Groundwater in Pakistan's Indus Basin: Present and Future Prospects" (2021), Water Global Practice, World Bank Group, Washington DC, **Exhibit P-0248**, p. 18. The remaining 2.5% "is served by other sources".

[298] L. Lytton and B. Saeed, "Managing Groundwater Resources in Pakistan's Indus Basin" (*World Bank*, 25 March 2021), available at: www.worldbank.org/en/news/feature/2021/03/25/managing-groundwater-resources-in-pakistan-indus-basin (last accessed 18 March 2024), **Exhibit P-0279,** p. 1. *See also* L. Lytton and others, "Groundwater in Pakistan's Indus Basin: Present and Future Prospects" (2021), Water Global Practice, World Bank Group, Washington DC, **Exhibit P-0248**, pp. xiii−xiv ("Before the development of the irrigation network, groundwater in the Indus basin is considered to have been relatively deep and saline, except for narrow zones adjacent to the rivers that cross the Indus plain. Seepage from the expanding canal network became the major source of groundwater recharge and led to the buildup of a thick layer of fresh groundwater on top of the underlying saline groundwater and a steady rise in the water table […] over time").

FAO GIS database has been used to produce the following indicative map of irrigated areas in the Indus Basin.



Map 3.7 - Irrigated areas in the Indus Basin[299]

3.57. The approximate size of the irrigated area in each jurisdiction is summarised in the following table, developed from the FAO's GIS database.

[299] The map was prepared based on the Normalized Difference Vegetation Index (NDVI), using remotely sensed data of Sentinel-2 for the years 2017-2022, along the rivers and canals in the Indus Basin area in Pakistan, India, Afghanistan, and China. The Sentinel-2 data is available at the Google Earth platform, *see* 'Sentinel-2', Earth Engine Data Catalog, available at: https://developers.google.com/earth-engine/datasets/catalog/sentinel-2 (data sourced 5 December 2023). The term "Indus Command" in the map refers to the geographical area that is served by canal networks supplied by the waters of the Indus Basin. The pink area on the map, referred to as "Indus Command Outside Catchment" identifies those areas which are irrigated with the waters of the Indus Basin, but do not fall within the catchment area of the Basin.

Jurisdiction	Irrigated Area (million hectares)	Percent of Basin Total
Pakistan	21.166	84.2
India	3.592	14.3
Afghanistan	0.365	1.5
China	0	0
Total	**25.123**	**100**

Figure 3.8 - Irrigated area supplied by the Indus Basin across national jurisdictions[300]

3C WATER USAGE, INCLUDING AGRICULTURAL, DOMESTIC, INDUSTRIAL AND HYDROELECTRIC USAGES, AND WATER STORAGE PRACTICES ON THE WESTERN RIVERS

3C.1 Agricultural use in Pakistan

3.58. The extensive reliance of local populations on the Indus Basin for water makes it one of the most depleted water basins in the world. The dependence and usage across the Eastern and Western Rivers are such that there are times when no Indus water drains into the sea.[301]

3.59. Pakistan is especially reliant on the Western Rivers for the country's agricultural needs. According to Pakistan's first Biennial Update Report to the UN Framework Convention on Climate Change (UNFCCC) in 2022, approximately 93% of the of the available water resource base in Pakistan was consumed by agriculture.[302]

3.60. Irrigated agriculture is responsible for about 90% of the country's agricultural production per annum, and about 70% of this irrigation is provided by the Western Rivers.[303] According to the Pakistan Economic Survey, in the 2022-23 fiscal year, the agriculture sector contributed 22.9% of the country's gross domestic product and employed 37.4% of the

[300] This data was calculated on the basis of the Normalized Difference Vegetation Index (NDVI), using remotely sensed data of Sentinel-2 for the years 2017-2022, along the rivers and canals in the Indus Basin area in Pakistan, India, Afghanistan, and China, available at the Google Earth platform, *see* 'Sentinel-2', Earth Engine Data Catalog, available at: https://developers.google.com/earth-engine/datasets/catalog/sentinel-2 (data sourced 5 December 2023).
[301] Cheema and Qamar, 2019, **Exhibit P-0263**, p. 185.
[302] Government of Pakistan, "Pakistan's First Biennial Update Report (BUR-1) to the United Nations Framework Convention on Climate Change (UNFCCC)", April 2022, **Exhibit P-0280**, p. 6.
[303] Khan and Idrees, 2023, **Exhibit P-0244**, p. 231.

country's labour force.[304] About 70% of Pakistan's exports are directly or indirectly derived from agriculture.[305]

3.61. Pakistan's agricultural sector is particularly vulnerable to water scarcity. It is anticipated that this vulnerability will only increase in the future due to the impacts of climate change, as elaborated below. A study in 2011 estimated that, by 2025, there will be a 32% shortfall of water available for agriculture in Pakistan (i.e., the difference between irrigation needs and available water supply), resulting in a food shortage of 70 million tons.[306] By 2050, it is projected that the Indus Basin will be able to effectively feed 26 million fewer people than it did in 2019, posing substantial challenges to Pakistan as its population expands.[307]

3.62. As discussed above, the irrigation system in Pakistan (and the Indus Basin more generally) relies on a combination of snow melt in the spring, and glacier melt plus rainfall during the summer. Surface waters are supplemented by groundwater (recharged by the flows of the Western Rivers) to cover supply shortfalls throughout the year.[308] Research into irrigated agriculture in the Indus, Ganges, and Brahmaputra basins has determined that "food production in Pakistan [is] heavily dependent on water originating from snow and glacial melt at high altitudes", much more so than food production in the Ganges and Brahmaputra basins in India.[309] The same research indicates that any change to the "timing or amount of meltwater" will affect crop production and warns that the "storage of water for hydropower supply" will affect downstream use of the water in agriculture.[310]

3.63. An important crop of the *kharif* season (April-September) is cotton, which is a key raw material for Pakistan's textile industry (a major source of the country's exports). According to the above-cited research, "mountain water – and meltwater more specifically – is especially important during the pre-monsoon period" and therefore "the production of early *kharif* crops such as cotton and rice, and annual crops like sugarcane, largely depend on this source of

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[304] Ministry of Finance, Government of Pakistan "Pakistan Economic Survey 2022-23 – Chapter 2: Agriculture", **Exhibit P-0281**, p. 19.
[305] "FAO in Pakistan – Pakistan at a Glance" (*Food and Agriculture Organization of the United Nations*), available at: www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/ (last accessed 18 March 2024), **Exhibit P-0282,** p. 3.
[306] Cheema and Qamar, 2019, **Exhibit P-0263**, p. 189.
[307] *Id.*.
[308] H. Biemans and others, "Mountain Waters Crucial for Irrigated Agriculture in the Indus, Less so in the Ganges and Brahmaputra Basins" (2018), Himalayan Adaptation, Water and Resilience (HI-AWARE) Research, **Exhibit P-0283**, p. 4.
[309] *Id.*, p. 5.
[310] *Id.*, p. 6.

supply."[311] Consequently, Pakistani cotton production would be dramatically impacted by any reduction or delay in water supply from the Western Rivers.[312]

3C.2 Domestic and industrial use in Pakistan

3.64. As of 2022, Pakistan uses 7% of its water resources for non-agricultural activities, including domestic uses (5%) and industrial uses including power generation (2%).[313] With projected rises in both total and urban population, Pakistan's domestic and industrial water needs will rise exponentially.

3.65. In 2017, the World Bank estimated that Pakistan had an annual water demand of 5.48 billion cubic metres ("**BCM**") for domestic uses.[314] The World Bank projects that annual domestic water demand will nearly double to 10.36 BCM by 2050, owing primarily to an increase in the country's urban population.[315] The research tells a similar story for Pakistan's industrial water needs. In 2008, the annual industrial water demand was approximately 1.4 BCM; under certain conditions of economic growth, this is projected to triple to 5.8 BCM by 2050.[316]

3C.3 Hydroelectric projects in the Indus Basin

3.66. As contemplated in the Treaty, Pakistan and India also rely on the waters of the Indus Basin for energy generation. Of the Treaty rivers, Pakistan is exclusively reliant on the flows of the Western Rivers for the generation of hydroelectric power, given the negligible flows from the Eastern Rivers once they enter Pakistan as a result of India's utilisation of the waters of the Eastern Rivers. Moreover, since the Indus Basin is its only significant river basin (as compared to over twenty different basins in India), Pakistan cannot rely on any rivers apart from the Western Rivers to generate hydroelectric power in its territory.

3.67. The map below sets out Pakistan's hydroelectric power generation ambitions on the Western Rivers, showing projects in operation, under construction, and in various stages of

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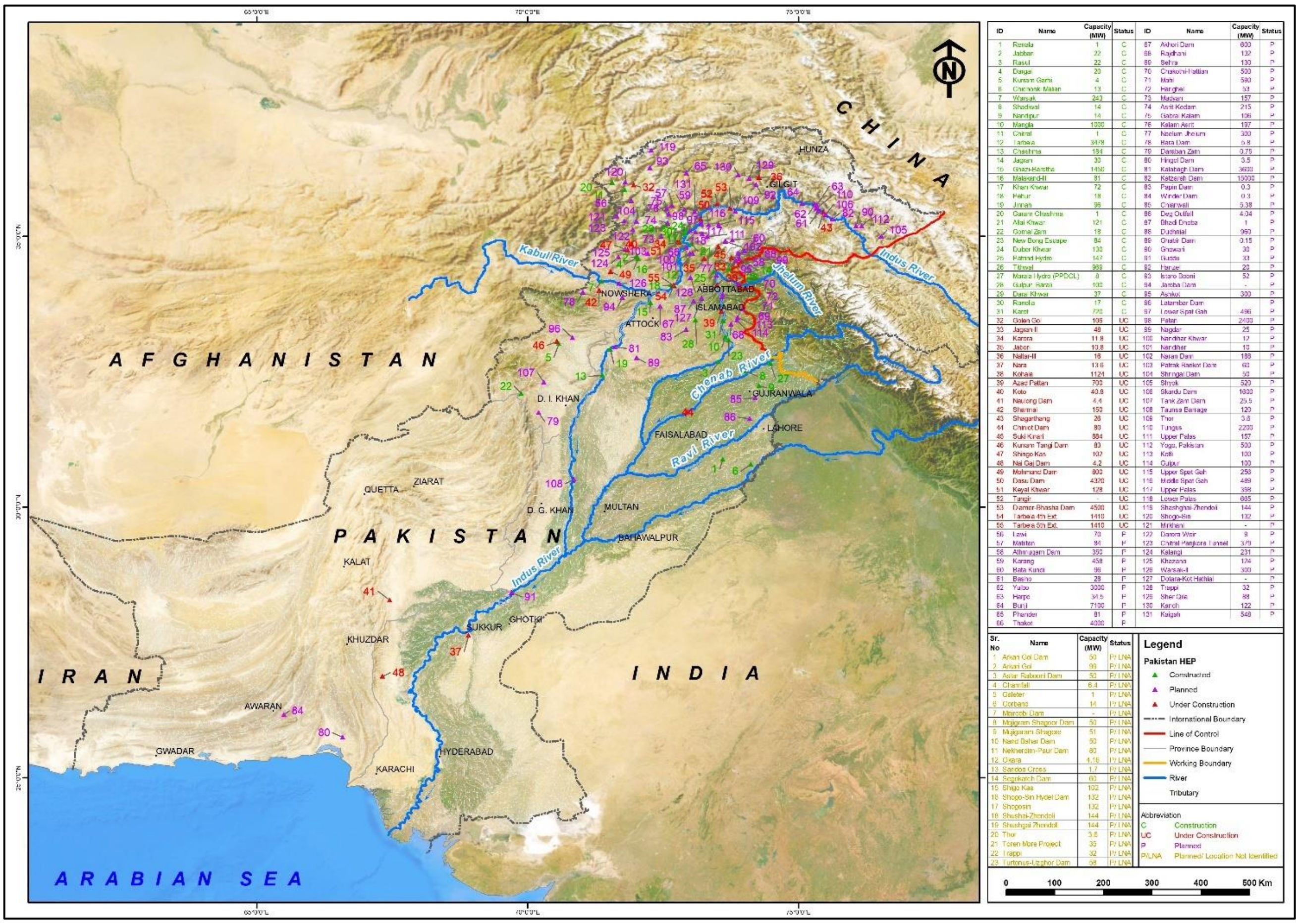
[311] *Id.*, p. 5.
[312] Z. Bhutta, "Water shortage looms over Kharif crops" *The Express Tribune* (Karachi, 25 April 2023), **Exhibit P-0284**.
[313] Government of Pakistan, "Pakistan's First Biennial Update Report (BUR-1) to the United Nations Framework Convention on Climate Change (UNFCCC)", April 2022, **Exhibit P-0280**, p. 6.
[314] L. Lytton and others, "Groundwater in Pakistan's Indus Basin: Present and Future Prospects" (2021), Water Global Practice, World Bank Group, Washington DC, **Exhibit P-0248**, p. 21.
[315] *Id.*.
[316] *Id.*, p. 26.

planning. Pakistan has 31 hydroelectric power plants (mostly run-of-river projects) in operation, with a combined generation capacity of 9,115 MW and an operational storage capacity of approximately 13.7 MAF. There are another 21 projects currently under construction (the most significant one being the Diamer-Bhasha dam, discussed in the following subsection) and a further 99 projects in various stages of planning. This gives a total of 151 projects of all sizes.



Map 3.8 - Pakistan's hydroelectric projects on the Western Rivers[317]

3.68. By contrast, India has utilised the flows of all six of the rivers that come within the scope of the Treaty (i.e., each of the Eastern and Western Rivers) to generate hydroelectric power. Being the upper riparian, vis-à-vis Pakistan, India can bank on unimpeded and unregulated flows for its run-of-river power plants on the Western Rivers, while it is entitled to the "unrestricted use" of the Eastern Rivers under the Treaty. Moreover, as illustrated at **Map 3.3** above, India has over twenty different river basins that contribute to the water

[317] The map was prepared using information on the location and generation capacities of the hydroelectric projects in reports and maps prepared by provincial governments in Pakistan and by WAPDA.

resources of the country, and which have a combined hydroelectric potential of up to 145,320 MW.[318] The Brahmaputra Basin (not the Indus Basin) has the highest hydroelectric potential of all river basins in India.[319]

3.69. As set out in more detail in **Chapter 5** of this Memorial, India has a staggering programme of hydroelectric power projects upstream on the Western Rivers. Further, Pakistan considers that India's run-of-river plants are being designed, constructed and operated in violation of the strict limits of Annexure D of the Treaty and in contravention of the "let flow" obligation of Article III. It is therefore plain that the combination of India's extensive HEP-construction programme and Pakistan's heavy reliance on the waters of the Western Rivers poses an existential threat to Pakistan.

3C.4 Water storage capacity and water security on the Western Rivers

3.70. Pakistan has a limited water storage capacity of only 13.7 MAF on the Western Rivers, meaning that Pakistan only has a 30-day carryover capacity.[320] Most of Pakistan's water storage capacity is derived from the Tarbela and Mangla dams, constructed on the Indus and Jhelum Rivers respectively, as part of the transitional arrangements under the Treaty.

3.71. Pakistan is being proactive in improving its water storage capacity, including through the construction of the Diamer Bhasha Dam on the Indus River. The Diamer Bhasha Dam will have an operational storage capacity of 6.4 MAF and a power generation capacity of 4,500 MW.[321] Pakistan concluded a contract for the construction of the dam in May 2020,[322] with

[318] "India has only developed 29% of its hydroelectric potential" (*Hydro Review*, 27 March 2023), available at: www.hydroreview.com/hydro-industry-news/new-development/india-has-only-developed-29-of-its-hydroelectric-potential/ (last accessed 18 March 2024), **Exhibit P-0285**. In comparison, Pakistan has an estimated hydroelectric potential of 64,000 MW (a little over a third of India's potential), *see* Private Power and Infrastructure Board, Ministry of Energy (Power Division), Government of Pakistan, "Hydropower Resources of Pakistan", July 2022, **Exhibit P-0286**, p. 9.

[319] J. Thakur, "Exploring the Hydropower Potential in India's Northeast" (March 2020) *ORF Issue Brief*, Issue No. 341, **Exhibit P-0287,**, p. 2.

[320] "Abysmally low water storage capacity in country" *DAWN* (Karachi, 19 December 2019), **Exhibit P-0288**.

[321] "Signing Ceremony of Contract Agreement of Construction of DiamerBasha Dam Project, 13th May 2020" (*Ministry of Water Resources - Government of Pakistan*, 13 May 2020), available at: www.mowr.gov.pk/NewsDetail/NWEzNDIyYzEtZGNjMC00Yjc1LWFkN2ItZWNjY2JkMzlmMTg3 (last accessed 18 March 2024), **Exhibit P-0289**, p. 2.

[322] *Id.*.

construction on the site beginning in July 2020.[323] The project is due to be completed by 2028.[324]

3.72. However, as described at **Section B.4** above and detailed in the table below, the unique sedimentation characteristics of the Indus Basin make it difficult for Pakistan to construct lasting water storage facilities, making the country reliant on timely inflows from the Western Rivers to meet its water needs.

3.73. Below is a table, published in 2023, detailing the substantial loss of storage capacity in existing reservoirs in the Indus Basin in Pakistan due to sedimentation.

Table 7.2 Loss of storage capacity of existing reservoirs in the IBS

Reservoir	Live storage capacity		Loss of storage	% loss
	Original	Existing		
Tarbela	11.95	7.34	4.61	38
Raised Mangla	10.16	8.965	1.195	11.8
Chashma	0.88	0.332	0.548	62.3
Total[a]	22.99	16.637	6.354	27.6%

Source: Authors' estimate based on WAPDA data
Note: All capacities in BCM
[a]Total live capacity of Tarbela, Raised Mangla and Chashma

Figure 3.9 - Loss of storage capacity of reservoirs in Pakistan[325]

3.74. The Tarbela reservoir uses carry-over storage to make irrigation deliveries in the spring (*kharif*) cropping season. However, the storage capacity of Tarbela is limited with respect to total river flow, and the reservoir has already lost about 40% of its usable capacity due to sedimentation. The "typical" operation of Tarbela is summarised in the figure below, which shows the relatively small impact Tarbela has on the discharge pattern of the Indus during the *kharif* irrigation season, despite its large physical capacity.

[323] S. Jamal, "Pakistan begins construction of Diamer Bhasha Dam" *Gulf News*, (Dubai, 15 July 2020), **Exhibit P-0290**.
[324] "Signing Ceremony of Contract Agreement of Construction of DiamerBasha Dam Project, 13th May 2020" (*Ministry of Water Resources - Government of Pakistan*, 13 May 2020), available at: www.mowr.gov.pk/NewsDetail/NWEzNDIyYzEtZGNjMC00Yjc1LWFkN2ItZWNjY2JkMzlmMTg3 (last accessed 18 March 2024), **Exhibit P-0289**, p. 2.
[325] M. A. Rasheed and D. Ahmad, "Storage and Hydropower" in M. Ahmad (*ed.*), *Water Policy in Pakistan* (Springer 2023), **Exhibit P-0268**, p. 194.

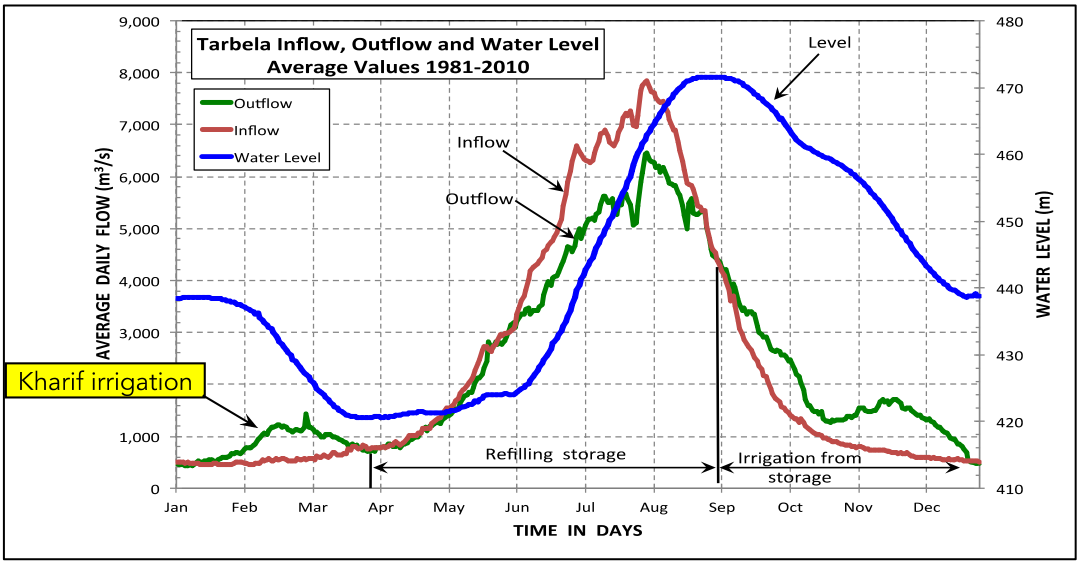


Figure 3.10 - Typical operational sequence for Tarbela reservoir[326]

3.75. The primary storage challenge that Pakistan faces on the Western Rivers beyond the construction of storage capacity, is the long-term preservation of that storage capacity against the impacts of sedimentation eroded from the Himalayan watersheds.

3D The impacts of climate change in the Indus Basin and threats to water sustainability

3D.1 Overview

3.76. Pakistan and India are both extremely vulnerable to the impacts of climate change. Pakistan, despite being responsible for less than 1% of the world's carbon footprint,[327] was the eighth-most climate change affected country in the world from 2000-2019 according to the Global Climate Risk Index 2021, suffering nearly 10,000 fatalities and estimated economic losses of USD 3.8 billion attributable to climate change during the period.[328]

3.77. By comparison, India is the third largest global emitter (by country) of greenhouse gases, being responsible for 7.5% of the world's carbon footprint,[329] and was determined to be the twentieth-most climate change affected country in the world from 2000-2019, according to

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[326] The graphic is based on daily operational data from Tarbela Dam Project Office collected by WAPDA.

[327] "Flooding in Pakistan: the latest news" (*British Red Cross*, 30 August 2023), available at: www.redcross.org.uk/stories/disasters-and-emergencies/world/climate-change-and-pakistan-flooding-affecting-millions (last accessed 18 March 2024), **Exhibit P-0291**, p. 5.

[328] D. Eckstein and others, "Global Climate Risk Index 2021", Germanwatch, **Exhibit P-0292**, p. 13.

[329] S. Bhattacharya, "Report at COP27: India Records Highest Emission Increase Among Top Global Contributors" *Outlook India* (New Delhi, 11 November 2022), **Exhibit P-0293**.

the Global Climate Risk Index 2021.[330] According to the same index, India was the seventh-most affected country in 2019, suffering over 2,000 fatalities and approximately USD 69 billion in economic losses.[331]

3.78. The rise in temperature in the Indus Basin creates an ever-present threat of extreme weather events like floods and droughts. In the summer of 2022, Pakistan suffered the most catastrophic floods in its recent history. More than 1,700 people died, almost 13,000 were injured and approximately 8 million were displaced.[332]

3.79. In addition, climate change will have more insidious impacts on the two countries' survival by impacting their respective water resources. Studies show that the projected increases in surface temperature in the region as a whole (between 1.7 and 6.3°C by the end of the 21st century)[333] will result in both: (1) in the short term, an increased and unpredictable variability in the flows of the Treaty rivers; and (2) in the long-term, a significant reduction of the glacial area in the Himalaya, Hindu Kush, and Karakoram ranges, which feed the waters of the Indus Basin. For Pakistan, rising surface temperatures 'burn the candle at both ends', so to speak, by impacting both the seasonality and the volume of water flowing into Pakistan from the Western Rivers, while simultaneously increasing the amount of water required by Pakistan, for instance, to maintain the country's agricultural output.

3D.2 Climate change impacts on flow in the Indus Basin

3.80. The waters of the Indus Basin are more heavily reliant on meltwater from upstream glaciers, as compared to other river basins globally. This makes those waters unusually exposed to the impacts of increasing temperatures associated with climate change.

3.81. The anticipated increase in temperature is likely to have a disproportionate impact on Pakistan, as compared to India, since 85% of the total glaciers in the Indus Basin fall within the sub-basins of the Western Rivers and given Pakistan's heavy reliance on those rivers.[334] Glacier shrinkage may provide more water in the short term as the glaciers melt. However,

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[330] D. Eckstein and others, "Global Climate Risk Index 2021", Germanwatch, **Exhibit P-0292**, p. 44.
[331] *Id*., p. 8.
[332] "Flooding in Pakistan: the latest news", British Red Cross, 30 August 2023, **Exhibit P-0291**.
[333] R. R. Wijngaard and others, "Future changes in hydro-climatic extremes in the Upper Indus, Ganges, and Brahmaputra River basins" (2017) (12(2)) *PLoS ONE*, **Exhibit P-0294**, p. 2.
[334] Michel and others, 2013, **Exhibit P-0264**, p. 45.

following the reduction in glacial mass due to melting, flow volumes in the Western Rivers will diminish substantially.

3.82. A review of multiple climate models concluded that temperatures in the Upper Indus Basin (i.e., the location of the glacial mass contributing to the water resource) are "projected to increase by more than 5°C by the late 21st century, as compared to the late 20th century, which will likely affect the snow and glacier melt, leading to variations in the availability of water."[335] The "variations in the availability of water" pertain to both the total volume of water available and (just as crucially) the timing of water flows into Pakistan.

3.83. Research by the International Centre for Integrated Mountain Development ("**ICIMOD**") indicates that by 2100, the Himalayan and Hindu Kush ranges will experience a reduction in glacial volume of up to 80% relative to 2015.[336] With respect to the total volume of water, depending on the "selected combination of projected temperature and precipitation" the Indus Basin may experience a decrease in total water availability of up to 17% by the end of the century.[337] With respect to the timing of flows, research indicates that the waters of the Indus Basin already face significant seasonal fluctuation due to an increase in the variability of monsoon and winter rains.[338] In the future, a rise in early snowmelt may result in changes to both river flow patterns and peak flow occurrence.[339]

3.84. Additionally, a rise in snow and glacier melt in the short term may increase sedimentation in the rivers of the Indus Basin,[340] creating new challenges with respect to water storage and the quantity of water available for irrigation, particularly in Pakistan, as the lower riparian.

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[335] A. B. Shrestha and others, "A Review on the Projected Changes in Climate Over the Indus Basin" in S. I. Khan and T. E. Adams III, *Indus River Basin: Water Security and Sustainability* (Elsevier 2019), **Exhibit P-0295**, p. 157.

[336] There are different projections for different "global warming levels". For a temperature rise of between 1.5°C and 2°C (as mentioned in the Paris Agreement), the glaciers are expected to lose 30-50% of volume; for a rise of 3°C there is a loss of 55-75%; and for a rise of 4°C there is a loss of 70-80%, *see* M. Jackson and others, "Consequences of climate change for the cryosphere in the Hindu Kush Himalaya" in R. Chettri and others (*eds.*), *Water, ice, society, and ecosystems in the Hindu Kush Himalaya: An outlook* (ICIMOD 2023), **Exhibit P-0296**, pp. 39−40.

[337] S. Nepal and others, "Consequences of cryospheric change for water resources and hazards in the Hindu Kush Himalaya" in R. Chettri and others (*eds.*), *Water, ice, society, and ecosystems in the Hindu Kush Himalaya: An outlook* (ICIMOD 2023), **Exhibit P-0297,** p. 88. Please note that "due to the large uncertainty in future precipitation projections", in some climate change scenarios, the total volume of water in the Indus Basin may actually increase, *see*, *Id.,* pp. 74 and 88.

[338] Q. Chaudhry, "Climate Change Profile of Pakistan" (2017), Asian Development Bank, **Exhibit P-0298**, p. 30.

[339] Khan and Idrees, 2023, **Exhibit P-0244**, p. 241.

[340] *Id.*, p. 242.

3D.3 Climate change impacts on irrigation and water demand in the Indus Basin

3.85. Climate change will not only impact the amount of water supply available, but also the amount of water required for agricultural production. Increasing temperatures and increasing surface water evaporation will increase irrigation demands. Changing seasonality of water availability will also affect irrigation. Again, this trend will disproportionately impact Pakistan in the Indus Basin, given its disproportionate reliance on irrigation from the Western Rivers to supply its water needs, including in areas previously supplied by the Eastern Rivers.

3.86. Research has highlighted a variety of possible impacts of climate change on irrigation in Pakistan. According to a World Bank study, climate change will negatively impact the yield and area of cultivable land suitable for certain crops, with wheat, maize and sugarcane most affected.[341] This means that Pakistan will have to increase its agriculture production to account for both a growing population and decreasing crop yields, thereby exponentially increasing its water requirements.

3.87. Further likely impacts of climate change in the Indus Basin as a whole include: an increase in evapotranspiration losses, thus increasing crop water demand; an increase in temperature which may result in unpredictable changes to cropping patterns; variability in precipitation, which may result in further unpredictable changes to cropping patterns; adverse changes in the working environment in low-lying agricultural areas due to worker heat stress; and increased water consumption thereby further accelerating groundwater depletion.[342]

3D.4 Climate Change threats to sustainability in Pakistan

3.88. The combination of potentially reduced water supply (due to reduced glacial and snow melt) and increased water demand (due to climate change and demographic changes) means that the "let flow" obligation of the Treaty with respect to the Western Rivers will become ever more critical to issues of sustainability in Pakistan in the coming years.

3.89. The long-term reduction in flows in the Indus Basin is particularly concerning for Pakistan. According to the Falkenmark Indicator, a country with annual water resources of less than 1,700 m^3 per capita is "water stressed"; a country with water resources of less than 1,000 m^3 per capita is "water scarce"; and a country with water resources less than 500 m^3 per

[341] "Climate-Smart Agriculture in Pakistan" (2017), World Bank, Washington DC, **Exhibit P-0299**, p. 9.
[342] Khan and Idrees, 2023, **Exhibit P-0244**, pp. 241−243.

capita faces "absolute water scarcity".[343] Pakistan became a water stressed country in 1990 and a water scarce country in 2005. By next year, it is projected that Pakistan will approach the (critical) absolute water scarcity threshold.[344]

3.90. India is in a similar, although not as drastic, situation as Pakistan, with an Indian government report in 2019 indicating that the country's average per capita water availability was "low enough for India to be categorized as water stressed".[345] The per capita water resource was projected to drop to 1,341m^3 by 2025,[346] still significantly higher than Pakistan's current per capita water resource and well above the threshold for absolute water scarcity.

3E CONCLUSION: THE CRITICAL IMPORTANCE TO PAKISTAN OF THE TREATY'S "LET FLOW" AND NON-INTERFERENCE OBLIGATIONS WITH RESPECT TO THE WESTERN RIVERS

3.91. For the reasons summarised in this Chapter and elaborated in its exhibits, Pakistan is overwhelmingly reliant on the free flow of waters from the Western Rivers. That reliance is an obvious and critical consequence of the allocation of the Western and Eastern Rivers between India and Pakistan under the Treaty and has become even more manifest following developments since 1960.

3.92. The Indus Basin and Pakistan have always had a unique connection. Most of the Basin's surface area, irrigated area, and population fall within Pakistan. The Indus Basin is the only river basin of any consequence within Pakistan's territory, making the entire population dependent on the Basin's water. Since the conclusion of the Treaty, India has exhausted the waters of the Eastern Rivers, leaving the Pakistani population exclusively reliant on the Western Rivers[347] to service its agricultural, domestic, and industrial water needs. Over the same period, the data indicates a decline in the annual volumes of flows of the Western Rivers. In parallel, Pakistan's population has experienced unprecedented growth, which is set to continue in the future. Pakistan is a "water scarce" country today and is fast approaching

[343] The Falkenmark Indicator is an indicator to measure water scarcity "that provides a relationship between available water and the human population", *see* Dr M. Ashraf, "Water Scarcity in Pakistan: Issues and Options" (May 2018) *Hilal*, **Exhibit P-0300**, p. 34.
[344] *Id.*, p. 35.
[345] Ministry of Jal Shakti and Ministry of Rural Development, Government of India, "Composite Water Management Index" (August 2019), **Exhibit P-0301**, p. 27.
[346] *Id.*.
[347] As illustrated at **Figure 3.1** above, Pakistan also depends to a lesser extent on inflows from the Kabul River, originating in Afghanistan. If more water is taken from the Kabul River for use in Afghanistan, this will decrease Pakistan's overall share of the Indus, but will not affect India's share (as the Kabul River does not flow into India or impact the Eastern Rivers). This would only further increase Pakistan's reliance on the Western Rivers.

conditions of "absolute water scarcity", making any violation or dilution of India's "let flow" obligation with respect to the Western Rivers an existential threat to Pakistan and its people.

3.93. The continued impacts of climate change only heighten this water insecurity. The Indus Basin has already experienced variability in the flows of its waters due to a rise in surface temperature, disrupting the regular cropping seasons in Pakistan. In the longer term, climate change is projected to, amongst other things, decrease the vast glacial mass that feeds the waters of the Indus Basin (and particularly the Western Rivers) and negatively impact crop yields. This will create a situation where Pakistan's available water resource steadily shrinks, while its water needs rise exponentially.

3.94. This is the fundamental backdrop to the present dispute. India's ambitious agenda of Treaty-inconsistent HEP construction on the Western Rivers will push Pakistan's limited water resource past breaking point. In such circumstances, the critical importance to Pakistan, today and in the future, of the India's "let flow", "non-interference" and associated obligations under Articles III and Annexure D of the Treaty cannot be overstated. For the people of Pakistan, these are not issues of economic optimisation; they are of fundamental and existential concern.

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CHAPTER 4: HOW RUN-OF-RIVER HYDROPOWER PLANTS WORK

4.1. As explored in **Chapter 2** above, this dispute is concerned with India's use of the waters of the Indus Basin to generate hydropower and the effects of that use on Pakistan as the downstream riparian. In particular, it concerns the extent to which the Treaty permits India to design and construct Run-of-River HEPs on the Western Rivers.

4.2. As a result, it is useful to have an understanding of both (1) the basic features of Run-of-River HEPs, including the process by which they use the hydraulic energy of water to produce electricity, and (2) the hydrological and geographical features of the Indus River basin which are relevant to the design and operation of HEPs under the Treaty.

4.3. This Chapter advances these objectives as follows:

(a) **Section A** identifies several internationally recognised guidelines used to aid in HEP design.

(b) **Section B** introduces several basic concepts in HEP design and operation, namely the process by which Run-of-River HEPs store water and their basic features.

(c) **Section C** provides a short introduction to the hydrological and geological features of the Indus Basin which are relevant to HEP design and operation.

(d) **Section D** introduces the HEP design process, by reference to a variety of design considerations, each of which, in turn, is reflected in modified form in Paragraph 8 of Annexure D—the heart of the Parties' dispute.

(e) **Section E** considers a final—but important—issue, namely: sediment management, a process that encompasses both design and operational considerations.

4.4. It is important to recognise at the outset that the provisions of Annexure D to the Treaty—which are addressed in later Chapters of this Memorial—set out specific definitions for some of the terms discussed below. Some of those definitions differ from the manner in which those terms are used in customary HEP design. The special meaning of these defined terms is addressed elsewhere in this Memorial. The purpose of this Chapter is simply to provide an initial introduction to HEP design and operation as a foundation for the detailed discussion of the Treaty terms that follow.

4A INTERNATIONAL AND NATIONAL GUIDELINES

4.5. It is necessary, first, to introduce the various international and national guidelines for HEP design and operation prepared by a range of specialist governmental and non-governmental organisations which are relevant to this Chapter. The site-specific nature of HEP design—and the issues which might need to be addressed—mean that "guidelines" rather than "standards" are the norm. The use of "guidelines" is an acknowledgement that a design approach that might be appropriate at one site may be wholly inappropriate at another. This contrasts with the use of "standards", which are typically applied to the individual manufactured components, or the materials, used in construction or fabrication.

4.6. The International Commission on Large Dams[348] ("**ICOLD**") was established in 1928. It is an international non-governmental organisation dedicated to sharing knowledge in relation to the design, construction, maintenance, and impact of large dams. Its member countries include India (through the India Committee on Large Dams) and Pakistan (through the Pakistan Committee on Large Dams).[349] At the heart of ICOLD's activities is the publication of expert Bulletins on various subjects in relation to large dams.[350] These are often said to reflect recommended international practice with respect to their particular subject matter.

4.7. The International Association for Hydraulic Research ("**IAHR**") is a "worldwide independent organisation of engineers and water specialists working in fields related to the hydro-environmental sciences and their practical application".[351] IAHR publishes four international scientific journals in the English language and "promotes the advancement and exchange of knowledge through working groups, specialty symposia, congresses, and publications on water resources, river and coastal hydraulics, risk analysis, energy, environment, disaster prevention, industrial processes".[352]

[348] "International Commission on Large Dams", ICOLD, available at: https://www.icold-cigb.org (last accessed 18 March 2024).
[349] "Member Countries", ICOLD, available at: https://www.icold-cigb.org/GB/icold/member_countries.asp (last accessed 18 March 2024).
[350] "Bulletins", ICOLD, available at: https://www.icold-cigb.org/GB/publications/bulletins.asp (last accessed 18 March 2024)
[351] "What is IAHR", IAHR, 24 February 2021, available at: https://www.iahr.org/index/detail/200 (last accessed 18 March 2024).
[352] *Id*..

4.8. In addition to the above, various national bodies and organisations publish guidance on the design of hydroelectric power infrastructure. Guidelines issued in the United States of America—whilst developed for national use—are in widespread use internationally. These include:

(a) The US Army Corps of Engineers ("**USACE**") which has published various Engineer Manuals, including manuals on (*inter alia*):

- Hydropower[353]
- Spillways[354]
- Reservoir outlets[355]
- Gravity dam design;[356] and
- Earth and rock-fill dams design.[357]

(b) The Bureau of Reclamation of the US Department of the Interior ("**USBR**")—a provider of wholesale water and hydroelectric power in the western United States—which has published (and continues to update) a suite of Reclamation Design Standards.

(c) The American Society of Civil Engineers ("**ASCE**") which has published documents setting out state of the art practices for hydroelectric power stations, including:

- Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments;[358] and

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353 United States Army Corps of Engineers, "Engineer Manual 1110-2-1701", *Hydropower*, 31 December 1985, **Exhibit P-0302**.
354 United States Army Corps of Engineers, "Engineer Manual 1110-2-1603", *Hydraulic Design of Spillways*, 16 January 1990; errata: 31 August 1992, **Exhibit P-0303**.
355 United States Army Corps of Engineers, "Engineer Manual 1110-2-1602", *Hydraulic Design of Reservoir Outlet Works*, 15 October 1980, **Exhibit P-0304**.
356 United States Army Corps of Engineers, "Engineer Manual 1110-2-2200", *Gravity Dam Design*, 30 June 1995, **Exhibit P-0305**.
357 United States Army Corps of Engineers, "Engineer Manual 1110-2-2300", *General Design and Construction Considerations for Earth and Rock-Fill Dams*, 30 July 2004, **Exhibit P-0306**.
358 ASCE Hydropower Committee, *Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments*, 1989, **Exhibit P-0307**.

- Guidelines for Design of Intakes for Hydropower Plants.[359]

4.9. Within the European Union ("**EU**"), the European Committee for Standards has prepared recommendations on how structural HEP design should be conducted and has published them as Eurocodes. Eurocodes are often applied for projects internationally as well as within the EU itself.

4.10. Finally, a wide variety of private engineers have published on matters of HEP design and operation, as part of the wider hydropower community. One such commentary, which would have been well-known to the Treaty's drafters, is *Hydro-Electric Handbook* by W. P. Creager & J. D. Justin. A *vade mecum* for HEP engineers, the *Hydro-Electric Handbook* was first published in New York and London in 1927.[360] A significantly expanded second edition, distilling the HEP practice of the first half of the 20th century into a single volume, was published in 1950, just before negotiation of the Treaty commenced.[361]

4B BASIC CONCEPTS OF HEP DESIGN – STORAGE AND COMPONENTS

4.11. With the subject introduced, it is sensible to frame the discussion by reference to two key features of HEP operation. The first is the process by which a HEP stores water—and, by, extension, the way in which a Run-of-River HEP may be distinguished from a larger storage work. The second describes the basic components of any Run-of-River HEP which allow a river's natural flow to be directed through a turbine to generate electrical power.

4B.1 Storage of water in HEPs

4.12. A HEP's ability to produce electrical power is dependent on river flow. As precipitation and snowmelt flows downhill it converges to form streams and rivers. Hydropower plants capture this water, passing it into a Power Intake, then conducting it from a higher elevation to a lower elevation at which point the pressurised water is released to drive a rotating turbine. This difference in water level from the intake to the turbine, is termed **hydraulic head** and is normally measured in terms of the corresponding elevation difference (e.*g., the turbine operates under a design head of 150 meters*). This pressurised water spins

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[359] ASCE Committee on Hydropower Intakes, *Guidelines for Design of Intakes for Hydroelectric Plants*, 1995, **Exhibit P-0308**.
[360] W. P. Creager and J. D. Justin (*eds*.), *Hydro-Electric Handbook* (John Wiley & Sons 1927).
[361] W. P. Creager and J. D. Justin (*eds*.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309**.

the turbine, which is connected by a shaft to a generator, which converts the rotating mechanical energy into electric energy. Water exiting the turbine is then returned to the river.

4.13. A HEP's **gross head** refers to the difference in water level between the river at the point of intake and the level at the point of discharge from the turbine. The **net head** (or generating head) is gross head minus the energy lost by the flowing water owing to friction and turbulence between the intake and the turbine. This energy loss may be significant, especially in plants with long tunnels. Thus, net head represents the hydraulic energy (pressure) actually available at the inlet to the turbine. Only net head is relevant from the perspective of power production.

4.14. Hydropower projects on rivers may be broadly classed into three categories:[362]

(a) Storage hydropower uses a large reservoir to capture water in the wet season. It then releases this water during the dry season to supplement the natural river flow thereby sustaining relatively stable power production throughout the year. A large reservoir can provide enough storage to supplement the natural flow of the river during seasonal low flow periods, or in some cases even for periods extending over several years.

(b) Run-of-River hydropower has little or no storage, depending rather on the natural rate of water flow in the river. In a pure Run-of-River plant there is zero storage, and water delivered to the turbines cannot exceed the instantaneous rate of river flow. However, some HEPs incorporate a limited volume of storage, termed pondage, usually only sufficient to regulate flows over a short period of time, such as to meet daily peak hour demands.

(c) Pumped storage hydropower generates electricity by releasing water from an upper reservoir into a lower reservoir via a turbine. Such releases occur when demand for electricity—and therefore the market price for such electricity—is high. The upper reservoir is then refilled by reversing the turbine to pump water back into the upper reservoir from the lower reservoir during periods of low electricity demand and low energy prices. A special type of turbine design is required for this operation.

[362] Noting that, more recently, offshore hydropower is beginning to be used to generate electricity from tidal currents.

4.15. Whether a HEP is characterised as a storage or Run-of-River plant depends on the amount of storage provided for the purpose of regulating river flow. In this regard:

(a) The capacity to store water for a HEP is created by constructing a dam that raises the water level to form a reservoir. The dam can have three functions: to create the storage reservoir, to divert water into the Power Intake, and it can also create or increase the head available to run the turbines.

(b) Storage capacity refers to the volume within a reservoir available to store water and will depend on the height of the dam and the topography of the river valley which has been flooded. A low dam in a narrow river valley will have very little capacity, while a taller dam with a broader upstream valley can provide substantial storage.

(c) A reservoir having a large storage capacity often serves other functions in addition to seasonal regulation hydropower. Other beneficial uses may include municipal or irrigation water supply, flood control, downstream navigational releases, etc. These are generally termed multi-purpose reservoirs.

4.16. As noted above, a pure Run-of-River HEP has no storage. Power may be generated by placing a turbine directly into a structure built in a river channel, or by diverting river flow out of the river channel, conveying it along a conduit (canal, tunnel, pipeline), and passing that flow through a turbine before returning it to the river further downstream. Since power production at a Run-of-River HEP is limited to the instantaneous flow rate in the river, potential production may be quite limited during the dry season. On the other hand, the Run-of-River plant may be part of a **hydropower cascade**, enabling it to receive water which has already been regulated by an upstream storage reservoir or upstream reservoirs with pondage. The concept of a hydropower cascade is illustrated in **Figure 4.1** below:

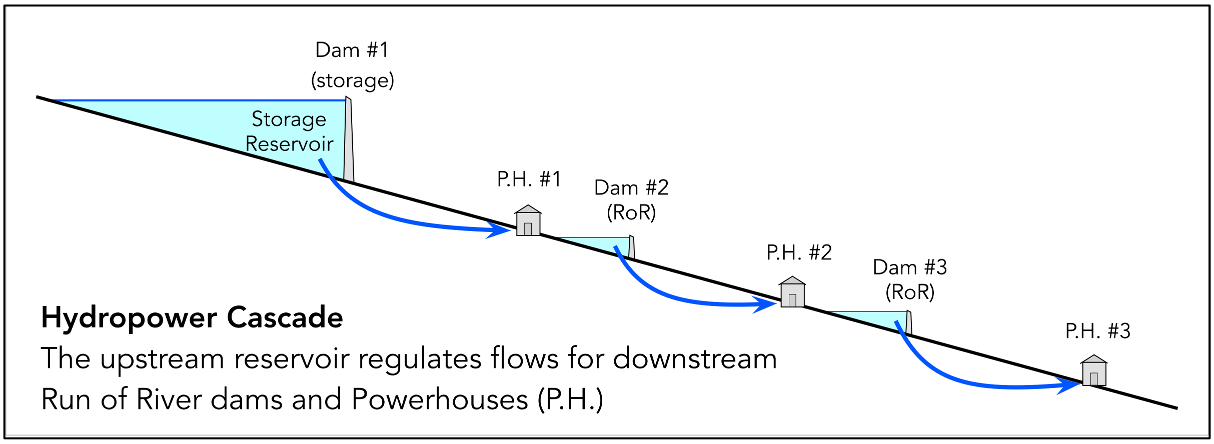

Figure 4.1 - Concept of a hydropower cascade with upstream flow regulation

4.17. The demand for electric power, also known as **load**, varies throughout the day, with some additional day-to-day variability. A graph of this variable demand for power is termed the **load curve**. This load often has two components. The **base load** is the essentially constant portion of the total demand that is continuously present, though it may vary gradually. In contrast, the **peak load** corresponds to the portion of the total load that varies throughout the day. Peak load typically occurs in the evening when people come home and turn on electricity throughout the household. The minimum power demand typically occurs after midnight. The concept of load variation over a 24-hour period is illustrated below in **Figure 4.2**.

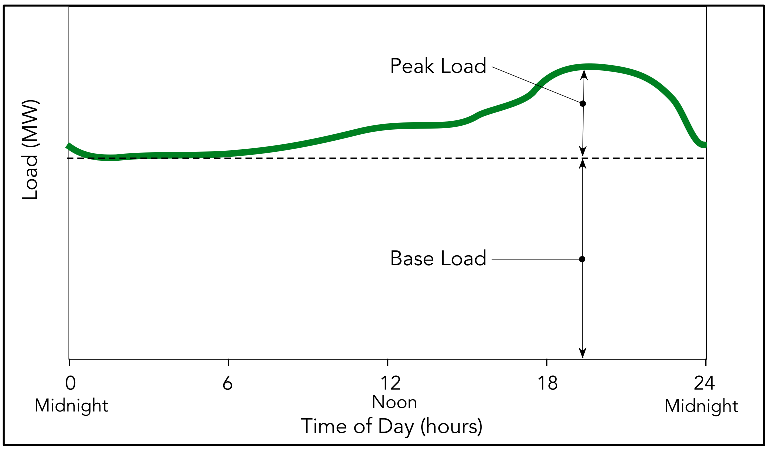

Figure 4.2 - Graph illustrating the concept of an electrical power load curve for a power system

4.18. In this connection, it is important to recognise that load is not assessed on a HEP-by-HEP basis, but across an entire **power system** into which individual plants feed. The day-to-day operation of a HEP therefore depends on system-wide demand and the role that the HEP is expected to play to meet that demand within the grid.

4.19. Some Run-of-River HEPs have a limited storage capacity which allows water to be captured during hours of low demand (e.g., after midnight), and then releasing this water to produce power during hours of peak demand. This form of storage—**pondage**—is usually only sufficient to meet fluctuations in power demands over a daily period. Peak demand hours usually occur in the evening and early night-time, although they can shift with the season. For instance, if air conditioning is a big component of demand, the peak demand in the summer may be closer to noon.

4.20. A HEP operated to supply the variable demand peaks is referred to as a **peaking plant**, and it will target energy delivery during the daily peak load period. By contrast, when HEPs are operated to deliver energy relatively continuously and with limited fluctuation, this is referred to as a **base load plant**.

4.21. Depending on the seasonal variability in river flows, a HEP may be operated either as a base load plant, producing maximum power continuously, or as a peaking plant that produces power only during hours of peak load, depending on water availability. This is particularly true of HEPs in the Himalayan region, where summer flows exceed the capacity of the turbines, allowing plants to be operated continuously at full power during monsoon months, thus acting as a base load plant. In contrast, during the winter dry season there is only enough water to allow the plant to operate a few hours a day at full power. The large variability in flows available to Himalayan HEPs is illustrated below in **Figure 4.3**. If the Run-of-River reservoir incorporates pondage storage, during the dry season the plant can be turned off to store water during hours of low demand and turned on to deliver full power during the hours of peak load. A HEP can only operate as a base load plant year-round when it is the beneficiary of a large reservoir, i.e., if it is a storage work.

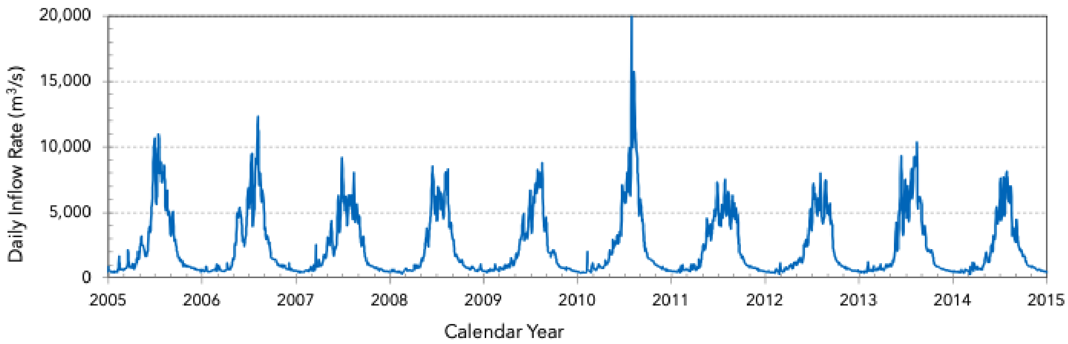

Figure 4.3 - Example of seasonality of flows in Himalayan rivers[363]

4.22. The total storage capacity in a HEP's reservoir may be subdivided into either active or inactive storage pools. Inactive storage (also called **dead storage**) is the lower portion of the reservoir from which water is not withdrawn. It always remains full of water. Active storage (also called **live storage**) comprises the upper portion of the reservoir which experiences variations in level as water is stored and then released, including for beneficial uses such as power production. In multi-purpose reservoirs the live storage may also be used for flood control, municipal or industrial water supply, irrigation supply, navigational releases, or other uses.

4.23. Storage relationships and commonly used nomenclature are illustrated in pictorial form in **Figure 4.4** below (turn over page):

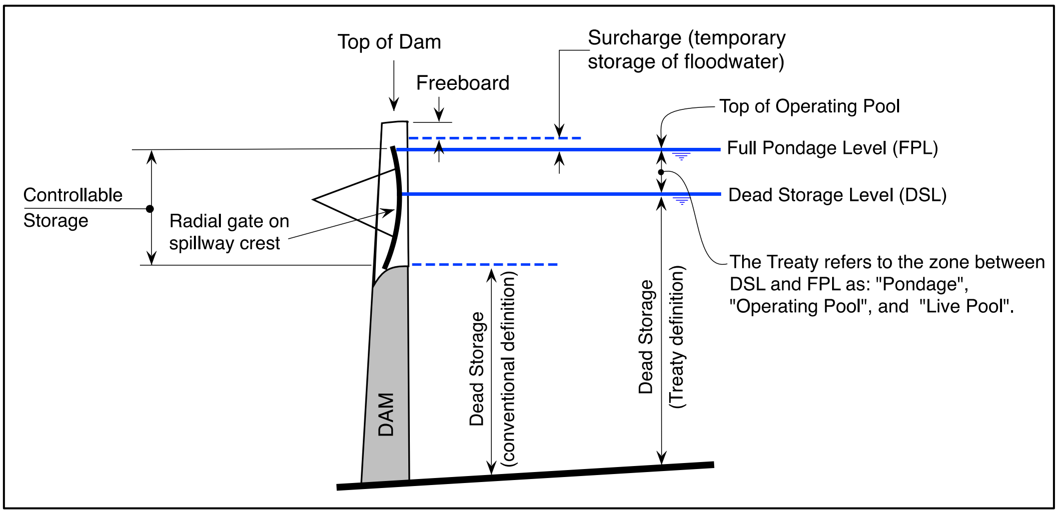

Figure 4.4 - Different forms of storage in the reservoir of a Run-of-River HEP

363 The graph uses the daily flow of the Indus River entering Tarbela Dam as an illustrative example. The graph is based on daily operational data from the Tarbela Dam Project Office, collected by WAPDA.

4.24. Starting from the top of the reservoir schematic shown in **Figure 4.4**, **freeboard** is a buffer space designed to prevent the reservoir from being overtopped by wind-driven waves. It is not a form of storage but rather provides a safety heightening to prevent overtopping of the dam.

4.25. Immediately beneath freeboard is the temporary flood **surcharge storage**. This zone may temporarily contain floodwaters during the time it takes to drain away the flood. If the HEP's gated spillway has sufficient capacity to discharge safely the maximum flood flow at the full pondage level, then the surcharge storage will be zero.

4.26. The **operating pool** or **pondage** is that portion of the storage pool designed for alternative filling and emptying in the course of power generation, although during part of the year it may be sustained continuously full, or continuously empty, depending on the plant's operating strategy.

4.27. It is important at this point to explain the concept of **dead storage** because the Treaty definition is different from that in conventional use. Under conventional terminology, dead storage is, as defined by the ASCE (and others), "[t]he portion of a storage basin or reservoir that cannot be used for temporary water storage."[364] This corresponds to the storage capacity below the lowest outlet, and it cannot be emptied using the provided outlets. It is often designated to be used for sediment storage.

4.28. By contrast, Annexure D of the Treaty defines Dead Storage as "that portion of the storage which is not used for "operational purposes" and "Dead Storage Level" as "the level corresponding to Dead Storage". Thus, the Treaty defines Dead Storage to correspond to the bottom of the Operating Pool, which is conventionally known as the minimum operating level or minimum drawdown level. However, if an outlet is placed lower than the Treaty-defined Dead Storage Level then the reservoir can, in fact, be lowered below the Treaty-defined Dead Storage Level.

4.29. A HEP's controllable storage, also shown in **Figure 4.4**, includes not only its operational storage but also the additional storage which is below the minimum operating level, but above the lowest part of the reservoir's lowest outlet.

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[364] ASCE Committee on Hydropower Intakes, *Guidelines for Design of Intakes for Hydroelectric Plants*, 1995, **Exhibit P-0308**, p. 430.

4B.2 Typical HEP components

4.30. Having described the configuration of reservoir storage, Pakistan now addresses the rest of a Run-of-River HEP's basic layout and components, which are shown schematically in **Figure 4.5** below:

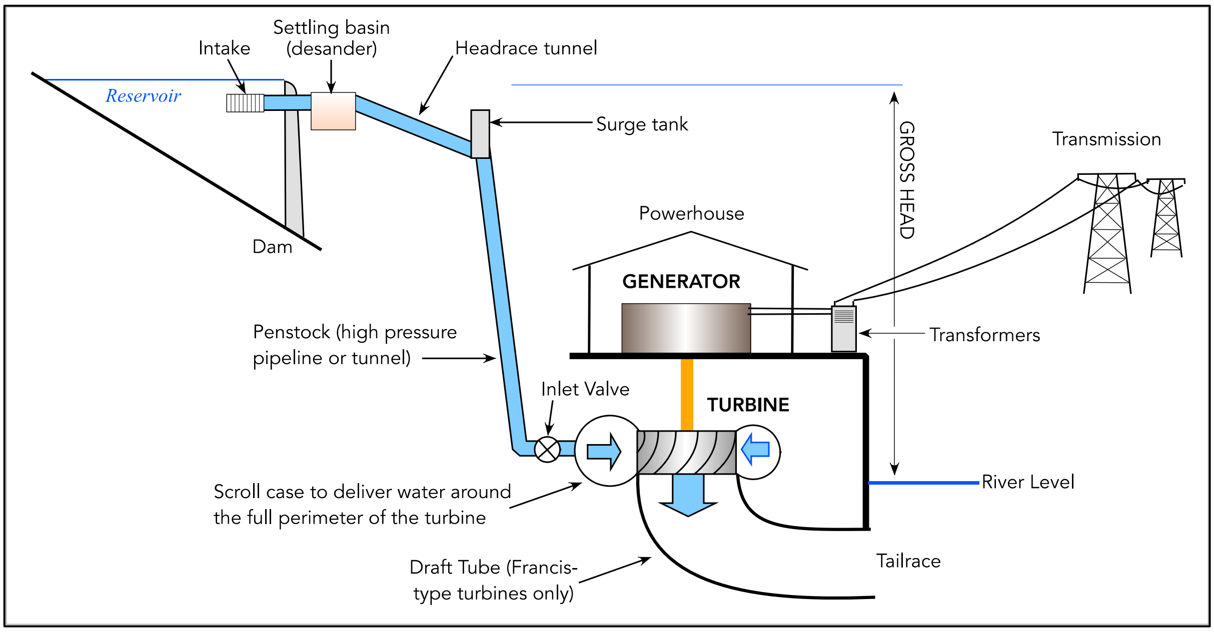

Figure 4.5 - Typical components of a Run of River HEP

4.31. As a general matter, most Run-of-River HEPs share the following common features, as shown in **Figure 4.5** above:

(a) A **low dam** which diverts water into a canal or tunnel leading to the power plant, or a higher dam which can also contribute to head in addition to diverting water;

(b) The **headrace conduit** (canal or tunnel) which carries diverted water, typically along a low slope, until reaching a further conduit;

(c) That further conduit, the **penstock**, which has a steep slope and delivers pressurised water to the turbines;

(d) An **above- or below-ground powerhouse** that houses the turbines, generators, and associated equipment;

(e) A final conduit, the **tailrace**, which removes the water from the turbine and delivers it back into the river; and

(f) Associated electrical and mechanical systems including step-up **transformers** to convert the low voltage output from the generators (e.g., 13,800 volts) into high voltage for efficient transmission (e.g., 220,000 volts). These voltages will vary from one location to another.

4.32. The **dam** raises the water level and diverts flow. Dams are also designed to pass floods downstream without suffering damage, and the top of the overflow section is termed the **crest** of a dam or of a weir. A low dam is often referred to as a weir. A barrage is a weir with its crest near the level of the riverbed, and which controls the upstream water level by opening or closing a series of gates extending across the width of the river.

4.33. The **reservoir** is the water impoundment behind a dam. As described above, a reservoir's storage pool can be sub-divided and assigned to specific purposes, such as the levels assigned for minimum and maximum operating levels.

4.34. An **outlet** is any opening designed to allow the controlled release of water from a reservoir. Outlets may penetrate the wall of the dam itself or may draw water off through a tunnel or canal adjacent to the dam. As a general matter, the term 'outlet' may also encompass: (i) an intake, which is a structure that regulates releases from the reservoir for beneficial uses, (ii) a spillway that releases large volumes of water to the river below the dam, typically for the controlled release of floodwaters, or (iii) sluice gates that deliver smaller flows to the downstream river in the process of making releases to clear sediment or debris from the area of the dam or intake.

4.35. A HEP's **spillway** may be thought of as a specialised type of outlet, the distinguishing feature being one of size and function: spillways tend to be much larger than other outlets and are primarily intended to release excess or flood flows of considerable volume and limited frequency. A spillway may operate for a few days to weeks in a year, and the full spillway capacity will rarely, if ever, be used. Indeed, prolonged operation of spillways may also not be feasible because of operating constraints, such as vibration when used with small gate openings, or the scour (i.e., riverbed erosion at the foot of the dam) caused by prolonged high flows associated with releases at larger openings. A spillway may be designated as a service spillway, expected to operate to pass floods every year, or an emergency spillway that would be pressed into operation only during those rare and extreme floods that exceed the capacity of the service spillway.

4.36. Smaller outlets that discharge below the dam may also be operated during periods of high flow for purposes of sediment management, such as a sediment flushing outlet adjacent to an intake that might operate for only a few days each year.

4.37. In contrast to spillways, **intakes** are used to make controlled releases from the reservoir and are expected to operate frequently or even continuously. Thus, an outlet from a reservoir is also, simultaneously the intake to the HEP's power generation system. Some intakes may release flows to the river below the dam (i.e., to sustain environmental flows), but more typically they divert water out of the river for uses such as power production, irrigation, etc.

4.38. Intakes are usually fitted with a coarse screen—called a **trash rack**—to keep both floating and submerged debris out of the turbine. There may be a mechanical raking system to remove trapped debris from the trash rack to prevent it from clogging.

4.39. Water flows from the intake to the **powerhouse** via the headrace and the penstock. A surge tank or surge chamber is included in the water conveyance system to limit the maximum pressure that can develop (particularly in the penstock) owing to sudden changes in the flow rate, such as may result from the rapid closing of a gate.

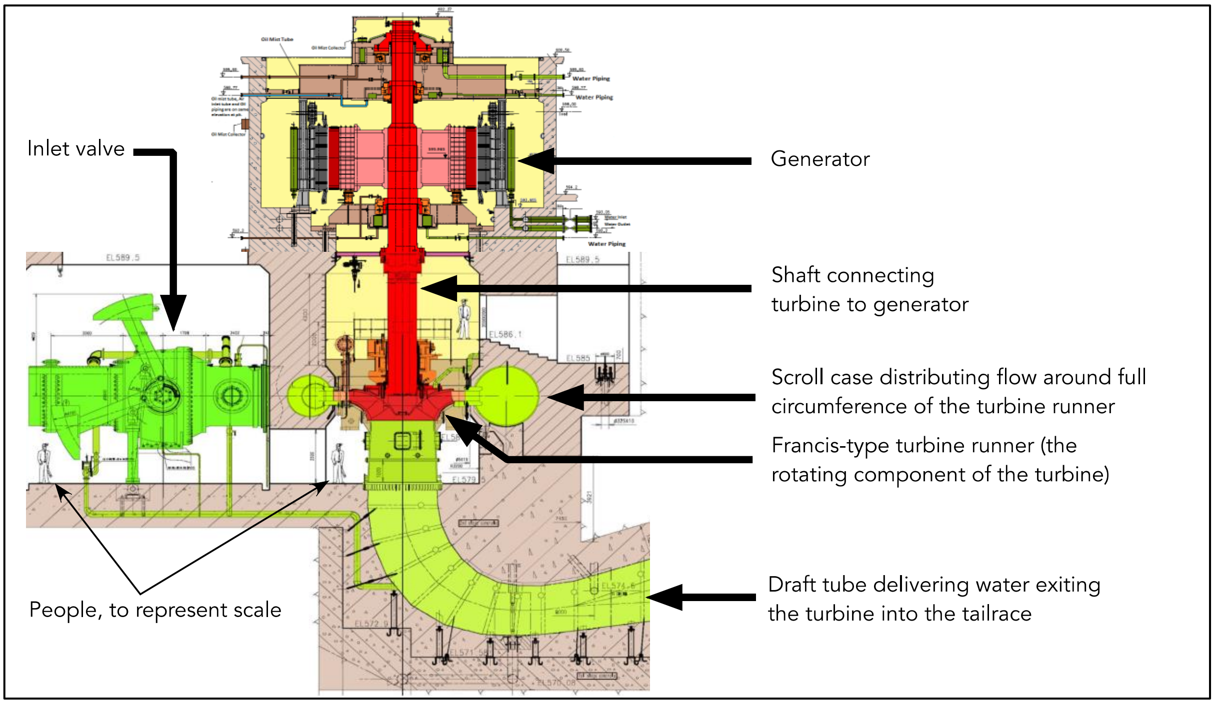

Figure 4.6 - Cutaway drawing of power generating machinery at Neelum-Jhelum HEP with Francis-type turbine

4.40. The basic components of a Francis-type turbine and generator, as installed in the Neelum-Jhelum HEP, are illustrated above in **Figure 4.6**, showing a cut-away scale view of the complete hydropower machine. Water enters from the penstock, flows around the scroll case and then through the turbine, before exiting through the draft tube. The spinning turbine causes the generator to rotate and create electricity.

4.41. Different types of turbines may be used, but the two most common types are Francis (as was shown in **Figure 4.6**) and Pelton, as seen in **Figure 4.7** below. The Francis turbine runner is typically used for systems having moderate head, approximately in the range of 25–500 m, whereas Pelton runners are typically used for heads exceeding 250 m, as these correspond to the ranges in which the different turbine types offer the greatest efficiency. There are areas of overlap, and the final selection of the runner type is based on considerations in addition to head. One significant difference between these two types is that the Pelton runner can be changed out very quickly (e.g., 24-hours), whereas the Francis unit will typically require over a week to pull out and replace because the generator, which sits on top of the turbine, must first be removed to access and then remove the Francis turbine runner.

Figure 4.7 - Photographs of a Francis turbine runner (left) and a small Pelton turbine runner (right)[365]

4.42. The **turbine** sits within the powerhouse and works when pressurised water passes through the turbine blades, which in turn rotate and transfer energy to a generator, which produces electricity. Once water has passed through the turbine, it is removed from the HEP via the tailrace and returned to the river. In this way, the HEP converts hydraulic energy into

[365] Photographs taken by Dr Gregory Morris on 2 July 2010 (left) and 15 June 2011 (right).

mechanical energy and, finally, electrical energy. Gates or valves are used to vary the flow rate entering the turbine so that it rotates at the speed required to maintain the proper voltage and frequency in the generator.

Figure 4.8 - Generators inside a HEP Powerhouse (Tarbela dam)

4.43. **Figure 4.8** shows the main floor of a **powerhouse** where the generators are located. A vertical arrangement of this type is characteristic of larger plants, while in smaller plants the turbine and generator may be arranged horizontally.

4.44. A HEP will generally have multiple generating units (each unit comprising a turbine and a generator) because this will allow individual units to be removed from operation for maintenance while the other units keep running. Multiple units also allow power production to track variations in the available flow of water or changing power demand during the day, switching individual units on or off as required. A higher level of energy conversion efficiency is achieved by running a single unit at its design optimal operating point, rather than running multiple units at lower flow rates. Finally, given that the largest generating units produced by most manufacturers are approximately 750 MW, larger HEPs will need multiple such units to meet the plant's design capacity.

4.45. The generated power is transmitted to a switchyard adjacent to the powerhouse where **transformers** raise the voltage to the high level needed to minimise transmission losses.

4.46. Modern turbines can convert up to about 94% of the potential energy theoretically available from the water into mechanical energy, and generators can convert about 98.5% of that mechanical energy into electricity. Roughly another 1% will be lost in the process of transforming the low voltage of the generator into high voltage. This transformation is done because high voltage electricity can be transmitted a long distance with much lower energy loss. At the optimal operating point, therefore, over 90% of the energy in the water can be converted into electrical energy and delivered to the high-voltage transmission line. The amount of power that can be produced by a HEP therefore depends upon: (i) the flow rate, (ii) the generating head, and (iii) the efficiency of the various plant components.

4.47. Electrical power is typically measured in watts (W), 1W being equivalent to one joule delivered over one second. The power of one million W (one megawatt, MW), delivered for one hour, produces one megawatt-hour (MWh) of energy. Annual energy production from HEPs is typically measured in units of gigawatt-hours (GWh), being equivalent to one billion watts supplied for one hour. To contextualise these units:

(a) A 'small' HEP is typically considered to have up to 20 MW (or 20,000 kilowatts) of installed capacity, although micro and mini-plants can be installed that provide only a small fraction of a MW, such as a micro-plant supplying only a few houses in a remote area.

(b) A 'large' HEP can have installed capacity of thousands of MW. The largest HEP in Pakistan is the Tarbela project, with 4,888 MW of installed power generation capacity. The largest HEP in India is the Tehri project with 2,400 MW of installed capacity.

4C INTRODUCTION TO THE HYDROLOGICAL AND GEOLOGICAL FEATURES OF THE INDUS BASIN WHICH ARE RELEVANT TO HEP DESIGN AND OPERATION

4.48. Before setting out further the considerations which are relevant to the design of a HEP, it is useful to address the particular hydrological and geographical characteristics of the Indus Basin, thereby providing relevant context for the Treaty and the dispute between the Parties. An overview of the characteristics of the Indus Basin was presented in **Chapter 3** above; further relevant details follow.

4C.1 Precipitation

4.49. The Indus River basin is characterised by wet summers and dry winters. This is illustrated in **Figure 4.9** which charts monthly rainfall at three cities on the Indus floodplain in Pakistan. The wettest area (Islamabad) is found upstream and the driest (Karachi) is found at the mouth of the Indus where it discharges to the Arabian Sea. Higher precipitation occurs in mountain areas.

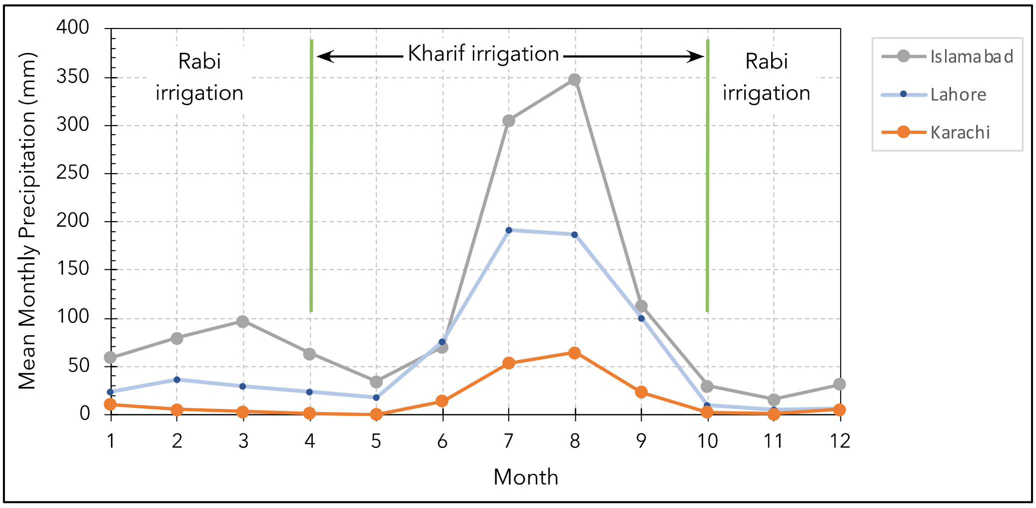

Figure 4.9 - Seasonality of rainfall and cropping seasons for three locations along the Indus floodplain in Pakistan[366]

4.50. Low rainfall, combined with high temperatures, means that most agricultural activities on the Indus floodplain require water supplies from irrigation. There are two cropping seasons in Pakistan, *kharif* (spring/summer) and *rabi* (fall/winter).[367] Production in both cropping seasons is closely linked to irrigation supply. The periods corresponding to these two cropping seasons are also illustrated in **Figure 4.9** above.

4C.2 River flow

4.51. The highly seasonal nature of streamflow in the Indus River Basin was illustrated in **Figure 4.3** above. This figure shows the dramatic difference in water availability between the dry winter months and the summer wet season (monsoon).

4.52. The summer flows are derived from the combination of snow and glacial melt plus rainfall. Meltwater begins flowing as the weather warms in the spring, whereas the monsoon rains typically occur from midsummer into September.[368] As discussed in **Chapter 3**, the Indus

[366] The graph is based on mean monthly data for rainfall for the period 1991-2020 collected by the Pakistan Meteorological Department, Government of Pakistan.
[367] *See*, generally, **Chapter 3**.
[368] *See* further **Chapter 3B.**

Basin is also influenced by upper atmospheric phenomena, including so-called 'atmospheric rivers'.[369]

4C.3 Sediment yield

4.53. Sediments are created by the decomposition of rock as it is broken into smaller and smaller particles by natural weathering processes. These particles are delivered into rivers via rainfall erosion, landslides, and debris flows. Erosion is naturally high in the tectonically active Himalaya and, as already described in **Chapter 3**, Himalayan rivers carry a correspondingly heavy sediment load which includes fine sediments (clay and silt) and coarse sediments (sand, gravel, cobbles and boulders). The vast majority of the sediment being transported by Himalayan rivers consists of silt and sand. The Wentworth scale is used to classify fluvial sediment size and is reflected in **Figure 4.10** below:

Sediment Sizes Classed by Particle Diameter in Millimeters (Wentworth scale)						
Name	Clay	Silt	Sand	Gravel	Cobble	Boulder
Min. diameter	0.0005	0.004	0.062	2	64	256
Max diameter	0.004	0.062	2	64	256	4096
Fine or Coarse?	----Fine Sediment ----		------------- Coarse Sediment ----------------			

Figure 4.10 - Nomenclature used to classify sediment particle size

4.54. Sediment is primarily mobilised and transported downstream in high flow and flood periods, and especially when heavy rainfalls erode the land surface. Sediment may be transported as **suspended load**, remaining suspended in the water owing to the turbulent energy in the flowing river. This is the component of the sediment load that is typically measured.

4.55. Sediment transported by rolling or bouncing along the riverbed is called **bed load**. In most Himalayan rivers the bed load is a minor component of the total sediment load, as confirmed by the analysis of sediment trapping in reservoirs. Bed load transport occurs along the bottom of the river during high flow and flood periods, and in steep Himalayan drainages it may consist largely of cobbles and boulders. For these reasons, it is rarely possible to measure bed load transport rates directly although they may be roughly estimated by empirical methods or the application of numerical models.

[369] *Id.*.

4.56. The average seasonality of inflow into the Tarbela Dam on the Indus River is presented in **Figure 4.11**, showing the seasonality of the flow. The graph shows high flows during the summer owing to snowmelt and monsoon rains, with low flows during the winter.

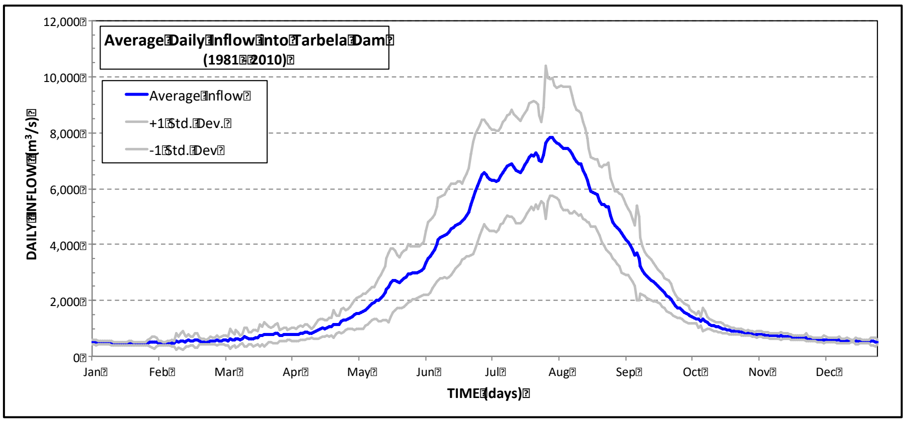

Figure 4.11 – Average daily values and variability of inflow into the reservoir of Tarbela dam on the Indus River[370]

4.57. **Figure 4.12** below shows daily suspended sediment data from the Indus River upstream of Tarbela dam. Most sediment is delivered into a HEP's reservoir by monsoon floods when rivers run muddy. In the dry season a negligible amount of sediment is delivered owing to the combination of low flow and clear water. Thus, sediment management techniques need to focus on periods of high flow in the summer, especially during larger floods. Examples of suspended sediment concentration versus monsoon flow rate, and also the variation in suspended sediment concentration as a function of daily flow, are also shown in **Figure 4.12** below (turn over page).

[370] This figure is based on daily operational data from the Tarbela Dam Project Office collected by WAPDA.

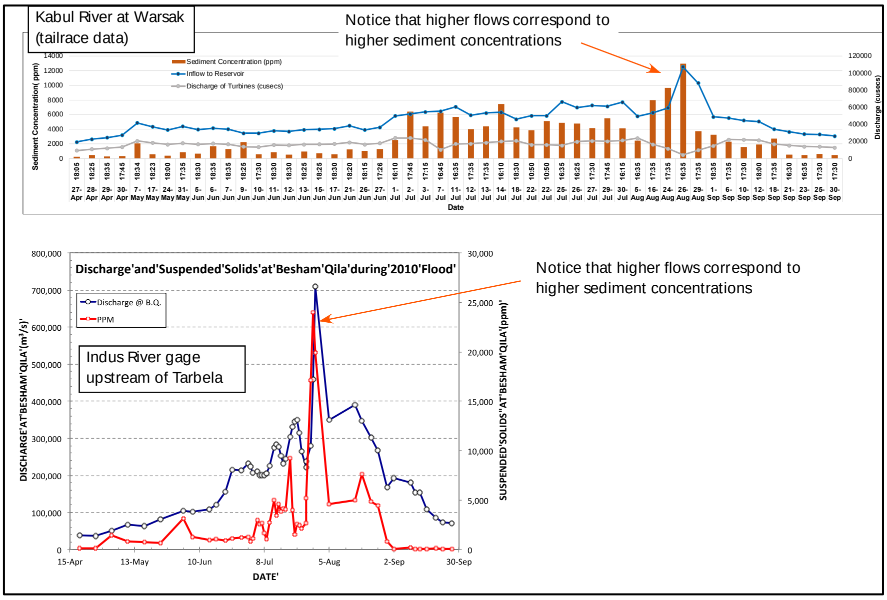

Figure 4.12 - Data from two stations in Pakistan showing the variation in suspended sediment concentration as a function of daily flow[371]

4D THE HEP DESIGN PROCESS

4.58. The HEP design process proceeds in steps, starting with a conceptual siting and design and ending with the preparation of engineering drawings for construction. Once a project or sequence of projects has been identified and agreed upon, the design process proceeds through a Feasibility Level study, a Detailed Level study, followed by the Preliminary Design and Final Engineering Design stages. The final design and accompanying specifications constitute the documents used for project construction.

4.59. HEP design is very sensitive to the physical characteristics of a site including the flows and head available for energy generation, the opportunities and constraints inherent in the topographic and geological conditions, the sediment load, and site access conditions (i.e., the need for new roads and transmission lines). The design must also consider the limitations imposed by social impacts, downstream users, local laws and regulations (e.g., for environmental protection) and, in this case, the limitations imposed by the Treaty. HEP design may also be influenced by the characteristics of the power system and its associated market, as a high price for power, or daily or seasonal price variability, may influence the installed power and design storage capacity for the HEP.

[371] The graphic was prepared using data for the Kabul River collected at Warsak dam from daily sampling by National Engineering Services Pakistan ("**NESPAK**") under contract to WAPDA, and data for the Indus River collected at Besham Qila gauge station by WAPDA.

4.60. Once the potential location of a HEP has been identified, more detailed studies are required to confirm project feasibility. A Feasibility Stage study will address: the project's overall planning, layout and operational strategies, plus those social, environmental, regulatory and legal conditions that influence design. The Feasibility Stage study will entail the collection and analysis of field data including topography, hydrology, geology, geotechnical, seismology, sediment, plus social and environmental parameters. A variety of analysis and modelling tools are used at this stage to establish the overall engineering parameters including installed capacity, height and configuration of the dam, structural and operational measures for sediment management, spillway sizing and configuration, calculation of power production, general layout of the intake including the sedimentation basin, if required, the route and profile for the tunnel or other conveyance facilities, the location and configuration of the powerhouse and its associated facilities, plus preliminary routes for access roads and transmission lines. Because structural and operational measures may be required for sediment management, a general strategy for sediment control is also outlined at the Feasibility Stage. The integration of the HEP into the grid is also evaluated to determine the extent of transmission improvements that may be required to deliver project power to demand centres. This stage will also entail development of the cost and income parameters required to assess the project's financial feasibility.

4.61. To move beyond the Feasibility Stage a project should typically have been judged to be technically, economically, and financially feasible, with acceptable levels of risk and of social and environmental impacts. The study defines the basic functional parameters, layout and dimensions for the project. These may be subsequently refined based on the collection of more extensive field data and more detailed evaluations, but the overall project configuration should be clearly established by the Feasibility Stage.

4.62. Once the Feasibility Stage has been completed, the Preliminary Engineering Design stage can commence. This process typically proceeds from the feasibility level design and includes the collection of more extensive and detailed field data on both physical parameters as well as social and environmental aspects, focusing on the parameters and design issues identified as needing more study at the feasibility stage. More detailed hydraulic and sediment transport simulations may be performed at this stage to verify or modify the initial recommendations for the design and operation of outlets and sediment management facilities. All aspects of project design are refined and optimised based on the field data and modelling studies, and the operational modelling of project integration into the power distribution grid is also updated. Project costs and benefits are updated, incorporating any required adjustments.

4.63. The Preliminary Engineering Design should establish the full design configuration of the project, including not only the dam and power generation system, but also river diversion works for project construction, access roads, transmission lines, the camp for workers, project construction scheduling, land acquisition boundaries, social and environmental mitigation measures, and so forth.

4.64. Final Engineering Design involves the further development of the Preliminary Engineering Design drawings and specifications to prepare the complete set of documents required for project procurement and construction activities. The Final Engineering Design will also include the environmental and social mitigation measures, monitoring systems, access improvements, worker camp, and other elements ancillary to project execution.

4D.1 Pondage

4.65. Run-of-River HEPs operate by utilising the natural flow of the river to generate power. However, the demand for electricity in the power system does not necessarily correspond to the flow of the river—especially in times of low flow. In other words, the electricity produced by a Run-of-River HEP will be variable, being contingent on the seasonal flow of water through the HEP's turbines, whereas the demand varies depending on the behaviour of power system customers.

4.66. As previously noted, the concept of pondage in a Run-of-River HEP is operational storage of limited capacity sufficient only to meet the diurnal variation of power demand. During periods of low river flow, when the plant cannot operate continuously at full power, the pondage capacity allows power production to be halted and water stored during hours of low demand and releasing this stored water to enable the plant to operate at high or full power during hours of peak power demand (peak load). During the dry season, the pondage pool may be emptied and refilled on a daily basis. Pondage is not needed during the wet season when the plant is operating continuously at full power.

4.67. Under *ordinary* principles of design—a point that requires emphasis in the context of the present case—there is no fixed methodology for determining how much pondage a HEP will require or be permitted to have. However, the provision of pondage, and ensuring it remains free of sediment, will incur both capital and operational costs. Thus, the rational selection of pondage capacity will usually balance these capital and operational costs against the income anticipated from delivery of power during peak hours when energy prices are higher.

4.68. However, in a cascade of HEPs, pondage will not necessarily be needed at all plants. As previously illustrated in **Figure 4.1** above, when multiple plants are constructed along the same river in a cascade they can utilise the same flow, with the tailrace of an upstream powerhouse discharging into the reservoir of the next plant downstream, and so on down the cascade. Where a HEP is placed downstream of a HEP with ample pondage—or, better still, a storage work—the downstream HEP may not need to incur the additional expense of including pondage at all because it will be able to rely on the operational releases from the upstream HEP. Thus, demand is supplied by aggregating the capabilities of all power stations available within a generating system, rather than treating each plant individually.

4.69. Definition of pondage capacity and the corresponding range of the reservoir's operating levels is an integral aspect of HEP design. Pondage capacity can be selected considering the dry season flows in the river, the planned power output from the HEP, the anticipated load characteristics of the system the plant will supply, and the reservoir geometry or other physical constraints which may influence pondage capacity.

4.70. In practice, the pondage at a HEP is *ordinarily* derived as part of the optimisation analysis by considering a range of options and determining the ideal balance between cost of the project (subject to any constraints) and the potential energy revenues, and the contribution of pondage capacity to costs and revenues.

4.71. As the Court will note from later chapters of this Memorial, the Treaty requires that the calculation of pondage is approached in quite a different way for a HEP on the Western Rivers.

4.72. The inclusion of pondage at a HEP is *ordinarily* an economic question. However, under the Treaty—as will be seen—the calculation of pondage is mandated without regard to economics. Most HEPs operate in combined power systems—that is to say, they work in conjunction with conventional thermal plants (coal, gas, nuclear, etc.) and increasingly with other renewable power sources (solar, wind, biomass, geothermal). In times of high river flow, when water is plentiful and the plant operates continuously at full power, the HEP can function to provide cheap baseload power. Other plants in the power system must supply the daily peaking load during this part of the year. In contrast, during months of low flow, when water is insufficient to sustain full power, storage can be used to allow the HEP to be used as a peaking plant, producing power during the daily high demand period, and storing water for the remaining off-peak hours.

4D.2 Outlets

4.73. The functions for which outlets are used in a HEP are various and include (but are not limited to):

(a) Diversion outlets, which are designed for diversion of the river around the work site during construction.

(b) Irrigation outlets, which are designed to allow water to be released from a reservoir for (typically seasonal) agricultural purposes. These outlets are characterised by their need to modulate the flow rate. They may release to a canal or pipeline, or may release at a controlled rate to the river below the dam to supply irrigation intakes installed in the river channel further downstream.

(c) Minimum flow outlets, which are designed to allow for continuous or seasonally variable (wet vs. dry season) releases to satisfy downstream environmental conditions, water supply, riparian water rights, etc. These outlets are situated deep in the reservoir as they must always be able to withdraw the design flow rate regardless of the reservoir level. These releases may also have higher legal priority than other uses.

(d) Drawdown outlets, which are designed to allow for low-level discharge and drawdown of the reservoir for inspection or maintenance of the dam.

(e) Bypass outlets, which are designed to divert sediment-laden water around the operating pool to be discharged downstream of the dam as a means to reduce the sediment load entering the pool, thereby helping to preserve long-term reservoir storage and reducing the load on the turbines.

(f) Flood control outlets, which allow floods to pass through the dam without endangering the dam's integrity. A dam may have multiple flood control outlets, which might include those used relatively regularly as well as emergency structures that come into use only during the most extreme events. Because floods can cause a reservoir to overflow, flood outlets are generally located at a high level. Some flood control outlets may be used to lower the reservoir in anticipation of a flood so that the peak reservoir discharge during the flood will be less than the natural peak of the flood.

(g) Water supply outlets, which are designed for municipal or industrial water supply. The flow rate of these outlets is modulated and is normally delivered year-round. Because water quality varies with depth, multi-level intakes may be used in these outlets to extract water from the reservoir at depths having the appropriate temperature and water quality, despite variations in water level.

4.74. As has already been noted above, the term 'outlet' <u>may</u>, as a general matter, also encompass:

(a) Intake structures – namely outlets used to allow the controlled release of water to beneficial uses, including environmental uses such as the maintenance of minimum instream flows. These structures simultaneously act as an outlet from the reservoir and as an intake for delivering water to the beneficial use. These outlets are used frequently or continuously, and the flows are usually diverted out of the river and into a canal or tunnel.

(b) Spillways – which are large capacity outlets designed to discharge flood flows into the river below the dam, and which are used infrequently or only seasonally (e.g., during the monsoon season). Spillways may be incorporated into the dam itself, or may tunnel through the abutments on either side of the dam.

(c) Sluice gates – which are smaller-capacity outlets that discharge to the river below the dam and which, depending on their location, may be employed for functions such as periodically flushing out trash and sediment from the vicinity of the intake and lowering the reservoir to perform repairs on the dam.

4.75. Intake-type outlets are typically placed to withdraw water across the full operational range of water levels in the reservoir. They characteristically include a screen (trash rack) to prevent the entry of woody debris and rubbish, and also incorporate flow regulation using gates or valves. Intakes can serve a variety of functions including:

(a) Water supply intakes – which make either continuous or seasonal deliveries into a canal or other conduit to deliver a relatively constant flow of water to users for purposes such as irrigation, municipal supply, industrial uses, and environmental flows to the river below the dam. They may also discharge into a pumping station to deliver water from the reservoir to higher elevations.

(b) Power Intakes – which divert water from the reservoir into the conveyance system supplying the power station. The flow rates through these intakes can be quite large, in the hundreds of cubic meters per second (m^3/s), and in Run-of-River plants they can divert most of the flow in the river, which makes them particularly prone to divert sediment out of the river as well as water.

4.76. Many HEPs incorporate only a limited subset of these potential outlet types. Furthermore, some of the provided functions are anticipated to be performed frequently (or continuously), whereas other functions (e.g., flood control) occur infrequently. Some outlets can be used for different functions and may therefore be multi-functional.

4.77. Normally, outlet works may be located at any depth within the reservoir as required based on purely technical and economic criteria. However, and as addressed later in this Memorial, the Treaty expressly restricts where India is permitted to position outlets in Run-of-River plants by requiring they be located at the highest level.

4.78. The following factors are usually relevant when a designer is considering the location of an outlet in a Run-of-River HEP:

(a) Hydrology (historical or simulated inflows);

(b) Sediment load and its variation over time, by grain size assessed by reference to the sediment characteristics and load, sediment catchment characteristics, including sources of sediment, nature and size of extreme design events, turbid density currents and river bed sediment particle size;

(c) Pondage, namely the volume of pondage, the efficiency of pondage for sedimentation of power flows and effective settling to prevent turbine abrasion and the requirements for sedimentation if pondage is insufficient:

(d) Appropriate methods for sediment exclusion from power flow and achieving sustainable pondage based on:

- River & reservoir geometry;
- Location of outlets;
- Type of dam (concrete, earthen, etc.);
- Allowable drawdown/refill rates;
- Downstream discharge limitations;
- Geology;
- Power intake arrangement;
- Power plant characteristics;
- Regulatory limits for downstream water quality;
- The presence of downstream infrastructure (e.g. irrigation and filter plant intakes, navigation channels, other reservoirs) and sensitive environmental resources (fish spawning habitat, etc.) that are sensitive to sediment releases;
- Seasonal limitations on water or sediment release;
- Downstream river channel characteristics (geometry, tributary inflow, etc.) needed to simulate potential for downstream water quality and deposition of the sediment released from the reservoir; and
- Permitting and/or any regulatory or other site-specific legal constraints.

4D.3 Power Intakes

4.79. As noted above, the outlet from the reservoir for diversion of water to the power station is referred to as the Power Intake. The Power Intake diverts water from the reservoir to the settling basin (if one has been included in the HEP), which discharges successively to the headrace, penstock and thence the turbine (as was previously illustrated in **Figure 4.5**). Intakes can be located in the dam's structure or, more commonly, in the adjacent abutment.

4.80. Intake designs have traditionally been derived from successful experiences from prototype structures, and other proposed design is thereafter confirmed using physical hydraulic models—although numerical models are becoming more common. The design process is grounded in hydraulic theory with a view to obtaining good performance over a broad range of operating conditions with minimal head losses. Minimisation of head losses requires careful shaping of the hydraulic design so that the flow velocity accelerates gradually through a transition from the reservoir to the conduit downstream from the intake structure.

4.81. As a starting point, the designer of an intake must have regard to the range of flow rates and operating conditions in which the HEP and its turbines, will be used. The intake design must be suitable for operating at both low and high flow rates, and to function efficiently at those flow rates across the full range of operational water levels.

4.82. In designing Power Intakes, a HEP's designer will need to avoid **vortices**, which are rapidly swirling masses of water that can entrain air within the headrace and affect the flow distribution, resulting in head (and, therefore, power) loss throughout the structure. A vortex occurs at the inlet as water accelerates from the reservoir into the intake in much the same way as a swirling eddy can be seen when a bathroom sink is drained. **Figure 4.13** shows the appearance of a well-developed vortex at the water surface. Vortices are mainly a concern for high pressure (submerged) intakes rather that low pressure (surface) intakes.

Figure 4.13 - Example of a vortex in water[372]

4.83. If the vortex induced at an intake becomes too intense it can pull floating debris down onto, and block, the trash racks. The entrance of air into the intake can reduce hydraulic efficiency and precipitate damaging vibration and cavitation, among other problems. Various degrees of vortexing are illustrated in **Figure 4.14** below:

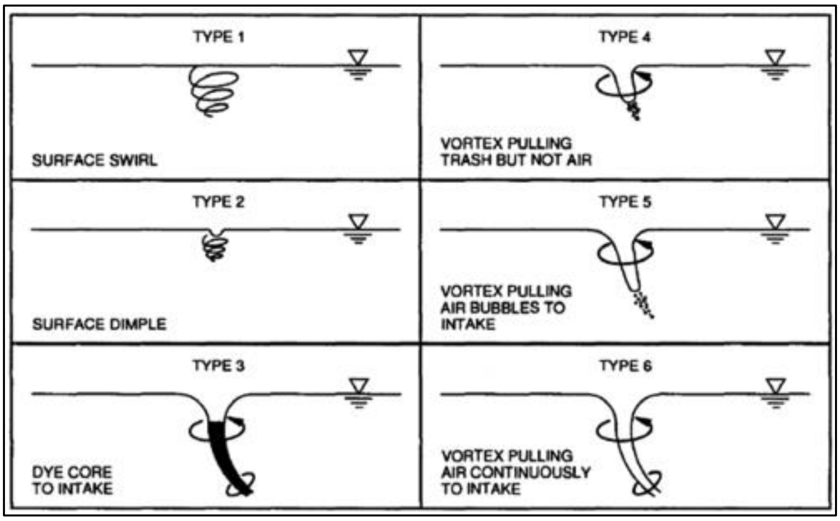

Figure 4.14 - Degrees of Vortex Formation[373]

4.84. In storage reservoirs, where sediment may not reach the area of the dam and intake for many decades or even centuries, the need to control vortex formation is typically the primary factor determining the level of the intake relative to the surface of the reservoir. However,

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[372] Photograph taken by Dr Gregory Morris on 18 November 2018.
[373] K. Walker, *Intake Vortex Formation and Suppression at Hydropower Facilities* (U.S. Bureau of Reclamation; Denver, Colorado), September 2016, **Exhibit P-0310**, p. 3.

whilst making the intake deeper might eliminate the creation of an objectional "full air core" vortex, the cost of construction will typically be increased.

4.85. In contrast to storage reservoirs, **sediment management** is the primary concern in the design of intakes for Run-of-River plants, especially in Himalayan rivers with their high sediment loads.

4.86. Intakes can have either a low-pressure (surface intake) or high-pressure (submerged intake) configuration. Low pressure (surface) intakes deliver water into a headrace that operates at atmospheric pressure. High pressure (submerged) intakes usually deliver water into a headrace that operates at greater than atmospheric pressure.

4.87. Low pressure (surface) intakes tend to be used for sites where the flow does not enter directly into the headrace, such as when the flow is diverted into a settling basin or canal, as illustrated in **Figure 4.15**. This shows a free-surface inlet channel from the reservoir to the sediment settling basin, which then discharges to the headrace. The water surface is open to the atmosphere throughout this system prior to entering the headrace.

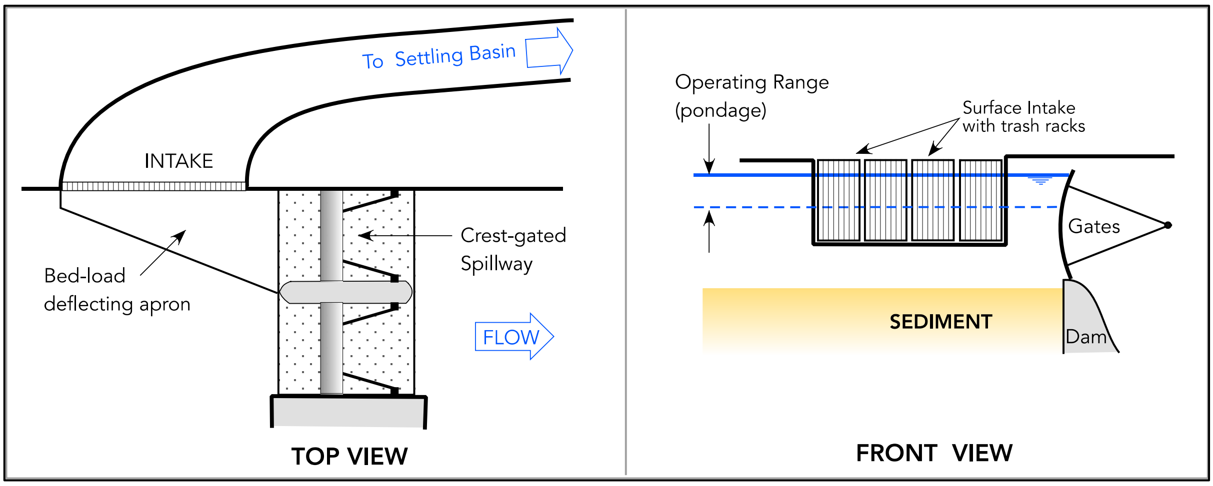

Figure 4.15 - Schematic drawing of a low-pressure (surface) intake configuration

4.88. Surface intakes are particularly well-suited for use in locations where sediment is a problem because they draw water from near the surface, where the sediment concentration is reduced. Accordingly, and given the challenges posed by sedimentation, a customary and accepted design practice for intakes at Run-of-River plants is to use a surface intake which draws from as near to the water surface as possible, when pondage is at its minimum operating level, because the concentration of highly abrasive sandy sediment is typically lowest near the surface, and sediment concentration increases with depth owing to the force of gravity in the reservoir causing sediment to sink.

4.89. **Figure 4.16** presents a conceptual illustration of a typical high-pressure intake, showing that the intake is submerged and the flow into the conveyance system, a headrace tunnel in this example, is under pressure. The intake includes trash racks at the outer face, an inlet transition section, control gates, and a transition from the rectangular section at the gates to the round headrace tunnel section. The intake typically includes equipment for cleaning the trash racks as well as stoplogs that are used to close the intake for maintenance of the gates or headrace tunnel.

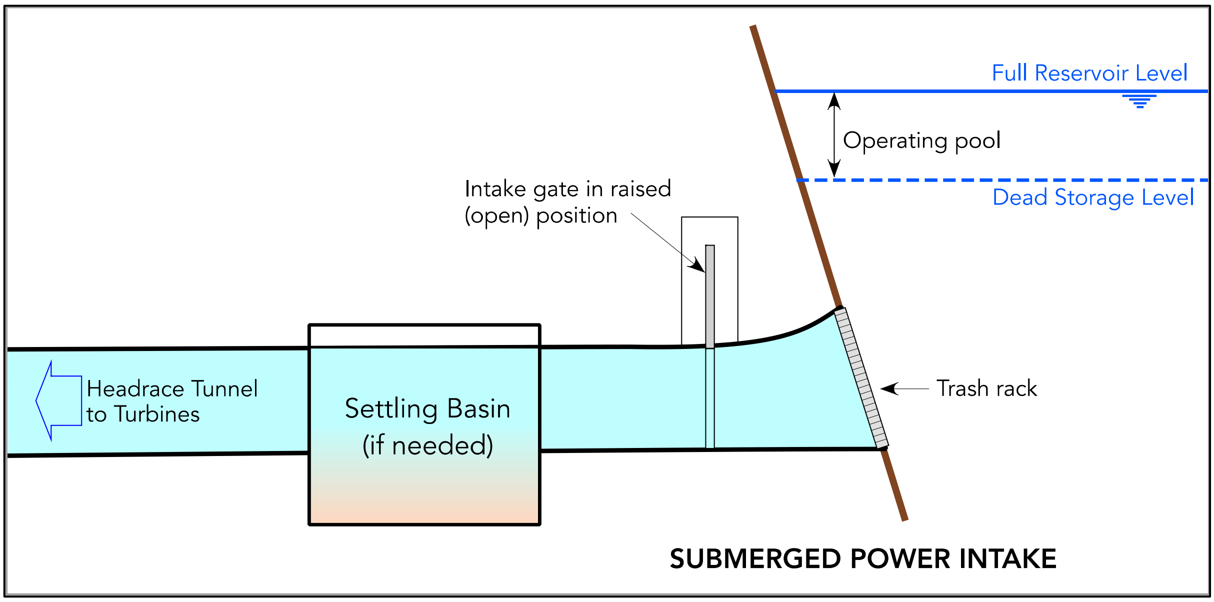

Figure 4.16 - Conceptual cross-section of a high-pressure (submerged) intake

4.90. So far as the minimisation of vortices (addressed above) is concerned, these can be minimised through a combination of steps:

(a) A well-designed approach flow from the reservoir towards the intake can reduce the vorticity of the flow (an indication of the curvature of the flow), making it less susceptible to the formation of a vortex at the intake. Poor approach conditions can allow submerged vortexes to form as well as vortices that extend to the surface. For instance, rapidly curving flow conditions can encourage the formation of vortexes. The location of an intake must be carefully selected to minimise the circulation of flow approach to the structure.

(b) The submergence depth of the intake may also play a role in reducing the tendency to form a vortex, in conjunction with a restriction on the flow velocity through the intake.[374] As illustrated in **Figure 4.17** below, submergence is the depth of water above the top of the intake at the level of the transition to the gate location. The bottom level of all Power Intakes—whether low or high pressure—should be located below the minimum operating level in the reservoir. But there is an important balancing exercise to be conducted when assessing the appropriate submergence depth of an intake. There are some well accepted methods for calculating the submergence required in any given case.[375]

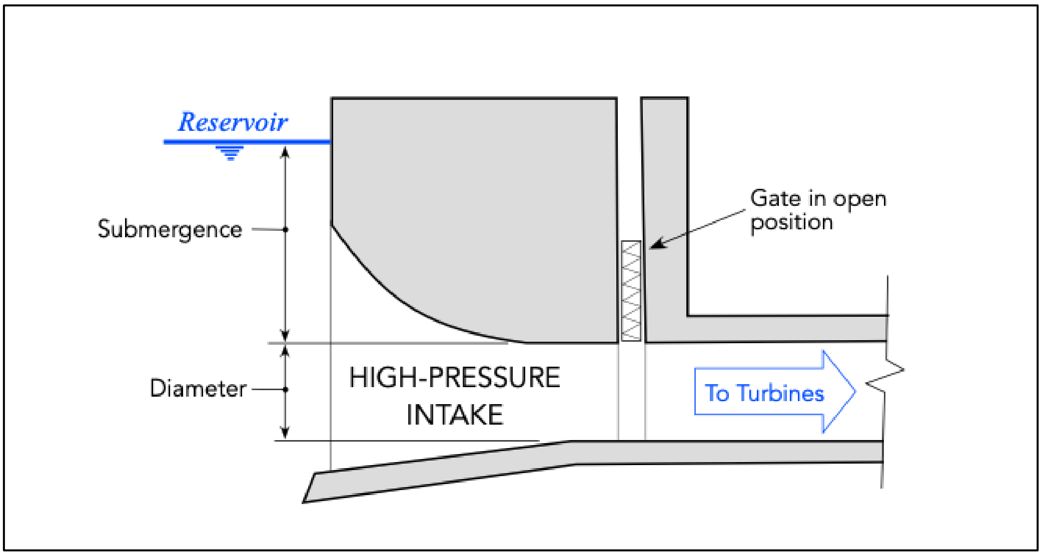

Figure 4.17 – Submergence is required at a high-pressure intake to control vortex formation

(c) Submergence requirements are a function of the height of the intake opening and the flow velocity through the inlet, both of which can be adjusted to reduce the submergence and mitigate sediment inflow. In addition, Power Intakes should be located as high as possible in the reservoir to reduce the cost for the mechanical equipment required.

(d) The flow conditions through an intake must also allow for uniform acceleration of the flow from the reservoir through to the headrace. The intake normally

[374] J. S. Gulliver et. al, "Guidelines for Intake Design Without Free Surface Vortices", *Waterpower* (III), 18-21 September 1983, **Exhibit P-0311**.

[375] *See* e.g., J. L. Gordon, "Vortices at Intakes", *Water Power* 1970, (4(137)), **Exhibit P-0312**. *See* also United States Army Corps of Engineers, "Engineer Manual 1110-2-1602", *Hydraulic Design of Reservoir Outlet Works*, 15 October 1980, **Exhibit P-0304**; ASCE Committee on Hydropower Intakes, *Guidelines for Design of Intakes for Hydroelectric Plants*, 1995, **Exhibit P-0308**.

transitions from a rectangular inlet at the trash rack face, to a smaller rectangular section at the face of the intake, and then to a circular outlet into headrace. The intake dimensions are configured to allow for the flow velocity to increase as the water enters the intake (via what is called a 'bell-mouth' transition). The dimensions for this transition are selected by computing the flow velocity through the intake and ensuring that the acceleration of that flow does not change abruptly at any location throughout its the full length.

4.91. Power Intakes should be located as high as possible in the reservoir to prevent accumulation of sediments—particularly in Run-of-River plants. In addition to the positioning of the inlet to the Power Intake as high as possible, provisions to exclude sediment from an intake might include (1) provide sluices below the inlet that can remove sediment that might be transported to the intake (as illustrated in **Figure 4.18** below); and/or (2) excluding sediment using a wall at the upstream face of the intake, thereby creating a barrier between the deep submergence required for vortex control and the deeper sediments in the reservoir.

Figure 4.18 – Intake for the Neelum-Jhelum HEP showing sediment sluices below the intake[376]

4.92. It is also to be noted that intakes can be designed specifically for reservoirs with sediments by using elongated entries and shallow submergence requirements. For instance:

376 Photograph is available at: https://www.dawn.com/news/1745082 (last accessed 18 March 2024).

(a) One variant of a pressure outlet is to have a tower or inlet structure configured to enable withdrawals from the reservoir at a higher level, even though the gate section and inlet to the tunnel is set much deeper. For instance, an intake can be designed incorporating a conduit set well below the sill of the inlet from the reservoir which enables the width of the inlet to be much greater than the width of the intake gate section and to draw water from higher levels of the reservoir while still enabling submergence of the intake.

(b) In addition, some projects have been built with long "gathering tubes" which collect water over a long length before approaching a transition to a deep tunnel intake. This hydraulic arrangement allows large amounts of water to be drawn through the intake with a very shallow submergence of the structure, which offers advantages for exclusion of sediment and ice. The requirements for high pressure at the intake gate section are still satisfied with a deep setting of the gate downstream from the face of the intake at the transition to the tunnel. The intakes to the power stations at Niagara Falls in Canada and the United States are examples of this arrangement.

4.93. In summary, and absent any specific design constraints, such as those agreed in the Treaty, when designing a Power Intake the following will, *ordinarily*, be relevant considerations:

(a) the rated power plant discharge;

(b) the full operating pool and Dead Storage levels;

(c) reservoir topography;

(d) geology;

(e) dam site layout;

(f) hydraulic performance;

(g) trash rack, trash rack cleaning and intake gate provisions;

(h) sediment load;

(i) requirements for sediment removal;

(j) inlet design;

(k) the cost of the works; and

(l) the effect of the works on the cost of energy.

4D.4 Spillways

4.94. As noted above, dams must be capable of safely passing floods into the downstream river. The hydraulic structures designed for passing these high-volume flows are termed spillways. If spillway capacity is inadequate the flood may overflow the dam itself, a process known as 'overtopping'. Overtopping is immensely dangerous and may lead to dam collapse with catastrophic downstream effects. Overtopping is the most common cause of dam failure and is the result of excessive flood inflows, undersized spillways, or functional problems with the operation of spillway gates.[377]

4.95. Spillways are outlets specifically designed to pass flood flows to the river below the dam. They are designed to manage the most extreme floods, which may entail the provision of multiple spillways with different configurations. Dam safety guidelines usually allow spillways and low-level outlets to be considered available for use during extreme floods if they are operable, but would exclude outlets to power stations (i.e., Power Intakes).

4.96. A spillway is composed of: (i) a weir or inlet structure which may incorporate gates for flow control; (ii) a conduit, tunnel, canal, or chute; and (iii) energy dissipation arrangements necessary to control the amount of downstream scour which will be caused by the impact of high velocity flood flow exiting the dam (scour depths can extend for tens of meters, even in rock, and if not controlled may endanger the dam structure). These main elements are illustrated in **Figure 4.19** below and are common to all spillways, but the arrangements differ significantly depending on the location and layout of the spillway (e.g., whether over the dam, through an abutment, energy dissipation requirements, and so forth).

[377] ICOLD, "Bulletin 99 (Update)", *Statistical Analysis of Dam Failures*, (Final Draft, December 2019), **Exhibit P-0313**, pp. 34, 37 and 40.

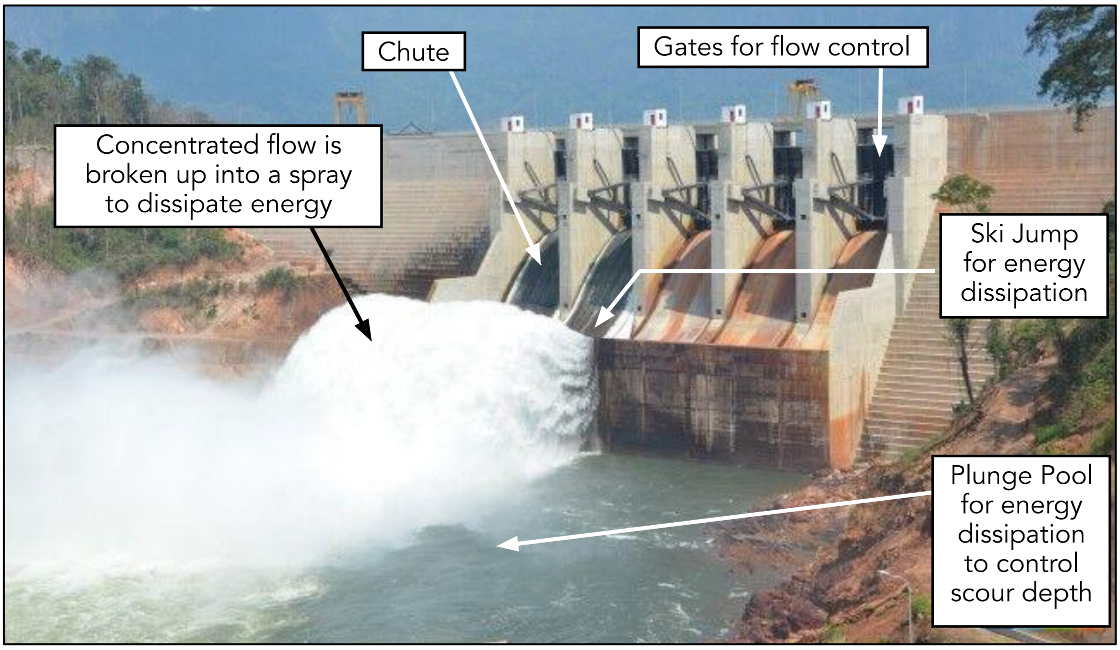

Figure 4.19 - Main spillway elements at Nam Gnoung dam, Lao PDR[378]

4.97. A single dam can have multiple spillways, with service spillways designed for frequent use and auxiliary spillways used only for extraordinary floods that exceed the service spillway capacity, or for infrequent events (e.g., if the service spillway has one or more gates out of service for maintenance or due to a failure).

(a) Types of Spillways

4.98. Spillways can be categorised into different types, dependent upon their design characteristics, namely:

(a) Service versus auxiliary spillways;

(b) Surface versus submerged spillways; and

(c) Uncontrolled or free overflow spillways versus gated spillways.

4.99. So far as the first distinction is concerned, service spillways are spillways which are expected to be used frequently, whilst auxiliary spillways (sometimes called emergency spillways) are intended for rare use in the event of an extreme flood. Many dams use only service spillways, sizing these to handle the full flow of the design flood.

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[378] Photograph is available at: https://www.atb.group/en/group/projects/hme/2012-theun-hinboun-expansion-project.html (last accessed 18 March 2024).

4.100. The second distinction is between submerged or orifice spillways (which are always gated) and crest or surface spillways (which may be gated or ungated). As explained in the overview of the spillways for dams provided in ICOLD Bulletin 58:

> "It is customary to classify spillways in two main categories on the basis of the position of the inlet with respect to the full supply level in the reservoir, i.e. surface spillways, the most widespread type, whose salient feature is that surplus inflows is drawn off with only a very slight rise in water level, and submerged or orifice spillways set well below full supply level, sometimes further subdivided into orifice spillways at around mid-depth, and bottom outlets".[379]

4.101. Both orifice and crest spillway types are illustrated by the three examples given in **Figure 4.20** below. A crest or surface spillway can have either a free overflow or it can incorporate a control structure with gates, as shown in **Figure 4.20 (b)** and **(c)** below.

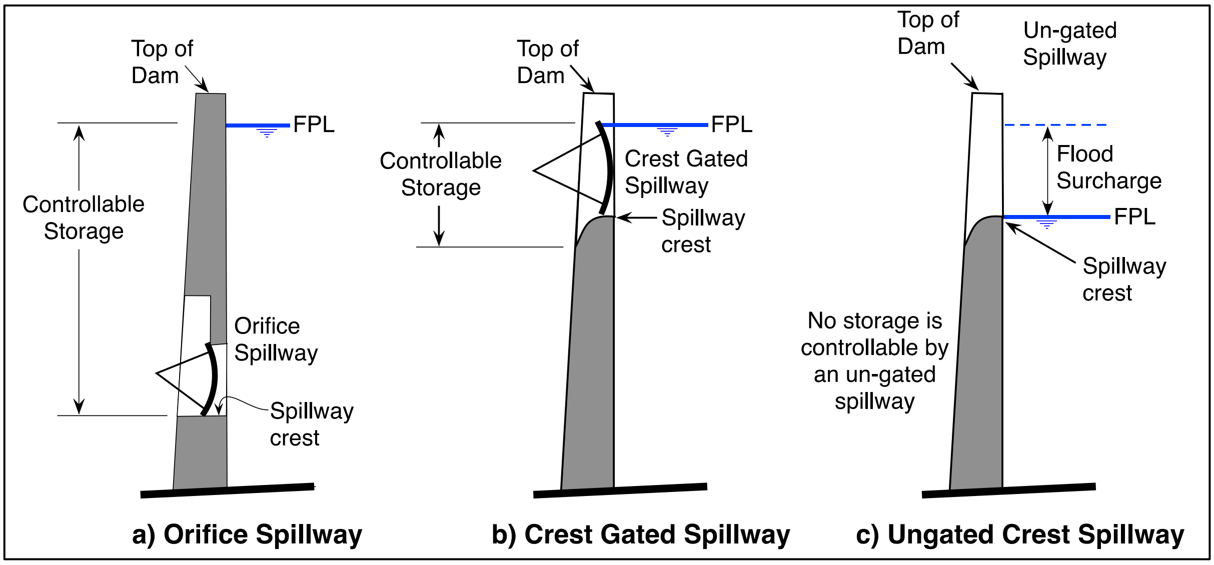

Figure 4.20 - Orifice versus crest gated and ungated spillways

4.102. Multiple types of spillways may be used on a single dam. Several types of spillways in operation at a single dam can be seen in the photograph included at **Figure 4.21** below.

[379] ICOLD, "Bulletin 58", *Spillways for Dams*, 1987, **Exhibit P-0314**, § 2.1.

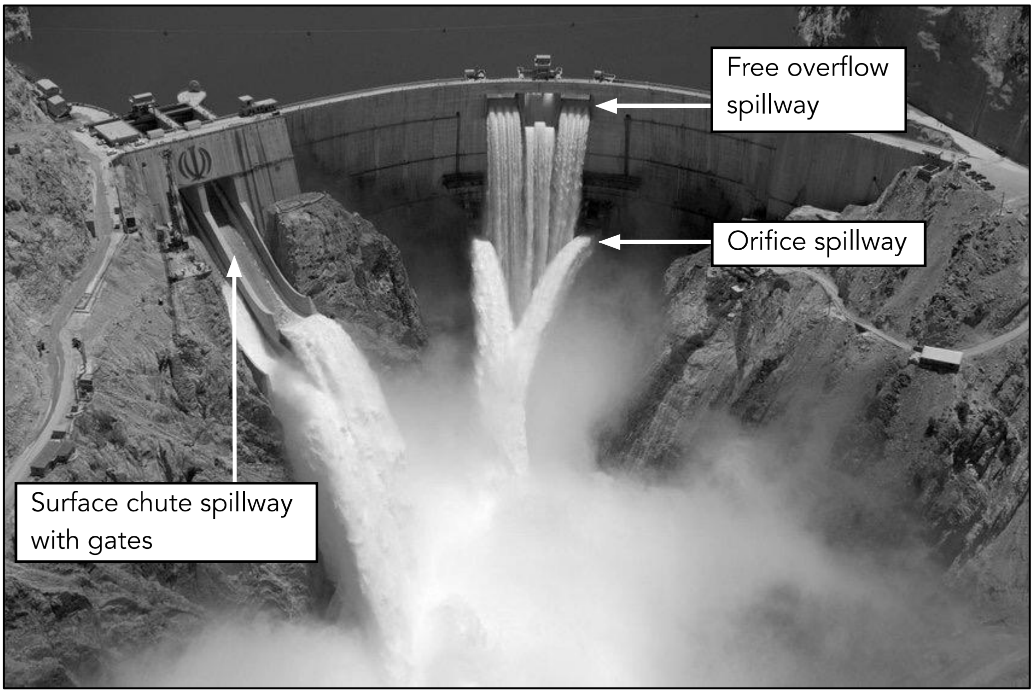

Figure 4.21 - Spillway at Karun III dam, Iran[380]

4.103. A free overflow (crest) spillway consists of an ungated (i.e., unregulated) overflow weir set at the full reservoir (pondage) level. The flood inflow is released downstream over the spillway as the water level rises over the crest of the dam. With a free overflow spillway, as the flood flow increases, the depth of water upstream of the weir also increases, and this increase in water level over the crest is referred to as **flood surcharge**. This spillway type is illustrated below in **Figure 4.22 (a)**. The free overflow spillway lacks gates, and therefore the flow rate over the spillway is not regulated by the dam operator. The spillway discharge will reflect the flow rate of the incoming flood and the subsequent drainage of the floodwaters across the weir and out of the reservoir. An important advantage of a free overflow spillway is its high reliability because it does not depend on the operation of gates, which may experience mechanical failure or be subject to operator error. However, as a disadvantage, for the purposes of *ordinary* design (i.e., absent considerations of what is provided in the Treaty), the flood surcharge pool cannot be used beneficially either to store water or to increase head for power generation.

[380] Photograph is available at: https://www.researchgate.net/figure/Spillage-at-Karun-III-dam-in-Iran-example-of-simultaneous-use-of-different-jet_fig1_272173753 (last accessed 18 March 2024).

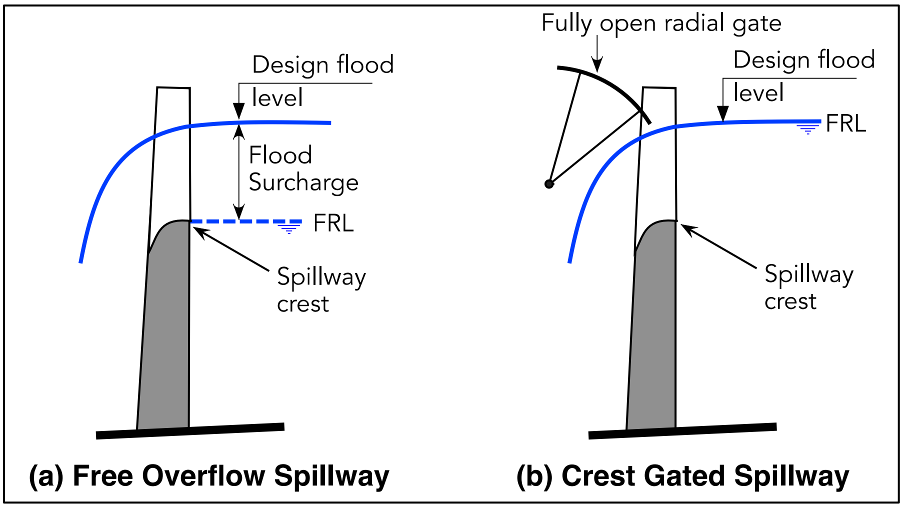

Figure 4.22 - Conceptual comparison of free-overflow and crest-gated spillways and their relationship to the Full Reservoir Level (FRL)

4.104. By contrast, and again absent consideration of the restrictions set out in the Treaty, by placing gates on the spillway crest it is possible to beneficially use the capacity and head that would otherwise be associated with the uncontrolled flood surcharge pool. The gates allow the reservoir's operational level to be raised above that which would occur with a free overflow spillway, opening the gates to release floods without raising the maximum flood level. Thus, a gated spillway allows the water level to be held at a higher level during normal periods, increasing the available head and thus also power production. The gates are used to control the rate of flow over the spillway, and when the gates are fully open the spillway operates in the same way as a free overflow spillway. In this manner the installation of crest gates can allow for the beneficial utilisation of a flood surcharge pool.

4.105. As shown in **Figure 4.20 (a)** above, orifice spillways are located below the reservoir surface. Being continuously submerged, an orifice spillway will always require gates and will always be pressurised. Deeper spillways will increase the water pressure on the gates thus requiring more robust and costly construction. Orifice spillways may be needed in narrow canyons which do not provide enough space to make it practical to accommodate the full design flood discharge using an elongated surface spillway. Orifice spillways can also be used for sediment management or for sediment flushing and sluicing. An example of this is Xiaolangdi

Dam in China, where orifice spillways have been used to release turbid density currents from the bottom of the reservoir.[381]

4.106. Free flow crest spillways and orifice spillways have important differences in their hydraulic behaviour. Under free-flow conditions, a small increase in reservoir water level will greatly increase the discharge rate, thus providing good protection against overtopping the dam in the case of larger-than-design flows or failure of some gates to open. In contrast, for orifice spillways, an increase in reservoir level above the design level will produce a relatively small increase in the orifice spillway discharge. This can make a dam fitted with orifice spillways more susceptible to overtopping as compared to a dam with free overflow spillways when the design flow of spillway outlets is exceeded owing to a larger-than-design flood or owing to failure of one or more gates to operate.

4.107. All forms of spillway require a form of energy dissipation structure to be constructed immediately downstream of the dam to prevent the jet of water from spillway releases from eroding the riverbed and undermining the dam. The precise type of structure will vary depending on the type of spillway used as well as the topographical and geotechnical conditions at the site.

(b) Spillway design considerations

4.108. Spillway design is a multi-disciplinary process, requiring consideration—on any given site—of hydrological, hydraulic, sedimentological, geotechnical and structural design factors, together with consideration of the operational and maintenance requirements of the HEP. The result is a process of design optimisation which should be achieved through comparative analysis of different viable options developed by reference to spillway location, type and size options relevant to the flood characteristics of the site.

4.109. In summary, and absent any specific design constraints, such as those agreed in the Treaty, the factors which are *ordinarily* to be included when designing a spillway include:

[381] Y. Wang and others, "Theory and Practice of Water and Sediment Regulation in Flood Season of Yellow River in 2018" (2018) MATEC Web of Conferences 246, available at: https://www.iahr.org/library/infor?pid=20298 (last accessed 18 March 2024), **Exhibit P-0315**; S. T. P. Hsu, "Conversion of Diversion Tunnels to Bottom Outlets at Xiaolangdi Dam on Yellow River" (2017) 2nd International Workshop on Sediment Bypass Tunnels, Kyoto, Japan, available at: https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/245488/1/2017SBT_FP4.pdf (last accessed 18 March 2024), **Exhibit P-0316**.

(a) Flow rates and flood flow rates (including the magnitude of the design flood);

(b) Reservoir and river channel topography;

(c) Dam type (concrete vs. earthen) and layout (including dam height);

(d) Foundation and abutment geology;

(e) River channel geology;

(f) The space available for the placement of spillways;

(g) Reliability of gate maintenance and operation;

(h) Management of sediment and floating debris;

(i) The geometry of the dam and spillways in relation to the Power Intake; and

(j) The power station location and characteristics.

4.110. The design process for a spillway will ordinarily begin by establishing the reservoir inflow design flood for which the design is to be prepared (e.g., the largest flood that can be expected over a 10,000-year period, or the **Probable Maximum Flood** determined by some alternative methodology). Criteria for the selection of design floods are well established as between dam construction specialists and general guidelines for dam safety are set out in ICOLD Bulletin 59.[382] More specific guidelines may also be developed at the national level. A summary of some of these is found in ICOLD Bulletin 167.[383]

4.111. No published design guidelines mandate either (i) the type of spillway which should be specified, or (ii) how the position or size of an outlet should be determined, because the design process is heavily influenced by a variety of site-specific conditions. Accordingly, the design process is an iterative one. The identification of the preferred configuration to pass the design flood will require several conceptual designs depicting a variety of spillway configurations and sizes, in different proposed locations. It will incorporate multi-disciplinary design approach considering factors such as those listed in **paragraph 4.109** above.

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[382] ICOLD, "Bulletin 59", *Dam Safety Guidelines*, 1987, **Exhibit P-0317**.

[383] ICOLD, "Bulletin 167", *Regulation of Dam Safety: An Overview of Current Practice World Wide*, Preprint 2023, **Exhibit P-0318**.

4.112. For gated spillways, the potential for an out-of-service gate owing to mechanical failure or maintenance must be considered in the design. Specifically, one of the spillway gates may be unavailable owing to ongoing repairs or operational failures during a flood. This condition can be incorporated into the design by sizing the spillway to pass the design flood with one (or more) gates out of service.

4.113. Any spillway designer needs to have due regard to the topographical and geological conditions on banks of the reservoir and of any receiving watercourse. The conditions in a particular location can render certain types of spillways unsuitable, or sub-optimal, from an engineering perspective.

4.114. Geotechnical conditions in particular will have a significant impact on the selection of the dam type (i.e. concrete vs. embankment dam). This is because the required design flood magnitude will govern the spillway capacity and its potential arrangement with the selected dam type at the site.

4.115. A material factor in spillway design is dam type—and, in particular, whether the designer has selected a **concrete dam** or an **embankment dam**. An embankment dam uses locally available materials (soil, sand, clay and rock) to form a structurally stable and impervious retaining structure behind which sits the reservoir. Spillways are not normally placed over or through an embankment dam on account of the inherent risks of differential settlement (where one part of a structure settles faster than another), and leakage or cracking which can result in erosion of the dam, potentially resulting in catastrophic failure of the dam's embankment. For this reason, embankment dams usually incorporate chute spillways located on an abutment, spillways with a tunnel outlet, or a separate concrete monolith spillway founded on bedrock that incorporates free overflow or gated spillway sections.

4.116. **Concrete dams** may be designed in a variety of configurations. A concrete gravity dam is an immense concrete structure that relies on gravity to resist the horizontal pressure of the reservoir behind it. A concrete arch dam is a thin shell structure that relies on the structural strength of the concrete to transfer water pressures into the abutments. Because concrete is not susceptible to erosion, as in the case of an embankment dam, all types of spillway can, in theory, be safely incorporated into concrete dam structures, including free overflow, crest gated and orifice spillways.

4.117. Site spatial restrictions also impact spillway design. In very narrow locations where the dam is not long enough to accommodate the required spillway dimension, the spillways may be designed to pass over a side-channel spillway leading to a chute or a tunnel through the abutments. For instance, **Figure 4.23** below is an example of a side-channel spillway being used to provide a much longer crest length by extending the spillway along the side of the reservoir before entering a tunnel.

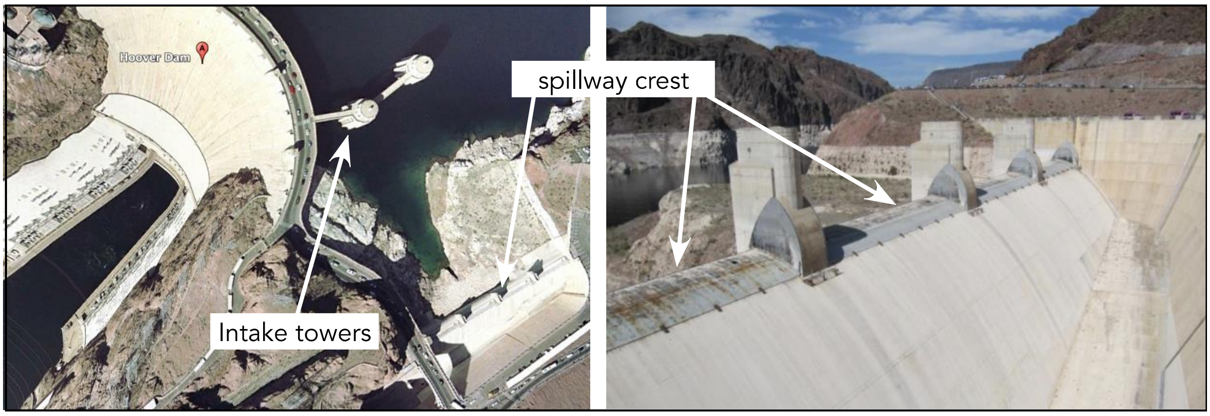

Figure 4.23 - Hoover dam, USA, showing free overflow side-channel spillway, which are provided on both sides of the dam[384]

4.118. Other spillway alternatives, shown in **Figure 4.24** below, provide an effective crest length that is longer than the straight crest used for a conventional free overflow. Spillway crest elongation using both labyrinth and piano key configurations are shown. Flow rates are greatly enhanced at relatively shallow depths over these weir types, but with deep submergence they lose their advantage.

[384] Photograph on the left was captured using the Google Earth Engine, and photograph on the right was taken by Mr Peter Rae on 21 May 2023.

Figure 4.24 - Examples of Labyrinth and Piano Key spillways[385]

4.119. The option of installing crest gates on a spillway to allow free flow over a concrete gravity dam is illustrated in **Figure 4.25**.

Figure 4.25 - Free-surface spillway with 10-metre-tall radial gates on the crest (Loíza, Puerto Rico, USA)[386]

4D.5 Freeboard

4.120. Optimisation of a spillway also considers freeboard requirements. A reservoir's **freeboard** is the vertical distance between the water level and the lowest portion of the dam wall not designed for overflow. Freeboard provides a margin above the full supply level in the reservoir that accommodates the effects of waves created by winds, flood surcharge for

[385] Photograph on the left taken by Dr Gregory Morris on 19 April 2017, and photograph on the right is available at: https://www.hydropower.org/blog/climate-resilience-case-study-piano-key-weirs (last accessed 18 March 2024).
[386] Photograph taken by Dr Gregory Morris on 2 August 2020.

optimisation of spillways, potential failure of some gates to open, partial spillway blockage by debris, and other potential risk events.

4.121. Freeboard determined based on the "normal" or full pondage level, may be termed the **normal freeboard**, whereas the vertical elevation distance between the design flood level and the top of the dam may be termed the **minimum freeboard**, as illustrated in **Figure 4.26 (a)** below. In the case of gated spillways sized to discharge the full design flood without any flood surcharge above the full reservoir level, as illustrated in **Figures 4.26 (b)** and **(c)** below, the normal and minimum freeboard will be identical.

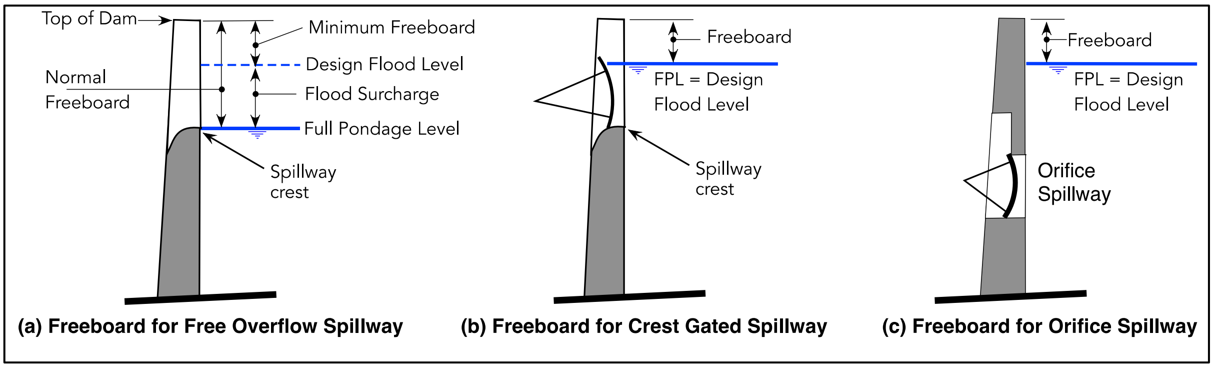

Figure 4.26 - Illustration of freeboard arrangements

4.122. Freeboard provides for flood surcharge plus additional height (the minimum freeboard) to prevent waves from overtopping the dam under specified flood and wind conditions, thereby reducing the risk of damage or dam failure. Because earthen dams are more susceptible to catastrophic erosion and failure due to overtopping, freeboard requirements for earthen dams are characteristically greater than for concrete dams, which are far less prone to catastrophic failure by overtopping.

4.123. An incidental by-product of freeboard is that it can provide additional storage capacity above the normal full reservoir level if: (a) spillway crest gates are heightened, or (b) by modifying the gate operating procedures for orifice spillways to specify that the water should be held at a higher level within the reservoir. The ability to operationally modify the maximum water level in a reservoir with orifice spillways, and lacking a complementary crest spillway to force overflow at the full reservoir level, can be appreciated in **Figure 4.26 (c)**. In that case, the operator could simply be instructed to raise the normal reservoir level higher against the dam, thereby increasing storage.

4.124. Design of a HEP's freeboard therefore *ordinarily* involves: (i) classifying a dam by reference to the foreseeable consequences of dam failure (i.e. concrete vs. embankment dam); (ii) the identification of potential site-specific sources of wave overtopping (e.g. wind velocity and fetch); and (iii) assessing the manner that these parameters should be combined to define suitable freeboard allowances. The design of a HEP's freeboard therefore requires consideration of:

(a) The inflow design flood;

(b) Potential wave height—determined by wind characteristics, and the shape and length of the reservoir which determines the fetch length;

(c) Earthquake and/or landslide potential which could cause a displacement wave;

(d) The reliability and type of spillway incorporated into the design; and

(e) The type of dam: For embankment dams, the risk of dam collapse owing to overtopping must be taken into account and the freeboard of such dams should be sufficient to avoid dam overtopping for 95% of waves under specified conditions. This is different from concrete dams where wave overtopping will not normally impact the safety of the structure.

4E SEDIMENT MANAGEMENT AT A HEP

4E.1 The importance of sediment management

4.125. Sediment management imposes important challenges for the design and operation of a HEP, with two types of problems being particularly relevant: (i) sediment accumulation in the reservoir which displaces storage capacity; and (ii) high sediment concentrations (especially sands) which, when reaching the turbines, cause abrasion damage with a resultant loss in efficiency and requiring repeated repair. The former is relevant for HEPs with significant storage facilities or pondage; the latter is particularly relevant for HEPs with limited or no storage, especially Run-of-River plants.

4.126. Sediment management is an inherent part of the HEP's design, and necessary for a sustainable hydropower project to be constructed and operationalised.

4.127. One of the most significant implications of sediment for a HEP is turbine abrasion if sediment is permitted to enter the intake. The rate of abrasion on a turbine and other hydraulic equipment increases as the head increases. For example, the rate of abrasion on a turbine operating at 800 metres of head will be much faster than a turbine operating at only 50 metres of head.

4.128. The rate of turbine abrasion also increases with grain size. Sand particles are much more abrasive than smaller silt particles because, being larger, sand particles have more momentum and strike the runner blades with greater force. Sand particles larger than approximately 0.2 to 0.4 mm are particularly damaging.

4.129. Himalayan rivers carry a higher content of silica sand compared to most other rivers, as illustrated in the photograph at **Figure 4.27** below, which shows the high proportion of silica (light-colour grains) and their high angularity. Both factors enhance abrasiveness. Silica is a mineral that is much harder than steel and it will abrade turbines, and if the sand grains are angular (instead of rounded) this will further enhance particle abrasiveness.

Figure 4.27 - Sand typical of Himalayan rivers

4E.2 Methods for the minimisation of sediment impact on storage

4.130. A storage reservoir acts as an efficient sediment trap, especially for sand. As streamflow enters the reservoir the flow velocity diminishes, thereby losing its capacity to transport sediment, allowing the sediment to fall to the bottom and become trapped in the reservoir. Storage reservoirs are normally sized to accommodate many decades of sediment accumulation. This allows them to be designed with deep intakes as there is little danger of sand being drawn into the intakes during the initial decades of project operation. However, to sustain long-term operation, storage plants may require costly future modifications when sediments do begin to impinge on the intakes and active sediment management becomes an operational requirement.

4.131. By comparison, in Run-of-River HEPs there is little or no volumetric capacity available for sediment storage and the available storage can quickly become filled with sediments. As a result, the HEP designer must provide a sustainable long-term sediment management solution at the intake as part of the initial project design.

4.132. A wide range of options are available for managing sediment. Potential management techniques are classified in **Figure 4.28** below. Some techniques will be better suited than others at a given project site, and multiple strategies may need to be employed simultaneously. The most appropriate strategies may also change over time as sedimentation progresses, and different strategies may be required for sustaining reservoir storage versus minimising the sediment load on the turbines.

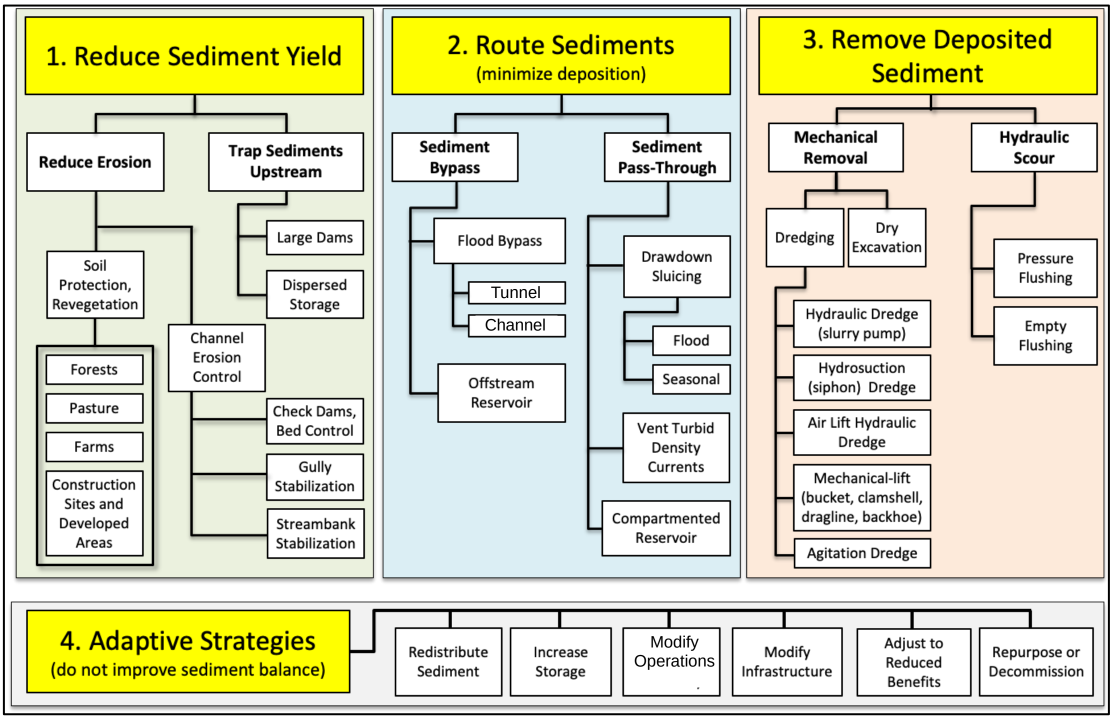

Figure 4.28 - Classification of sediment management techniques for reservoirs and HEPs[387]

4.133. For Himalayan HEP projects, and absent any design restrictions such as those established by Treaty, techniques that are potentially useful for sustaining reservoir capacity

[387] G. L. Morris, "Classification of Management Alternatives to Combat Reservoir Sedimentation", *Water* (12(3)), 19 March 2020, **Exhibit P-0319**, p. 861.

include: sediment bypass tunnels, drawdown sluicing (i.e., drawdown to the minimum operating level during the entire monsoon or during the largest floods), reservoir emptying and flushing, dredging with discharge to the river below the dam, construction of off-stream pondage storage, and venting of turbid density currents. Further measures to minimise turbine abrasion can include adaptive strategies such as optimisation of the intake configuration, construction of a settling basin, application of abrasion-resistant coatings to turbine runners, and adoption of sediment-guided operational rules.

4.134. Some of the key elements of strategies to sustain long-term storage capacity are summarised in the below table, together with their operational consequences.

Strategy	Key elements	Operational Consequences
Sluicing	Large capacity gates are incorporated that allow reservoir drawdown to the minimum operational level during large floods or the full monsoon season, passing sediment-laden flows through the reservoir with minimum sediment trapping. The reservoir may be held at the minimum operating level during the full flood season to prevent sedimentation in the pondage pool.	This is an environmentally friendly strategy; it focuses on passing sediment-laden floods through the reservoir and into the downstream river according to the natural occurrence of these floods and without creating excessive sediment concentrations in the river below the dam.

Strategy	Key elements	Operational Consequences
Flushing	Low level outlets are incorporated that allow emptying of the reservoir to pass small floods that can scour sediments from the reservoir and carry them into the river below the dam. This methodology is only technically feasible at reservoirs small enough to be readily refilled after being emptied.	This strategy can produce adverse consequences downstream because it can produce high sediment concentration that injures aquatic life, impairs water quality for downstream users, and increases sedimentation in the river channel and in irrigation intakes and canals. Impacts can be mitigated by closely controlling the timing and execution of flushing.
Bypass tunnel	An intake is constructed in the reservoir a significant distance upstream of the dam. The intake captures sediment-laden flows and diverts them via a tunnel to a point downstream of the dam, thereby reducing sediment load on the intake and enhancing sediment capture between the bypass intake and the Power Intake. This technique may be combined with another strategy, such as flushing, to achieve complete control of sedimentation. Bypass may be incorporated into the original design or as a retrofit for an existing reservoir.	On its own, this is an environmentally friendly strategy because it passes the flood downstream of the dam with a minimal alteration to the flow rate or sediment concentration. However, if combined with flushing, the adverse consequences of flushing will need to be considered and mitigated.

Strategy	**Key elements**	**Operational Consequences**
Vent turbid density currents	A low-level outlet or turbidity siphon is used to release bottom-hugging turbidity currents comprised of fine sediments.	This is an environmentally friendly technique that passes inflowing fine sediment downstream according to the natural occurrence of these events along the river. However, this strategy can pass only a limited fraction of the inflowing sediment.
Off-stream storage	If topography permits, the reservoir's pondage capacity can be located outside of the main river channel, receiving water via a river intake. However, this strategy is only feasible when specific topographic features are available.	This can be a highly effective strategy in the Himalayan environment, leaving the off-stream pondage empty during the monsoon, and operating the pondage pool only during the dry season using water that is largely free of sediment. It does not alter the natural pattern of sediment transport along the river.

Strategy	**Key elements**	**Operational Consequences**
Dredging	Dredging mechanically removes sediment from the reservoir. It is a costly strategy and financial feasibility will depend on the value of storage. Where a HEP incorporates pondage, this is a more financially viable option because pondage can be emptied and filled many times a year, generating economic benefits during each cycle. Environmental regulations should permit discharge of sediment to the river below the dam so that dredging can restore the natural path of sediment transport along the river.	Although costly, this strategy does not interfere with hydropower operations, unlike strategies like flushing that require power production to be halted. Environmental impacts will depend on the manner that the sediments are delivered to the river below the dam. In Himalayan environments the disposal of dredged sediments to an upland disposal area is not feasible in the long run owing to the massive volumes of sediment involved and lack of disposal sites.

4E.3 Minimising sediment damage to hydropower equipment

4.135. A second important aspect of sediment management for a HEP, and of particular importance for Run-of-River plants, is to minimise the sediment load on the turbines to minimise abrasion damage. This can be addressed through a variety of strategies, which can be used simultaneously in a complementary manner. Strategies to reduce abrasion damage should be considered in combination with the strategies to sustain long-term storage, since there are opportunities for both strategies to function in a synergistic manner.

4.136. Several commonly used approaches to minimise the sediment impacts on the turbines are briefly summarised below:

Strategy	Key Elements	Implementation Considerations
Optimise intake configuration	Locate and configure the intake to minimise the entrainment of sandy sediment. This design should consider the operating requirements when sediments reach the dam, and the reservoir achieves a balance between sediment inflow and outflow.	While normally an integral part of the original design, existing intakes can also be structurally modified to better manage existing or anticipated sediment problems.
Construct a sedimentation basin	Pass diverted water through a sedimentation basin to settle out highly abrasive sand and prevent it from reaching the turbines.	Needs to be part of the original design; rarely a viable retrofit option.
Sediment bypass tunnel (SBT) with sedimentation headpond	By diverting flows in excess of the turbine capacity via a sediment bypass tunnel (SBT), the sediment trapping efficiency in the reservoir between the SBT intake and the Power Intake is enhanced. This reduces the sediment concentration in the water entering the Power Intake.	This may form part of an original design, but there are an increasing number of examples where bypass tunnels are being installed as retrofits to manage sediment problems.

Strategy	**Key Elements**	**Implementation Considerations**
Abrasion-resistant coatings	Coat various components of the turbine with an abrasion-resistant material such as tungsten carbide, an extremely hard ceramic. These coatings will retard, but not eliminate, abrasion damage. Coatings will need to be re-applied at annual or longer intervals, depending on the rate of abrasion.	May be specified in the original design or applied as an adaptive measure after the plant is in operation.
Turbine re-design	Turbine configurations can be modified to reduce sediment damage or facilitate repair. This will include specification of appropriate machinery during the design phase, or the re-design of turbines for an existing plant to reduce abrasion damage.	Normally included in the original design, but in some cases existing turbines can be replaced with re-designed units.
Sediment-guided operation	Reduce power or shut down the plant when challenged by extreme sediment loads during floods. Do not operate plants when the damage by sediment will exceed the value of power production.	Monitor upstream sediment concentration to optimise this operation. Requires coordination with the power dispatcher.

4.137. In some cases, an economical solution may be simply to accept the abrasion damage, as the cost of turbine repair plus the cost of lost power due to the reduced efficiency of the abrasion-deformed turbine runner may be less than the combined cost of other abrasion mitigation alternatives. This is particularly true in the Himalayan environment, where most power is produced during the monsoon when river flow can greatly exceed plant capacity, allowing the operator to offset the decline in runner efficiency by passing more water through the turbine to maintain power production.

4.138. In summary, a variety of strategies can be used to manage sediment in HEPs, and more than one of the strategies appropriate to a particular plant site may be employed simultaneously to achieve a sustainable and economically viable solution.

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CHAPTER 5: INDIA'S HYDROPOWER PROGRAMME ON THE WESTERN RIVERS AND ITS IMPACT

5.1. The purpose of this Chapter is to provide details of India's wider programme of HEP construction on the Western Rivers to contextualise Pakistan's systemic concerns about the consequences of India's approach to the interpretation and application of the Treaty.

5.2. By way of overview, Pakistan has collated information on India's programme of HEP construction in three tables, at **Appendix C1**, one for each of the Indus, Jhelum and Chenab Rivers and their respective Tributaries. Each table reflects Pakistan's understanding of India's HEP programme for the river systems in question in three categories:

(a) Completed projects, namely, projects which have been officially notified to Pakistan under Paragraph 9 of Annexure D (for Run-of-River Plants), Paragraph 19 of Annexure D (for Small Plants), or Paragraph 12 of Annexure E (for Storage Works), as appropriate, **and which are now in operation**.

(b) Under Construction projects, namely, projects that have been notified to Pakistan under the appropriate provision of Annexures D or E but in respect of which **India has not confirmed their entry into operation**, officially or otherwise.

(c) Planned projects, namely, projects that have not been formally notified to Pakistan by India under Annexures D or E but of which **Pakistan has become aware**, including as regards aspects of their design, through publicly available materials.[388]

5.3. If India's HEP construction programme is carried out in full it would result in a network of **201 Indian HEPs** on the Western Rivers. Although Pakistan's understanding of India's Planned projects (in particular) is incomplete, nearly all of India's proposed Plants appear to be Run-of-River HEPs subject to the provisions of Part 3 of Annexure D of the Treaty. The only confirmed Storage Work is the 1,500 MW Pakul Dul HEP, currently Under Construction in the Chenab Basin, which is subject to Annexure E. However, Pakistan also believes that

[388] Paragraph 9 of Annexure D and Paragraph 12 of Annexure E require that India notify Pakistan of (respectively) any proposed Run-of-River HEP or any Storage Work no less than six months prior to construction commencing. Paragraph 18 of Annexure D requires India to notify Pakistan of any Small Plant no less than two months prior to construction commencing. On India's information-sharing obligations, *see* **Chapters 6**, **7** and **9**.

India has Storage Works Planned elsewhere on the Chenab, including Bursar I and II (1,230 MW) and Gypsa-I and II (240 MW). It is also aware of two smaller Storage Works Planned in the Jhelum Basin, at Gangabal Lake (100 MW) and Sonarmarg (165 MW).

5.4. **Appendix C2** includes three maps prepared by Pakistan, one for each river system, showing each of these projects and their location, insofar as Pakistan has been able to do so on the basis of the available data.

5.5. This Chapter addresses the information set out in these Appendices under the following sub-headings:

(a) In **Section A**, Pakistan sets out the pre-Treaty HEPs that India still has operating on the Western Rivers which are subject to a more limited regulatory regime than post-Treaty HEPs under Part 2 of Annexure D.

(b) In **Section B**, Pakistan sets out, on a Basin-by-Basin basis, each Indian HEP on the Western Rivers of which Pakistan is aware, divided into Completed, Under Construction and Planned categories, subject to Part 3 of Annexure D or Annexure E.

(c) In **Section C**, Pakistan addresses the relevance of India's wider HEP construction programme to the dispute before the Court and how it has influenced Pakistan's approach to these proceedings.

5A PRE-TREATY HEPS

5.6. The Treaty, by its terms, does not overtly regulate every Indian HEP on the Western Rivers. Pursuant to Paragraph 3 of Annexure D, Indian HEPs in operation prior to the Treaty's Effective Date of 1 April 1960 can operate unrestrained. Paragraph 4 of Annexure D does the same in respect of HEPs that were under construction on 1 April 1960, irrespective of whether they were in partial operation at that time. This said, pursuant to Paragraphs 6 and 7 of Annexure D, India cannot subsequently modify any of these HEPs in a way that materially departs from Paragraphs 8 or 18 of Annexure D, or Paragraph 11 of Annexure E, as appropriate. In other words, any significant alteration of any of the HEPs that were grandfathered under Annexures D or E at the point at which the Treaty was concluded would render them subject to regulation.

5.7. Pursuant to Paragraphs 3 and 4 of Annexure D, 14 Indian HEPs were grandfathered. These were (and are) relatively small Plants—the largest, Ganderbal in the Jhelum Basin, had (and has) an installed capacity of 15 MW, some 22 times smaller than the 330 MW KHEP, which is itself less than half the size of the 850 MW RHEP. All of these Plants are Run-of-River HEPs. Following the destruction of two of these HEPs due to flooding,[389] and the modification of three more,[390] only nine pre-Treaty HEPs remain, as follows:

(a) Bandipura (30 KW); Dachhigam (40 KW); Kupwara (150 KW); Ganderbal (15 MW); and Poonch (160 KW) – each in the Jhelum Basin;

(b) Chinani (14 MW); Nichalani Banihal (600 KW); Ranbir Canal (1.2 MW); and Udhampur (640 KW) – each in the Chenab Basin.

5.8. These Plants aside, all other Indian HEPs on the Western Rivers are subject to the provisions of either Annexure D or Annexure E of the Treaty.

5B POST-TREATY HEPS

5.9. Beyond the pre-Treaty HEPs noted above, India has undertaken HEP construction in each of the three Western River systems since the Treaty was concluded. The analysis shows moderate construction for the first half century of the Treaty's life, followed by an explosion of recent activity.

5B.1 The Indus[391]

5.10. Historically, India has exploited the Indus[392] less than the other two Western Rivers, as the river flows through the most mountainous parts of Kashmir, and is difficult to access. This remains true today. As of the date of this Memorial, India has Completed only 16 HEPs on this river system. These have tended to be relatively small Plants. Many of them—e.g., Bazgo (0.3 MW), Dumkhar (0.5 MW) and Hunder Nobra (0.4 MW)—have installed capacities of less

[389] Being Mahora (12 MW) in the Jhelum Basin, and Kishtwar (350 KW) in the Chenab Basin.
[390] Being Pahalgam (previously 186 KW, now 4.5 MW) in the Jhelum Basin; and Badarwah (previously 600 KW, now 1.5 MW) and Rajouri (previously 650 KW, now 3 MW) in the Chenab Basin.
[391] The analysis in this section is based on information set out in **Appendix C1**, **Section A**.
[392] By which Pakistan means the main stem of the Indus, including Connecting Lakes, and its Tributaries per Article I(3) of the Treaty. The same definitional concepts are applied to the Jhelum and Chenab in **Chapters 5B.2** and **5B.3** below.

than 1MW and no storage. The largest, Nimo Bazgo, has an installed capacity of 45 MW with 42,814 acre-feet[393] ("**AF**") of storage, 7,880 AF of which is Live Storage.

5.11. The same cannot be said of India's newer projects on the Indus. Since late 2012, India has notified Pakistan of 27 HEPs that are presently Under Construction. While some of these—e.g., Bogdang (0.8 MW), Chamshen (0.45 MW) and Henache (0.6 MW)—follow the previous model of a small (<1 MW) installed capacity and no or only negligible storage, others are more ambitious. Magdum Sangra has an installed capacity of 19 MW with 932 AF of storage. Nimu Chilling has an installed capacity of 24 MW, with 697 AF of storage. And Durbuk Shyok has an installed capacity of 19 MW, with 202 AF of storage.

5.12. Again, these HEPs are comparatively modest by comparison to what is taking place in the Jhelum and Chenab. But from what Pakistan can glean from publicly available sources, India has much larger HEPs planned for the Indus River. It is aware, for example, of 20 HEPs that fall into this category, including Achinathang-Sanjak (220 MW), Drass Shingo (107 MW) and Sunit (295 MW). The planned storage of these projects is unknown, but given their installed capacity, India almost certainly intends to include sizable Dead and Live Storage in each to increase their power generation potential.

5.13. The bottom line is that, from the available record, India aims to build up to 63 HEPs on the Indus. This includes 16 Completed projects, with 27 Under Construction and 20 Planned. The Completed projects have an installed capacity of 120.5 MW, the Under Construction projects are slated to have an installed capacity of 136.8 MW, and the Planned projects are scheduled to have an installed capacity of 1,240 MW. This would give India a total generating capacity of 1,497.3 MW and a gross storage capacity of 45,699 AF—with both numbers likely to increase as more information about India's Planned projects comes to light.

5B.2 The Jhelum[394]

5.14. The Jhelum is more accessible than the Indus and so has attracted greater attention from India from an HEP development perspective. At present, India has completed 19 HEPs on the Jhelum—a comparable number to the Indus, but on a far larger scale. The largest current Plant

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[393] Acre-feet are the standard measuring unit for storage under Paragraph 7 of Annexure E, regulating India's capacity to construct Storage Works. One AF of water equals approximately 1,233.5 m^3. One million m^3 equals 810.71 AF.

[394] The analysis in this section is based on information set out in **Appendix C1**, **Section B**.

is Uri-I, a 480 MW HEP with a storage capacity of 292 AF. Its capacities are supplemented by the 240 MW Uri-II, designed to work in tandem with the Uri-I, and provide an additional 5,144 AF of storage capacity. Also significant is the KHEP, a 330 MW HEP with 14,881 AF of storage capacity, 6,123 AF of it Live Storage. Rounding out the larger Completed HEPs on the Jhelum is Lower Jhelum, a 105 MW HEP with 1,045 AF of storage capacity, 780 AF of it Live Storage.

5.15. India also has several projects that are currently Under Construction on the Jhelum. Pakistan is aware of 9 HEPs that fall into this category, the most significant of which is New Ganderabal, a 93 MW HEP with 121.7 AF of storage capacity, 81.1 AF of which is Live Storage. With the exception of one of these, the 37.5 MW Parnai, all projects currently Under Construction by India on the Jhelum were notified to Pakistan between 2011 and 2021.

5.16. Finally, India has 36 HEPs that are Planned for the Jhelum. These are, in the large part, relatively small—the largest being the proposed HEPs at Shutkari Kullan (84 MW) and Lidder-I and Lidder-II (50 MW and 45 MW, respectively). Again, the storage available to India at these HEPs is currently unknown, but given their installed capacities, India likely intends to include Dead and Live Storage in each.

5.17. As with the Indus, therefore, the available record indicates that India proposes to construct 64 HEPs on the Jhelum. This includes 19 Completed HEPs, with 9 presently Under Construction and 36 Planned. The Completed projects have an installed capacity of 1,333.2 MW, the Under Construction projects are slated to have an installed capacity of 212.1 MW, and the Planned projects are scheduled to have an installed capacity of 678 MW. This would give India a total generating capacity of 2,223.3 MW and a gross storage capacity of 22,076 AF—although, again, both will increase as more information about India's Planned projects (and, specifically, the generating capacity and storage associated with each) comes to light.

5B.3 The Chenab[395]

5.18. India's plans with respect to the Indus and Jhelum pale in comparison to what it has planned for the Chenab. The Chenab has always been favoured by India for its largest hydropower projects. India has Completed 17 HEPs on the Chenab to date. Again, this is

[395] The analysis in this section is based on information set out in **Appendix C1**, **Section C**.

broadly consistent with the number of HEPs India has constructed elsewhere on the Western Rivers—but the scale of India's projects on this river system are of an altogether different order. They include the 900 MW Baglihar-I and II facilities, with 321,000 AF of storage capacity, 30,400 AF of it Live Storage. They also include the 780 MW Dul Hasti HEP and its 7,570 AF of storage capacity, 6,500 AF of it Live Storage, and the 690 MW Salal-I and II facilities, with 230,303 AF of storage capacity.

5.19. The projects that India has Under Construction on the Chenab are of a similar size. There are 8 HEPs under construction at the present time, most notably in the stretch of the river in and around the Kishtwar area. These HEPs include: Kiru, a 624 MW HEP with 33,657 AF of storage capacity, 8,516 AF of it Live Storage; Kwar, a 540 MW HEP with 22,027 AF of storage capacity, 7,429 AF of it Live Storage; and the RHEP itself, a 850 MW HEP with 63,833 AF of storage capacity, 19,350 AF of it Live Storage. To these may be added smaller HEPs at Lower Kalnai (48 MW with 1,508 AF of storage capacity, 616 AF of it Live Storage) and Miyar (120 MW with 1,298 AF of storage capacity, 730 AF of it Live Storage).

5.20. It is only when one considers the Planned projects on the Chenab, however, that the full sweep of India's programme comes into view. Pakistan believes that India has 49 HEPs planned for the Chenab, many of them of the same size as, or even larger than, what has come before. Significant projects include Dugar (380 MW), Dugli (360 MW), the Kirthai-I and II facility (1,320 MW), Kirthai-Naunatu (1,190 MW), Naunat (400 MW), and, finally, the massive Sawalkot-I and II facilities (1,856 MW). The storage capacity for some of these plants is known, but others will only become clear when India officially notifies Pakistan, pursuant to the requirements of the Treaty, that a particular HEP's construction is about to commence.

5.21. As regards the Chenab, therefore, the available data indicates that India plans to construct 74 HEPs on the Chenab. This includes 17 Completed HEPs, with 8 presently Under Construction and 49 Planned. The Completed projects have an installed capacity of 2,420.6 MW, the Under Construction projects are slated to have an installed capacity of 3,707 MW, and the Planned projects scheduled to have an installed capacity of 10,491.2 MW. This would give India a total generating capacity of 16,618.8 MW and a gross storage capacity of 2,907,450 AF (inclusive of Storage Works), 1,786.537 AF of it Live Storage—although, again, these numbers are likely to increase as more information about India's Planned projects comes to light.

5.22. The above analysis produces the below table.

	Description	No. of Projects	Installed Capacity	Storage Capacity (Acre Feet)		
			MW	Dead	Live	Gross
A.	**India's HEPs on the Indus**					
1	Completed	16	120.5	35,424	7,896	43,320
2	Under Construction	27	136.8	2,346	33	2,379
3	Planned	20	1,240.0	NA	NA	NA
4	**Total (A)**	**63**	**1,497.3**	**> 37,770**	**> 7,929**	**> 45,699**
A.	**India's HEPs on the Jhelum**					
1	Completed	19	1,333.2	14,475	7,404	21,879
2	Under Construction	9	212.1	57	140	197
3	Planned	36	678.0	NA	NA	NA
4	**Total (B)**	**64**	**2,223.3**	**> 14,532**	**> 7,544**	**> 22,076**
A.	**India's HEPs on the Chenab**					
1	Completed	17	2,420.6	522,073	36,922	558,895
2	Under Construction	8	3,707.0	99,583	124,540	224,123
3	Planned	49	10,491.2	NA	> 1,638,857	> 2,165,989
4	**Total (C)**	**74**	**16,618.8**	**> 621,656**	**> 1,800,319**	**> 2,949,007**
	Total [(A) + (B) + (C)]	**201**	**20,339.4**	**> 673,958**	**> 1,815,792**	**> 3,016,782**

5C THE RELEVANCE OF INDIA'S WIDER PROGRAMME OF HEP CONSTRUCTION

5.23. In Pakistan's submission, the wider relevance of this material is self-evident. As set out in its Pakistan's Arbitration Request, the dispute between the Parties is not principally about the KHEP and the RHEP. It is about India's plan, via the ambitious HEP construction programme described above, to turn the Indus River System into a "major power generation hub for north India".[396] Heedless of the toll that its ambitions take on the Kashmiri people,[397] India's programme is proceeding with "unprecedented" speed,[398] with its officials proclaiming

[396] Pakistan's Application for Leave to Amend Pakistan's Request for Arbitration, 28 July, ¶ 33.
[397] *See* e.g. "India's Grand Plan for Kashmir Dams" (*The Diplomat*, 15 October 2022), available at: https://thediplomat.com/2022/10/indias-grand-plan-for-kashmir-dams/ (last accessed 18 March 2024), **Exhibit P-0320**.
[398] "India hastens hydropower projects in Jammu and Kashmir" (*The Third Pole*, 24 July 2017), available at: https://www.thethirdpole.net/en/energy/india-hastens-hydropower-projects-in-jammu-and-kashmir/ (last accessed 18 March 2024), **Exhibit P-0321**. *See* also "India fast-tracks Kashmir hydro projects that could affect Pakistan water supplies", (*The Guardian*, 16 March 2017), available at:

in 2022/2023 that "[i]n the next three years, [Indian-administered Kashmir] is set to generate the capacity equivalent to what was achieved in [the previous] 70 years".[399]

5.24. Pakistan is far from alone in predicting disaster from India's course of action. Another concerned (and avowedly neutral) observer was the former Senior Water Advisor for the World Bank, and Gordon McKay Professor of Environmental Engineering at Harvard University, John Briscoe. Over the course of his career, Professor Briscoe worked with water engineers on both sides of the Line of Control. He played a role in the selection of the Neutral Expert in the *Baglihar* case. In 2010, in the wake of the Neutral Expert effectively affirming India's design for the Baglihar HEP via what Professor Briscoe described, in various publications, as a "reinterpretation of the Treaty",[400] that "gutted [it] of its essential balance",[401] Professor Briscoe looked at India's hydroelectric plans and predicted "a looming train wreck on the Indus, with disastrous consequences for both countries". He continued:

> "If Baglihar was the only dam being built by India on the Chenab and Jhelum, this would be a limited problem. […] But following Baglihar is a veritable caravan of Indian projects – Kishanganga, Sawalkot, Pakuldul, Bursar, Dal Huste, Gyspa. The cumulative live storage will be large, giving India an unquestioned capacity to have major impact on the timing of flows into Pakistan. Using Baglihar as a reference, simple back-of-the-envelope calculations suggest that once it has constructed all of the planned hydropower plants on the Chenab, India will have an ability to effect major damage on Pakistan. First, there is the one-time effect of filling the new dams. If done during the wet season this would have little effect on Pakistan. But if done during the critical low-flow period, there would be a large one-time effect (as was the case when India filled Baglihar). Second, there is the permanent threat which would be a consequence of substantial cumulative live storage which could store about one month's worth of low-season flow on the Chenab. If, God forbid, India so chose, it could use this cumulative live storage to impose major reductions on water availability in Pakistan during the critical planting season."[402]

https://www.theguardian.com/world/2017/mar/16/india-fast-tracks-kashmir-hydro-projects-that-could-affect-pakistan-water-supplies (last accessed 18 March 2024), **Exhibit P-0322**.

[399] "Kishtwar in J-K set to become major power generation hub of north India" (*Economic Times*, 25 August 2022), available at: https://energy.economictimes.indiatimes.com/news/power/kishtwar-in-j-k-set-to-become-major-power-generation-hub-of-north-india/93764939 (last accessed 18 March 2024), **Exhibit P-0323**. *See* also "J&K's Kishtwar will become north India's major 'power hub': Jitendra Singh" (*Business Standard*, 3 June 2023), available at: https://www.business-standard.com/india-news/j-k-s-kishtwar-will-become-north-india-s-major-power-hub-says-union-minister-jitendra-singh-123060300718_1.html (last accessed 18 March 2024), **Exhibit P-0324**.

[400] J. Briscoe, "War or peace on the Indus?" (*The News International*, 3 April 2010), available at: https://johnbriscoe.seas.harvard.edu/files/johnbriscoe/files/108._john_briscoe_war_or_peace_on_the_indus_201004.pdf (last accessed 18 March 2024), **Exhibit P-0325**.

[401] J. Briscoe, "Troubled Waters: Can a Bridge be Built over the Indus?" (2010) 45(50) Economic and Political Weekly 28, **Exhibit P-0326**, p. 28.

[402] J. Briscoe, "War or peace on the Indus?" (*The News International*, 3 April 2010), available at: https://johnbriscoe.seas.harvard.edu/files/johnbriscoe/files/108._john_briscoe_war_or_peace_on_the_indus_201

5.25. Professor Briscoe's concern with India's programme was (and is) well-placed. India's HEP construction programme is proceeding at breakneck speed despite the clear guidance given by the Court of Arbitration in the *Kishenganga* case. The Court, in that case, observed that Article IX was placed in the Treaty to enable the settlement of disagreements "before construction of a Project commences", and that, in keeping with this, any issues between the Parties under Annexure D should be resolved before breaking ground, thereby avoiding "the invidious idea that the Parties are in a race to design, construct and operate a hydro-electric plant 'first'".[403] As pointed out in the course of Pakistan's submissions to the Court in the Competence phase of the present proceedings,[404] India's strategy in this respect appears clear: tie Pakistan up in the Commission and elsewhere for years while its construction programme continues unabated, rendering its Treaty-inconsistent HEPs a *fait accompli*.

5.26. From the HEP designs that India has already submitted in the Commission, Pakistan anticipates that many of the proposed HEPs (and especially those with Live Storage) will contain what Pakistan considers to be the same Treaty-inconsistent design features to which Pakistan has objected with respect to the KHEP and the RHEP, including (*inter alia*) excessive freeboard, exaggerated Pondage, low level outlets and intakes, and deep orifice spillways. The consequence, if India's plans are realised, would be the gutting of Article III of the Treaty and its pivotal obligations of let flow, non-interference and heavily constrained storage in respect of the Western Rivers. Even if the proposed HEPs were to be constructed and operated in complete compliance with the Treaty, the risks to Pakistan, as the lower riparian, would be considerable. If these proposed HEPs are constructed and operated in **violation** of the Treaty, the consequences for Pakistan would be nothing short of catastrophic.

5.27. This is *a fortiori* in circumstances in which several of India's Under Construction and Planned projects—particularly those on the Chenab upstream from Baglihar (e.g., the RHEP, the Dul Hasti HEP, the Pakul Dul HEP, the Kiru HEP and the Kwar HEP) appear to be intended to be, and are capable of being, operated as a **cascade**.[405] If each of these HEPs—contrary to the terms of the Treaty and the *Kishenganga* Court's unequivocal finding—was to empty its reservoir as part of a coordinated sediment flushing exercise, Pakistan's Marala Barrage (and

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004.pdf (last accessed 18 March 2024), **Exhibit P-0325**. Professor Briscoe secured advance agreement to publish this piece in parallel in the *Times of India*. On receipt, the *Times* refused to run it: J. Briscoe, "Troubled Waters: Can a Bridge be Built over the Indus" (2010) 45(50) Economic and Political Weekly 28, **Exhibit P-0326**, p. 30.

[403] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 443–444.

[404] *See*, e.g., Transcript of Hearing on Competence, Day 1 (11 May 2023), p. 41, lines 11–20 (Sir Daniel Bethlehem); Day 3 (13 May 2023), p. 17, lines 16–22 (Dr Miles), and p. 31, lines 18–21 (Dr Miles).

[405] *See* **Chapter 4**.

its associated system of irrigation canals) would be severely affected, both in terms of the initial flood and the subsequent dry spell as India's reservoirs were thereafter refilled. Were this dry spell to occur during the *rabi* cropping season or the April–June planting period of the *kharif* cropping season (i.e., before the onset of the monsoon rains),[406] the consequences for Pakistani agriculture and for Pakistan more broadly would be disastrous.

5.28. It is for this reason (*inter alia*) that Pakistan initiated these arbitral proceedings—to secure a systemically binding interpretation of the Treaty that reaches beyond individual HEPs. Pakistan cannot afford the delay and the systemic implication of having to litigate India's ambitious HEP programme on a Plant-by-Plant basis, a process that would both take decades and be subject to the vagaries of individual Neutral Expert determinations. The scale of India's planned HEP programme, and the speed with which it is being realised in concrete, require clear and authoritative direction as to the interpretation and application of the Treaty now.

* * *

[406] *See* **Chapter 3**.

CHAPTER 6: SCHEME OF THE INDUS WATERS TREATY AND ITS OPERATION IN PRACTICE

6.1. **Chapter 6** introduces the overall scheme of the Treaty and how it works in practice. It is intended to be read together with the Statement of Syed Muhammad Mehar Ali Shah, Pakistan's Commissioner for Indus Waters, dated 16 March 2024, which is at **Appendix B** to this Memorial. As long-standing PCIW and a high-ranking and highly experienced engineer competent in the fields of hydrology and water use, Mr Shah is able to assist the Court by providing both:

(a) expert testimony in relation to the way in which the Treaty ought to operate between the Parties; and

(b) a factual account of the way in which the provisions of the Treaty are in fact operating and the implications that follow from this.

6.2. This Chapter is structured as follows:

(a) **Section A** addresses the Treaty's origin and purpose;

(b) **Section B** addresses the utilisation of waters and fixing and delimiting the rights and obligations of the Parties;

(c) **Section C** addresses the importance of co-operation, transparency and information-sharing under the Treaty; and

(d) **Section D** addresses India's failure to fulfil its Treaty obligations with respect to information-sharing.

6.3. The purpose of this broad contextualisation of the framework of the Treaty, and of how it works in practice, is to assist the Court in resolving the issues of interpretation and application of the Treaty that are subsequently addressed in detail at **Parts III** and **IV** of this Memorial.

6.4. As a preliminary matter, the Treaty is formed of three principal components[407]:

[407] Per Article XII(1): "This Treaty consists of the Preamble, the Articles hereof and Annexures A to H hereto, and may be cited as 'The Indus Waters Treaty 1960'" (Indus Waters Treaty, **PLA-0001**). The Treaty was signed in parallel to the signature of the IBDF Agreement and incorporated as an Annex to that Agreement. The purpose of

(a) The Preamble, which provides that:

> "The Government of India and the Government of Pakistan, being equally desirous of attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers and recognising the need, therefore, of fixing and delimiting, in a spirit of goodwill and friendship, the rights and obligations of each in relation to the other concerning the use of these waters and of making provision for the settlement, in a cooperative spirit, of all such questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein, have resolved to conclude a Treaty in furtherance of these objectives […]."

(b) Twelve Articles with the following titles:

Article I	Definitions
Article II	Provisions regarding Eastern Rivers
Article III	Provisions regarding Western Rivers
Article IV	Provisions regarding Eastern Rivers and Western Rivers
Article V	Financial Provisions
Article VI	Exchange of data
Article VII	Future co-operation
Article VIII	Permanent Indus Commission
Article IX	Settlement of differences and disputes
Article X	Emergency Provision
Article XI	General Provisions
Article XII	Final Provisions

and

(c) Eight Annexures as follows:

Annexure A	Exchange of notes between Government of India and Government of Pakistan
Annexure B	Agricultural use by Pakistan from certain tributaries of the Ravi *(Article II (3))*
Annexure C	Agricultural use by India from the Western Rivers *(Article III (2)(c))*
Annexure D	Generation of hydro-electric power by India on the Western Rivers *(Article III (2)(d))*

the IBDF Agreement was to agree the nature and extent of funding contributed by other Governments for the construction of works to effect the division of waters set out in the Treaty (*see* IBDF Agreement, **PLA-0043**).

Annexure E	Storage of waters by India on the Western Rivers *(Article III (4))*
Annexure F	Neutral Expert *(Article IX (2))*
Annexure G	Court of Arbitration *(Article IX (5))*
Annexure H	Transitional arrangements *(Article II (5))*

6.5. The manner in which those provisions interrelate is described below.

6A THE TREATY'S ORIGIN AND PURPOSE

6.6. It will be recalled that the context in which the Treaty was negotiated and agreed was to settle the disputes which had erupted between the newly-independent India and Pakistan as a consequence of (1) the line of Partition, which had been drawn across Punjab; and (2) Pakistan's legitimate fears for its security following the April 1948 crisis. The aftermath of the April 1948 crisis, and the need for a long-lasting solution between the two States was clearly reflected in the provisions of the Treaty which were thereafter negotiated. The Treaty was intended to reset the Parties' relations and to provide for an enduring and permanent settlement.

6.7. As the Preamble to the Treaty recognises, in order to achieve a lasting settlement, three pillars needed to be recognised:

(a) **First**, that the Treaty reflected a mutual aim of "attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers" and that in order to achieve that aim the Parties would each need to accept some restriction on their use of the waters ("recognising the need, therefore, of fixing and delimiting […] the rights and obligations of each in relation to the other concerning the use of these waters");

(b) **Second**, that the Treaty was to be implemented "in a spirit of goodwill and friendship" and "in a cooperative spirit"; and

(c) **Third**, that dispute resolution provisions needed to be incorporated into the Treaty to ensure that "such questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein" could be satisfactorily resolved.

6.8. The resetting of relations was also reiterated by Annexure A, whereby the Parties agreed that the Inter-Dominion Water Agreement ceased to apply.

6.9. The Treaty entered into force on 12 January 1961, with retroactive effect from 1 April 1960 (per Article XII (2)). 1 April 1960 is defined in Article I (16), with reference to Article XII, as the "Effective Date".

6B THE UTILISATION OF WATERS AND FIXING AND DELIMITING THE RIGHTS AND OBLIGATIONS OF THE PARTIES

6B.1 The division of the Eastern and the Western Rivers

6.10. As the Court will recall from **Chapter 3**, the Indus Basin (for present purposes) comprises the Indus River and six major tributaries: (1) the Kabul River which enters Pakistan from Afghanistan in the west; and (2) the Chenab, Jhelum, Ravi, Sutlej and Beas rivers that enter Pakistan from the east. The Treaty is concerned with the Indus River and the latter five tributaries, which it divides into two groups, the Eastern and Western Rivers. These are each defined by Article I(5) and (6) as:

(a) the "**Eastern Rivers**", comprising the Sutlej, the Beas and the Ravi; and

(b) the "**Western Rivers**" comprising the Indus, the Jhelum and the Chenab.

6.11. As regards the Eastern Rivers, the substantive provisions are set out in **Article II** (Provisions regarding Eastern Rivers) and **Annexure B** (Agricultural Use by Pakistan from Certain Tributaries of the Ravi).

6.12. In respect of the Western Rivers, the substantive provisions are set out in **Article III** (Provisions regarding Western Rivers) and **Annexure C** (Agricultural Use by India from the Western Rivers), **Annexure D** (Generation of Hydro-Electric Power by India on the Western Rivers) and **Annexure E** (Storage of Waters by India on the Western Rivers).

6.13. **Article IV** also includes provisions which apply to both the Eastern and Western Rivers.

6.14. Articles II and III set out the division of the waters of these Rivers between India and Pakistan. Article II(1) to (3) provide, in relevant part and in respect of the **Eastern Rivers**, that:

> "(1) *All the waters* of the Eastern Rivers shall be *available for the unrestricted use* of India, except as otherwise expressly provided in this Article.
>
> (2) Except for Domestic Use and Non-Consumptive Use[[408]], Pakistan shall be under an *obligation to let flow*, and *shall not permit any interference with, the waters* of the Sutlej Main and the Ravi Main in the reaches where these rivers flow in Pakistan and have not yet finally crossed into Pakistan. […]"
>
> (3) Except for Domestic Use, Non-Consumptive Use and Agricultural [Use][[409]] […], Pakistan shall be under an *obligation to let flow*, and *shall not permit any interference with, the waters* (while flowing in Pakistan) of any Tributary which in its natural course joins the Sutlej Main or the Ravi Main before these rivers have finally crossed into Pakistan." (Emphasis added).

6.15. According to Article II(4), it is not until the Eastern Rivers have "finally crossed into Pakistan" that their waters are available to Pakistan for its unrestricted use. As noted in **Chapter 3**, Pakistan now receives almost no water from the Eastern Rivers.

6.16. Article III(1) and (2) similarly provide, in relevant part and in respect of the **Western Rivers**, that:

> "(1) Pakistan *shall receive for unrestricted use all those waters* of the Western Rivers which India is *under obligation to let flow* under the provisions of Paragraph (2).
>
> (2) India shall be under an *obligation to let flow all the waters* of the Western Rivers, and *shall not permit any interference with these waters*, except for the following uses, restricted […] in the case of each of the rivers, […] to the drainage basin thereof:
>
> (a) Domestic Use;
>
> (b) Non-Consumptive Use
>
> (c) Agricultural Use, as set out in Annexure C; and
>
> (d) Generation of hydro-electric power, as set out in Annexure D." (Emphasis added)

6.17. Each of these provisions refers to the "unrestricted use" of the waters of the relevant group of Rivers by the beneficiary (India, or Pakistan, respectively), a positive "obligation" on Pakistan or India (respectively) to "let flow" the relevant waters, and the prohibition against "interference with [those] waters" by the Party under the obligation to let flow. The terms

[408] As defined in Article I(10) and (11).

[409] As defined in Article I(9) and further set out in Annexure B.

"unrestricted use" and "let flow" are not defined in the Treaty. The term "interference with the waters" is, however, defined in Article I(15), which provides:

> "(15) The term "interference with the waters" means:
>
> (a) Any act of withdrawal therefrom; or
>
> (b) Any man-made obstruction to their flow which *causes a change in the volume* (within the practical range of measurement) of the *daily flow of the waters*: Provided however that an obstruction which involves only an insignificant and incident change in the volume of the daily flow, for example, fluctuations due to afflux caused by bridge piers or a temporary by-pass, etc., shall not be deemed to be an interference with the waters." (Emphasis added).

6.18. Articles II and III reflect the fact that, by entering into the Treaty, Pakistan and India each surrendered significant rights in relation to the Eastern and Western Rivers (respectively), in return for securing an entitlement to use the natural flow of the other group of rivers.[410]

6.19. This surrender of rights over the waters of each of the Rivers was not absolute, however. In relation to the Eastern Rivers, Article II provides exceptions to Pakistan's "let flow" and "non-interference" obligations for Domestic Use, Non-Consumptive Use and, in the case of waters falling within Article II(3), Agricultural Use. In the case of the Western Rivers, pursuant to Article III(2), India must not permit interference with the waters of the Western Rivers, save where one of the four exceptions listed in Article III(2) applies (i.e., Domestic Use, Non-Consumptive Use, Agricultural Use[411] and, in addition, use for the generation of hydro-electric power). Like the term "Agricultural Use", use for the generation of hydro-electric power is carved out of the term "Non-Consumptive Uses" in the definition at Article I(11) and is addressed in its own Annexure (D). Annexure D (entitled "Generation of Hydro-electric Power by India on the Western Rivers") defines the extent to which India is permitted to use the waters of the Western Rivers for the generation of hydro-electric power.

6.20. In addition to its obligations to "let flow" and "not permit any interference" with the waters, India is also expressly required by Article III(4) not to "store any water of, or construct any storage works on, the Western Rivers", except "as provided in Annexures D and E". The significance of Article III(4) is reiterated in Article IV(3), which provides that:

[410] For the evolution of this bargain, up to its final encapsulation in the Treaty, see **Appendix A** to this Memorial.
[411] These terms are defined in the same way as for Pakistan, at Article I(10), (11) and (9) of the Treaty, respectively. India's Agricultural Use of the Western Rivers is further regulated by Annexure C of the Treaty.

"Nothing in this Treaty shall be construed as having the effect of preventing either Party […] from removal of stones, gravel or sand from the beds of the Rivers: Provided that

(a) in executing any of the schemes mentioned above, each Party will avoid, as far as practicable, any material damage to the other Party;

(b) any such scheme carried out by India on the Western Rivers shall not involve any use of water or any storage in addition to that provided under Article III".

6B.2 The generation of hydro-electric power on, and storage of water of, the Western Rivers in Annexures D and E

6.21. As set out in **Chapter 7** and **Appendix A** of this Memorial, Pakistan's agreement to certain uses of the Western Rivers was fiercely fought during the negotiations of the Treaty. In particular, Pakistan took the position that, having ceded the Eastern Rivers to India, it could not agree to any control by India of the Western Rivers, even for the generation of hydroelectricity. And while Pakistan ultimately agreed to permit certain exceptions to this fundamental principle, they were tightly constrained by the provisions of Annexures C (Agricultural Use by India on the Western Rivers), D (Generation of Hydro-Electric Power by India on the Western Rivers) and E (Storage of Waters by India on the Western Rivers). The remainder of this Section considers the second and third of these exceptions: Annexures D and E which, as Mr Shah observes in his Statement, are of "critical importance".[412]

6.22. The purpose and scope of application of each of these Annexures is set out in Paragraph 1 of each, respectively. They provide as follows:

Paragraph 1 of Annexure D

"The provisions of this Annexure shall apply with respect to the use by India of the waters of the Western Rivers for the generation of hydro-electric power under the provisions of Article III (2) and, *subject to the provisions of this Annexure*, such use shall be unrestricted: Provided that the design, construction and operation of new hydro-electric plants which are incorporated in a Storage Work (as defined in Annexure E) shall be governed by the relevant provisions of Annexure E." (Emphasis added)

Paragraph 1 of Annexure E

"The provisions of this Annexure shall apply with respect to the storage of water on the Western Rivers, and to the construction and operation of Storage Works thereon, by India under the provisions of Article III (4)."

[412] **Appendix B** to this Memorial (Statement of Syed Muhammad Mehar Ali Shah, Pakistan's Commissioner for Indus Waters dated 16 March 2024) ("**PER-01**"), paragraph 36.

6.23. Mr Shah's Statement provides a detailed overview of the provisions of Annexure D and E at paragraphs 36−43.

6.24. As Mr Shah explains, Annexure D "addresses four categories of Run-of-River Plant".[413] They are:

(a) existing HEPs (either already in operation or under construction as of the Effective Date), which essentially fall outside the ambit of the Treaty, unless alterations to those plants result in a material change to their operation (Annexure D, Part 2);

(b) new Run-of-River Plants, defined in Paragraph 2(g) of Annexure D as HEPs "that develop[] power without Live Storage as an integral part of the plant, except for Pondage and Surcharge Storage" (Annexure D, Part 3);

(c) Small Plants, which are a type of new Run-of-River Plant falling within the definition at Annexure D, Paragraph 18[414]; and

(d) new HEPs located on an irrigation channel, which may be constructed and operated without restriction, provided that they meet the requirements of Paragraph 24 of Annexure D (see Annexure D, Part 4).

6.25. Annexure E is, in turn, concerned with the storage of water, and the construction and operation of "Storage Works", by India under the provisions of Article III(4). The term "Storage Work" is defined at Paragraph 2(a) of Annexure E, as "a work construct constructed for the purpose of impounding the waters of a stream". Excluded from the definition of "Storage Works" are, however, the following: "(i) a Small Tank, (ii) the works specified in Paragraphs 3 and 4 of Annexure D, and (iii) a new work constructed in accordance with the provisions of Annexure D."[415]

6.26. Annexure E, for its part, addresses three categories of storage works:

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[413] *Id.*, paragraph 38.

[414] A "Small Plant" is defined as a new Run-of-River Plant "which is located on a Tributary and which conforms to the following criteria […]: (a) the aggregate designed maximum discharge through the turbines does not exceed 300 cusecs; (b) no storage is involved in connection with the Small Plant, except the Pondage and the storage incident to the diversion structure; and (c) the crest of the diversion structure across the Tributary, or the top level of the gates, if any, shall not be higher than 20 feet above the mean bed of the Tributary at the site of the structure."

[415] Indus Waters Treaty, **PLA-0001**, Annexure E, Paragraph 2(a) (citation omitted).

(a) existing Storage Works which were already in operation on the Effective Date, the operation of which is subject to "no restriction" under the Treaty (Annexure E, Paragraph 3);

(b) Small Tanks,[416] on which there is "no restriction" on their construction or operation (Annexure E, Paragraph 3); and

(c) new Storage Works,[417] which will be permitted on the Western Rivers provided that their aggregate storage capacity does not exceed the capacity limits defined by Paragraph 7 of Annexure E.[418]

6.27. There are circumstances in which the provisions of Annexure E will apply to a hydroelectric plant which India might describe as a Run-of-River Plant. This is clear from Paragraph 1 of Annexure D, where it provides that "the design, construction and operation of new hydro-electric plants which are incorporated in a Storage Work (as defined in Annexure E) shall be governed by the relevant provisions of Annexure E" read together with Paragraph 2(a) of Annexure E, which provides that a new work which "is constructed for the purpose of impounding the waters of a stream" but is not "constructed in accordance with the provisions of Annexure D", will fall within the definition of a Storage Work and thus be regulated by Annexure E.

6.28. Turning back to Annexure D, the scheme of that Annexure is explained in overview in Mr Shah's Statement, at paragraphs 38−42. As he explains, "[m]ost relevant for present purposes is Part 3, which lays down restrictions on the design, construction and operation of new Run-of-River Plants (other than Small Plants addressed in Paragraph 18 of Annexure D)."[419] Part 3 is formed of Paragraphs 8 to 23, which cover three main elements:

(a) the design and operation requirements for Run-of-River Plants and Small Plants (addressed by Mr Shah at paragraphs 39−40 and 42 of his Statement);

[416] Defined in Annexure E, Paragraph 2(n) as "a tank having Live Storage of less than 700 acre-feet and fed only from a non-perennial small stream: Provided that the Dead Storage does not exceed 50 acre-feet".
[417] Defined in Annexure E, Paragraph 2(a), as set out in paragraph 6.25 above.
[418] By reference to each relevant river system (namely The Indus, The Jhelum (excluding the Jhelum Main), The Jhelum Main, The Chenab (excluding the Chenab Main) and the Chenab Main), Paragraph 7 identifies the maximum storage capacity by reference to General Storage Capacity, Power Storage Capacity and Flood Storage Capacity (terms defined in Paragraph 2 of Annexure E).
[419] **PER-01**, paragraph 39.

(b) India's information-sharing obligations for both Run-of-River Plants and Small Plants (addressed by Mr Shah at paragraph 41 and Section VI of his Statement); and

(c) The way that disputes regarding Run-of-River Plants and Small Plants should be resolved (addressed by Mr Shah at paragraphs 65−66 and 68 of his Statement).

(a) Design and operation requirements on new HEPs

6.29. The design requirements for Run-of-River Plants (other than Small Plants) are set out in Paragraph 8 of Annexure D (read together with the various definitions set out in Part 1 of Annexure D (Paragraph 2)).

6.30. At Paragraphs 15 to 17 of Annexure D, the Treaty identifies various operational requirements for both Run-of-River Plants and Small Plants which India must meet. At Paragraph 14, Annexure D sets out the requirements that apply to the "filling of Dead Storage".

6.31. These provisions are at the heart of this dispute and are addressed in detail in **Parts III** and **IV** of this Memorial.

(b) Information-sharing

6.32. Mr Shah's Statement addresses in detail the Treaty's information-sharing requirements, and their centrality to its proper functioning (at Sections IV and VI of his Statement). As he observes:

> "The sharing of information is an important aspect of co-operation under the Treaty. Given the status of Pakistan as the lower riparian to India (the upper riparian), Pakistan cannot satisfy itself as to whether or not the Treaty is being implemented in its true letter and spirit, in the absence of information provided by India. The success of this Treaty is fundamentally linked to the sharing of information and data between the Parties."[420]

6.33. Where India plans to construct any engineering work which would cause interference with the waters, it is under a general obligation pursuant to Article VII(2), as Mr Shah observes, voluntarily and "at the planning stage" to supply Pakistan with the details.[421] Specifically,

[420] *Id.*, paragraph 46.
[421] *Id.*, paragraph 50.

India must notify Pakistan "of its plans and shall supply such data relating to the work as may be available and as would enable [Pakistan] to inform itself of the nature, magnitude and effect of the work".[422] In short, in Mr Shah's words, India must be "transparent with Pakistan in the provision of information" regarding its plans.[423] In addition, as Mr Shah explains, "India is under a number of specific information-sharing obligations in relation to its use of the Western Rivers for hydroelectric power generation".[424] Those specific obligations are contained within Annexure D, and addressed in Sections VI.B to VI.D of Mr Shah's Statement.

6.34. As Mr Shah's Statement makes clear, there is an extensive list of information-sharing requirements on both Parties under the Treaty, but especially on India as regards its use of the Western Rivers for the purposes of generation of hydroelectric power. This reflects the more general expectations of cooperation and transparency embodied in the Treaty (as to which, see Mr Shah's Statement at Section III). The most relevant requirements for present purposes are found in Paragraphs 9, 12 and 13 of Annexure D (applicable to new Run-of-River Plants), addressed at Section VI.C of Mr Shah's Statement.

6.35. Paragraph 9 of Annexure D identifies the communication and information-sharing which must be undertaken by India if it wishes to construct a new Run-of-River Plant (other than a Small Plant) on the Western Rivers. It provides as follows:

> "To enable Pakistan to satisfy itself that the design of a [Run-of-River] Plant conforms to the criteria mentioned in Paragraph 8, India shall at least six months in advance of the beginning of construction of river works connected with the [Run-of-River] Plant communicate to Pakistan, in writing, the information specified in Appendix II to this Annexure. If any such information is not available or is not pertinent to the design of the [Run-of-River] Plant or to the conditions at the site, it will be so stated."

6.36. The five categories of information which must be supplied by India, as defined in Appendix II to Annexure D are:

(a) Location of Plant

(b) Hydrologic Data

(c) Hydraulic Data

[422] Indus Waters Treaty 1960, **PLA-0001**, Article VII (2).
[423] **PER-01**, paragraph 52.
[424] *Id.*, paragraph 46.

(d) Particulars of Design

(e) General

6.37. As Mr Shah explains, the "terms of this Paragraph [9] are significant. The Treaty provides a mechanism to enable Pakistan to satisfy itself as to whether or not *the design* of a new Run-of-River hydroelectric plant is in conformity with the criteria mentioned in Paragraph 8 of Annexure D".[425]

6.38. Annexure D also records that there is a continuing obligation on India to furnish information to Pakistan in the event of any changes in the information previously furnished either because of (1) "any alteration proposed in the design of a [Run-of-River] Plant […] [which] would result in a material change in the information furnished to Pakistan under the provisions of Paragraph 9" either before or after the Run-of-River Plant comes into operation (per Paragraph 12); or (2) if it has been necessary for India to carry out repairs or alterations in the event of an emergency (per Paragraph 13).

(c) Dispute resolution in relation to Run-of-River Plants

6.39. Paragraphs 10 and 11 define the way that disagreements regarding India's proposed construction of a new Run-of -River Plant should be resolved. It provides:

> "Within three months of receipt by Pakistan of the information specified in Paragraph 9, Pakistan shall communicate to India, in writing, any objection that it may have with regard to the proposed design on the ground that it does not conform to the criteria mentioned in Paragraph 8. If no objection is received by India from Pakistan within the specified period of three months, then Pakistan shall be deemed to have no objection."

6.40. Where Pakistan raises an objection, Paragraph 11 applies. It provides: "If a question arises as to whether or not the design of a Plant conforms to the criteria set out in Paragraph 8, then either Party may proceed to have the question resolved in accordance with the provisions of Article IX(1) and (2)".

6.41. Paragraphs 10 and 11 are incorporated into Paragraphs 12 and 13 and apply where there has been any alteration proposed in the design of a Run-of-River Plant or a change as a result of India having altered the Run-of-River Plant in the event of an emergency.

[425] *Id*., paragraph 60 (emphasis added).

6.42. The final pillar identified in the Preamble, as discussed in paragraph 6.7 above, is the recognition that the Treaty also defines how any "questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein" are to be satisfactorily resolved. Article IX of the Treaty addresses (and is titled) the Settlement of Differences and Disputes. It is to be considered together with Article VIII (Permanent Indus Commission) as an illustration of the focus which the Treaty places upon the early resolution of disagreements, between the Commissioners, before the Parties need to turn to more formal methods of dispute resolution.

6.43. Article IX(1) states:

> "Any question which arises between the Parties concerning the interpretation or application of this Treaty or the existence of any fact which, if established, might constitute a breach of this Treaty shall *first be examined by the Commission*, which will endeavour to resolve the question by agreement." (Emphasis added)

6.44. This requirement is reflected in Article VIII(4) which requires the Commission: (1) to study and report to the two Governments on any problem relating to the development of the waters of the Rivers which may be jointly referred to the Commission by the two Governments (per Article VIII(4)(a)); and (2) to make every effort to settle promptly, in accordance with the provisions of Article IX(1), any questions thereunder (Article VIII(4)(b)).[426] It is only where the Commission has been unable to reach agreement that the remaining provisions in Article IX(2) to (6) apply. These Paragraphs, as supplemented by Annexures F and G, address the steps which the Parties are required to take where agreement has not been reached.

6C THE IMPORTANCE OF CO-OPERATION, TRANSPARENCY AND INFORMATION-SHARING UNDER THE TREATY

6.45. As noted in paragraph 6.7 above, the second pillar recognised in the Preamble to the Treaty was the commitment, by both States, that the Treaty was to be implemented "in a spirit of goodwill and friendship" and "in a cooperative spirit". This is repeated in Article VII(1), which records that, "The two Parties recognize that they have a common interest in the optimum development of the Rivers, and, to that end, they declare their intention to co-operate by mutual agreement, to the fullest possible extent." These sentiments are also echoed in

[426] In addition, Article VIII(4)(c) and (d) of the Treaty also provide for tours of inspection to be undertaken by the Commissioners, as part of both their general functions, the exchange of information and in the resolution of disagreement, as explained further in **Chapter 6C** below.

various substantive provisions incorporated into the Treaty itself, as detailed broadly in Mr Shah's Statement.

6C.1 The Permanent Indus Commission

6.46. The Permanent Indus Commission has a critical role in promoting cooperation, transparency and information-sharing between the Parties under the Treaty, as Mr Shah explains in his Statement: "Article VIII, entitled the **Permanent Indus Commission** […], is an important starting point in relation to co-operation."[427]

6.47. The Commission was intended to be, as he recalls, "the principal forum for the resolution of questions arising in relation to the implementation of the Treaty".[428] It also has extensive information-sharing and cooperation responsibilities, set out in seven paragraphs of Article VIII (from (4) to (10)). These include, most notably, the obligation to facilitate General[429] and Special Tours of Inspection[430], to meet "regularly", to "report on its work" and submit that report to the two Governments, and, overall, to "promote cooperation".[431]

6.48. Article VIII(1) provides for the establishment of a permanent post of Commissioner for Indus Waters, by India and Pakistan and Article VIII(3) recognises that the "two Commissioners shall together form the Permanent Indus Commission". The Commission is a significant lynchpin without which the Treaty has significantly less efficacy. By Appendix VIII the parties agreed, amongst other things:

(a) that "the purpose and functions of the Commission shall be to establish and maintain co-operative arrangements for the implementation of this Treaty [and] to promote co-operation between the Parties in the development of the waters of the Rivers" (Paragraph (4));

(b) that each Commissioner will be the representative of his Government for all matters arising out of this Treaty (Paragraph (1));

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[427] **PER-01**, paragraph 17 (emphasis original).
[428] *Id.*, paragraph 18.
[429] General Tours of Inspection are envisaged in Article VIII(4)(c), and are described as "a general tour of inspection of the Rivers for ascertaining the facts connected with various developments and works on the Rivers".
[430] Special Tours of Inspection are those envisaged in Article VIII(4)(d), which are described as "a tour of inspection of such works or sites on the Rivers as may be considered necessary by him for ascertaining the facts connected with those works or sites".
[431] **PER-01**, paragraphs 20-22. *See*, generally, Article VIII(4), Indus Waters Treaty, **PLA-0001**.

(c) that each Commission will serve as the regular channel of communication on all matters relating to the implementation of the Treaty and "in particular, with respect to the furnishing or exchange of information or data provided for in the Treaty" (Paragraph (1));

(d) that the Commission shall meet regularly at least once a year (Paragraph (5)); and

(e) that the Commission shall produce an annual report on its work (Paragraph (8)).

6.49. The Permanent Indus Commission also bore responsibility, under Article VIII(4)(e), for the implementation of the provisions of Annexure H in relation to the Transition Period.

6C.2 Data and information-sharing

6.50. At the heart of the Parties' express agreement to cooperate lie the Treaty's obligations in relation to transparency in information-sharing. The requirement to share information, in the period immediately prior to the commencement of construction of a Run-of-River Plant, has already been discussed above. However, the Treaty is peppered with specific and general requirements for the sharing of data which point to a far more extensive process of information-sharing having been intended by the drafters of the Treaty.

6.51. Examples of the data-sharing provisions in the Treaty include:

(a) Article VI(1), which recognises that data "with respect to the flow in and utilization of the waters or the rivers, shall be exchanged regularly between the Parties". Article VI(1) lists the data which each party is required to collate on a daily basis, which is thereafter to be "transmitted monthly by each Party to the other as soon as the data for a calendar month have been collected and tabulated […]";[432]

(b) Article VI(2), which also entitles either Party to request "the supply of any data relating to the hydrology of the Rivers […] or to any provision of this Treaty"

[432] *See* **PER-01**, paragraphs 29.1 to 29.3.

and provides that "such data shall be supplied by the other Party to the extent that these are available";[433]

(c) Article VII(1)(a) which provides that "Each Party, to the extent it considers practicable and on agreement by the other Party to pay the costs to be incurred, will, at the request of the other Party, set up or install such hydrologic observation stations within the drainage basins of the Rivers, and set up or install such meteorological observation stations relating thereto and carry out such observations thereat, as may be requested and will supply the data so obtained";[434]

(d) Annexure B, Paragraphs 5 and 6, which set out the information which Pakistan must provide to India on an annual basis "following the end of that crop year" where the waters of the Eastern Rivers are being used for Agricultural Use "as specified in Annexure B";[435] and

(e) Article IV(8), which imposes an obligation of communication on both India and Pakistan in relation to information regarding floods. The Paragraph itself is split into two parts, the second providing that "Each Party agrees to communicate to the other Party, as far in advance as practicable, any information it may have in regard to such extraordinary discharges of water from reservoirs and flood flows as may affect the other Party."[436] As Mr Shah explains, "[t]he obligation to communicate flood information under Article IV(8) […] has been the subject of correspondence with the ICIW in recent years and illuminates the different approach which has been taken by India, in recent years as compared to decades gone by, to co-operation under the Treaty."[437]

6.52. In addition to this collation and exchange of information, the provisions of Article VII (Future Co-operation) also envisage the open exchange of information where either India or Pakistan plan to "construct any engineering work which *would cause interference with the waters* of any of the Rivers". The Court will recall that this phrase is defined in Article 1(15)

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[433] *See id*., paragraph 29.4.
[434] *See id.*, paragraph 28.
[435] *See id.*, paragraph 29.5.
[436] *See id.*, paragraphs 29.6 to 29.7.
[437] *See id.*, paragraph 87.

and that the obligations owed under Articles II and III prohibit such interference save as permitted as explicit exceptions to the rule. Where such interference is anticipated:

(a) Article VII(2) stipulates that there must be a free provision of information (either as of right, or in response to a request being made);

(b) In the first situation (where the Party planning the engineering work considers that they will "affect the other Party materially") that party falls under an obligation to "notify the other Party of its plans and […] supply such data relating to the work as may be available and as would enable the other Party to inform itself of the nature, magnitude and effect of the work".

(c) In the alternative, if the Party planning the engineering work does not consider that they will "affect the other Party materially" that Party remains under an obligation to provide the other Party with "such data regarding the nature, magnitude, and effect, if any of the work as may be available" if a request is made for it to do so.

(d) The timing of any request for data under Article VII(2)—and the obligation to notify—is not limited by the Treaty; both the right (of the requesting Party) and the obligation (of the Party planning the works) arise, therefore, as soon as plans are being made to construct any engineering work.

6.53. The obligation under Article VII(2) is a precursor to the subsequent prescribed requirements for the provision of information under Annexure D, Paragraphs 9 and 19 (as set out in **Chapter 6B.2** above).

6D INDIA'S FAILURE TO FULFIL ITS TREATY OBLIGATIONS WITH RESPECT TO INFORMATION-SHARING

6.54. As Mr Shah explains in his Statement, the Treaty is not currently operating as it should. He explains that, in recent times:

> "India has consistently failed to meet its obligations under the Treaty in respect of information-sharing, tours of inspection, and more. Despite the care with which the provisions of Article VIII (Permanent Indus Commission) were drafted, it has not been possible to resolve disagreements within the Commission. Since 2018, the position has

worsened and the Commission is not now, regrettably, operating as intended under the Treaty."[438]

6.55. This has manifested itself in various ways, starting with the way in which the Commission is functioning under Article VIII:

(a) The frequency of Commission meetings, and their duration, have reduced since 2018.[439]

(b) The Commission has been incapable of settling disputes "promptly", as required by Article VIII(4)(b).[440]

(c) The practice of undertaking General Tours of Inspection pursuant to Article VIII(4)(c) has all but fallen apart. As Mr Shah explains, General Tours used to take place "quite frequently": "every year a tour of at least one river—sometimes two—would be undertaken, so that over five years each river had been visited".[441] However, since 2018, Mr Shah recalls that General Tours have taken place only "once every five years",[442] and even then only after "many letters" from the PCIW calling on the Indian Commissioner "to fulfil India's important obligation" to undertake General Tours of Inspection.[443]

(d) Special Tours of Inspection (pursuant to Article VIII(4)(d)) have not taken place, as they should, upon the PCIW's request. As Mr Shah reports, "India has a very poor record in relation to these inspection requests."[444] Mr Shah further recalls that:

> "In recent years my requests for inspections have been ignored by India, or spurious excuses have been given to avoid them taking place. It is not enough for India to say—as it has—that it is unable to arrange a tour of inspection because of some local body's elections, or that weather conditions prevent access. These factors should not prevent inspections and India should, at least, show that it has tried to arrange the visit."[445]

[438] *Id.*, paragraph 70.
[439] *Id.*, paragraph 71. *See,* Indus Waters Treaty 1960, **PLA-0001**, Article VIII(5).
[440] *Id.*, paragraph 72.
[441] *Id.*, paragraph 73.
[442] *Id.*.
[443] *Id.*.
[444] *Id.*, paragraph 74.
[445] *Id.*, paragraph 76 (citations omitted). Mr Shah refers in this respect to the bundle of correspondence that Pakistan submitted to the Court on 9 May 2023, and the accompanying "Explanatory Note on site visit correspondence for the Kishenganga and Ratle Hydroelectric Plants, 2014-2023".

6.56. Mr Shah further explains that "[d]espite repeated requests, there have been no inspections, general or special, since 2019"[446], and the PCIW's request for a Special Tour of Inspection of the KHEP has been pending since 2014. As a result, Pakistan has never been able to inspect the works to satisfy itself that they comply with the requirements of the *Kishenganga* Awards. As Mr Shah explains, India's conduct with respect to tours of inspection is "indicative of the state of co-operation under the Treaty, and therefore of the implementation of the Treaty."[447]

6.57. The functioning of the Treaty is also compromised, however, by India's approach to its information-sharing obligations beyond Article VIII. Mr Shah explains that, in that respect also, India has taken an increasingly obstructive approach.[448] Meanwhile, as detailed in **Chapter 5**, India's HEP-building programme gathers pace. Perhaps therefore unsurprisingly, Mr Shah attributes "India's failure to comply with Paragraph 9 of Annexure D [which, as set out above, concerns the information India must supply to Pakistan regarding the design of a new Plant], read together with Article VII (2) of the Treaty", as "one of the main reasons why disputes have arisen under the Treaty."[449] As Mr Shah observes, part of the reason for this is that by the time India belatedly communicates the information required by Paragraph 9, the design of a new HEP is "already far advanced", the construction works may be "substantially completed", and it is therefore essentially—in practical terms—a *fait accompli*.[450] India's belated communication of information, in Mr Shah's view, causes India, upon receiving objections from Pakistan, to "defend its design", and "continue construction", even where it might be convinced that "certain modifications to the design are necessary to bring it into line with the Treaty requirements."[451]

6.58. Mr Shah's opinion, as Pakistan's Commissioner, is that the Paragraph 9 information "needs, in reality, to be received much earlier and not just six months before the beginning of construction of river works connected with the plant."[452] This tallies with the lengthy timeframes that are involved in the design and construction of HEPs, as described more fully

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[446] **PER-01**, paragraph 77.
[447] *Id.*.
[448] *See* generally, *id.*, Section VII.B.
[449] *Id.*, paragraph 78. Mr Shah also explains other ways in which India has been less than forthcoming with respect to the information it is required to share under the Treaty, most notably in relation to hydrological data (at *id.*, paragraph 85) and flood information (at *id.*, paragraph 87).
[450] *Id.*, paragraph 78.
[451] *Id.*.
[452] *Id.*, paragraph 79.

in **Chapter 4**. Mr Shah has sought to persuade India of this view, without success.[453] In his view, India's position "ignore[s] the purpose of Article VII (2) and the spirit of co-operation required under the Treaty."[454] He also believes that, were India to accept his view, and cooperate more openly, it would result in "much less scope for discord."[455]

6.59. Another contributing factor in the impairment of the Treaty's functioning is that, as Mr Shah explains, the "information that is ultimately provided by India under Paragraph 9 and Appendix II of Annexure D for new run-of-river HEPs is not sufficiently detailed to enable Pakistan to satisfy itself about the conformity of the design with the criteria set out in Paragraph 8."[456] Again, the impact of this is that the Treaty's ability to minimise conflicts between the Parties over the use of the waters it regulates is compromised.[457]

6.60. In sum, it is clear that the Treaty is not functioning as was intended. The Treaty gave India a limited and tightly constrained right to utilise the waters of the Western Rivers for (among other things) the generation of hydro-electric power. Its entitlement to do so is constrained by the design and operation criteria set out in Annexure D of the Treaty. The information-sharing obligations on India under Paragraph 9 of Annexure D are inextricably linked to the design criteria in Paragraph 8 of Annexure D, and clearly an integral part of the bargain that was struck in the Treaty. The provisions setting out the Parties' obligations to undertake General and Special Tours of Inspection, and other related obligations, are also an integral part of the bargain struck. As Mr Shah concludes, both of these elements "go hand-in-hand" with the restrictions on the design, operation and construction of HEPs under Annexure D.[458] If these provisions do not function adequately, Pakistan is left with no way to monitor India's compliance with the detailed design and operation criteria of Annexure D. And, as a result, the entire balance of the Treaty breaks down.

6.61. Much of the dysfunction of the Treaty addressed in Mr Shah's Statement, and in this **Chapter 6**, would be alleviated if the Parties were to be aligned on the proper interpretation of the design criteria set out in Paragraph 8. The present phase of these proceedings, centring on

[453] *Id.*, paragraphs 81−82.
[454] *Id.*, paragraph 82.
[455] *Id.*, paragraph 83.3.
[456] *Id.*, paragraph 84.
[457] *Id.*.
[458] *Id.*, paragraph 89. It is also self-evident from the circumstances of conclusion of the Treaty and the *travaux*, detailed in **Appendix A** of this Memorial, that Pakistan would never have agreed to the exception to India's "let flow" and "non-interference" obligations for the generation of hydro-electric power, without these protections in place.

the questions set out in paragraph 35 of its PO6, presents an opportunity for such alignment. It is to the interpretative issues identified in the Court's questions that Pakistan turns next.

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PART III: THE BARGAINS AT THE HEART OF THE TREATY, TREATY INTERPRETATION AND THE SCHEME OF THE WESTERN RIVERS RUN-OF-RIVER HYDRO BARGAIN

III.1 **Part III** is composed of three chapters that situate the Indus Waters Treaty in the context of the relations between Pakistan and India since 1948 and the international law principles of treaty interpretation. It explains the crucial bargains struck in the Treaty and their impact on its interpretation and application, in particular in restricting India's development of hydropower plants in the Indus Basin.

III.2 **Chapter 7** examines the three bargains at the heart of the Treaty: the **Peace Bargain**, that settled a period of strife between Pakistan and India over riparian rights beginning in April 1948 and ending in September 1960; the **Treaty Bargain**, which addressed the division of the waters of the Indus Basin between the two States, granting each exclusive rights of use, as reflected principally in Articles II and III of the Treaty but informing the terms of the Treaty throughout; and, for purposes of these proceedings, the **Western Rivers Run-of-River Hydro Bargain**, which rests on the rule of "let flow"/non-interference/no storage in respect of the Western Rivers (to Pakistan's benefit) subject to limited and tightly constrained exceptions regarding India's use of those waters for purposes of hydroelectric power generation.

III.3 Three key points emerging from the examination of the three bargains are developed in **Chapter 8** through the lens of customary rules of treaty interpretation. First, the Treaty is akin to and has the same function and effect as a treaty of peace or a boundary treaty. It is an agreement that is intended to settle a profound and potentially deadly disagreement between Pakistan and India in perpetuity, and must therefore be approached by an interpreter through this interpretative prism. Second, the three bargains are crucial to defining the object and purpose of the Treaty, which is the litmus test for interpretations of the Treaty as a whole as well as its individual provisions. Third, an important principle of treaty interpretation is that exceptions to a general rule must be interpreted restrictively. It is this approach that must be applied to the exceptions contained in Article III(2) and Annexures C, D and E of the Treaty. In this case, the rule is "let flow"/non-interference/no storage by India on the Western Rivers, and the exceptions are the limited uses that India may make of the waters, most relevantly for the generation of hydro-electric power in accordance with Annexure D. As demonstrated in **Chapter 7** and recognised by the *Kishenganga* Court, the object and purpose reflect the Peace, Treaty and Hydro Bargains, which were—and are—of existential importance to Pakistan. A restrictive interpretation of exceptions is therefore mandatory. An important related principle is that the burden is on the party that seeks to benefit from the exception (here, India) to prove its application.

III.4 **Chapter 8** answers the Court's question at **paragraph 35(a) of PO6**. This question enquired about the extent and basis for the binding or controlling effect of the decisions of past dispute resolution bodies established pursuant to Article IX of the Treaty concerning (i) competence, (ii) matters of fact, (iii) the interpretation of the Treaty, or (iv) the application of the Treaty in particular factual circumstances. The Chapter draws on the compelling analysis of the *Kishenganga* Court, contrasted with the flawed approach of India regarding the *Baglihar* Neutral Expert Determination. The key conclusions are that the decision of a past Court of Arbitration in a particular dispute is binding (provided it constitutes an "Award") on the Parties as to competence, matters of fact and the interpretation and application of the Treaty; binding in relation to those aspects of the Award that are *res judicata* in present proceedings before the Court and the Neutral Expert and future proceedings before a court or neutral expert; binding in all other respects pursuant to Paragraph 23 of Annexure G, the principle of good faith, and the overriding and general duty of comity and mutual respect. As regards the decisions of a past Neutral Expert, procedural decisions (under Paragraph 6 of Annexure F) and competence decisions (under Paragraph 7 of Annexure F) are final and binding upon the Parties and upon any Court of Arbitration as regards that proceeding and that HEP, provided that, and only to the extent that, such decisions are in fact within the Neutral Expert's competence. Substantive decisions (under Paragraph 9 of Annexure F) are binding upon the Parties and upon any Court of Arbitration, in respect of the particular matter or HEP on which the decision is made, provided that, and only to the extent that, such decisions are in fact within the Neutral Expert's competence.

III.5 **Chapter 9** examines the Western Rivers Run-of-River Hydro Bargain more closely, addressing the relationship between the rule and the exceptions. In that regard, the "let flow"/non-interference obligation in the *chapeau* of Article III(2) is the rule. The exceptions to the rule are indicated in Article III(2)(a)–(d) and Paragraphs 8-17 of Annexure D. The prohibition on storage and storage works in Article III(4) also constitutes a part of the rule, which is subject to the exceptions indicated in Annexures D and E. The implementation of the rule and exception is subject to a "trust and verify" regime—India's design, construction and operation of HEPs is subject to obligations regarding timely cooperation and access in order to facilitate constant monitoring for compliance with the Treaty. The application of these features of the Treaty to the interpretation of Paragraph 8 of Annexure D is undertaken in **Part IV** of this Memorial.

III.6 **Chapter 9** answers the Court's question in **paragraph 35(b) of PO6**. This inquires about the extent to which non-Treaty-based design and operational practices may be taken into account for purposes of interpreting the technical requirements set out in Annexure D, Paragraph 8. Building on the discussion in **Chapters 7 and 8**, the answer to this question is that the design and operation of Annexure D.3 HEPs on the Western Rivers must be achieved within—not despite—the constraints imposed by the Treaty. Modern developments and "best practices" in engineering must be taken into account but within and subject to the framework and the constraints of the Treaty. In other words, the notion of "best practices" in dam design, construction and operation does not permit India to ignore the constraints of the Treaty and, as regards new Run-of-River HEPs, of Annexure D, which constitute carefully limited exceptions to the superior rules that govern India's conduct on the Western Rivers in Article III of the Treaty. Pakistan considers that India's approach in *Baglihar, Kishenganga* and in this dispute has been to use, or attempt to use, "best practices" in design and operation in a manner that is neither well-founded in substance nor advanced within the scheme of the Treaty.

CHAPTER 7: THE THREE KEY BARGAINS OF THE INDUS WATERS TREATY

7.1. This Chapter addresses the three bargains at the heart of the Indus Waters Treaty. These suffuse the Treaty's architecture and influence the interpretation of its provisions.

7.2. **First**, the **Peace Bargain** embodied in the Treaty settled a period of strife between Pakistan and India over riparian rights over the waters in the Indus system of rivers beginning in April 1948 and ending in September 1960. In this way, the Treaty is akin to and has the same function and effect as a treaty of peace or a boundary treaty; an agreement that is intended to settle a profound and potentially deadly disagreement for all time, and which must be approached by an interpreter through this interpretative prism. As explained in **Chapter 8**, such treaties are less amenable to evolutionary interpretation (i.e., a changing meaning over time).

7.3. **Second**, the **Treaty Bargain** is the *quid pro quo* between the Parties reflected in the Treaty itself. While the present case concerns the rights, duties and entitlements of the Parties in respect of the Western Rivers under Article III, the Treaty Bargain is much broader, giving India extensive rights pursuant to Article II in respect of the Eastern Rivers, balancing Pakistan's rights under Article III. The overall division of the waters of the Indus system of rivers between the two riparians, granting each exclusive rights of use, is important context that informs the terms throughout the Treaty.

7.4. **Third**, the **Western Rivers Run-of-River Hydro Bargain** ("**Hydro Bargain**") rests on the general rule of "let flow"/non-interference/no storage in respect of the Western Rivers (to Pakistan's benefit) subject to limited and tightly constrained exceptions regarding India's use of those waters (*inter alia*) for purposes of hydroelectric power generation.

7.5. This Chapter proceeds as follows:

(a) **Section A** sets out the critical background to the Treaty and the bargains within it: the trauma of Partition and the crisis of April 1948, whereby India cut off Pakistan's access to the waters of the Eastern Rivers and threatened the viability of the young State as a political and territorial entity. That crisis, and the potential for it to be repeated, both informed and dictated the Treaty and continues to be an essential part of the background against which the Treaty is to be interpreted.

(b) **Section B** discusses the Peace Bargain, the mechanism by which the question of the Indus system of rivers was resolved through an enduring and definitive division of the Western and Eastern Rivers between Pakistan and India, respectively. Drawing on the *travaux préparatoires* and circumstances of conclusion of the Indus Waters Treaty, discussed in detail in **Appendix A**, this section addresses the circumstances of the Treaty's conclusion, its drafting, and the process by which more cooperative models for the administration of the Indus system of rivers were considered, revealed to be unworkable, and discarded.

(c) **Section C** addresses the Treaty Bargain, examining the provisions of the Treaty whereby the division of the Indus system of rivers was effected.

(d) **Section D** provides an overview of the Hydro Bargain, which is then addressed in more detail in **Chapter 9**.

(e) **Section E** provides a conclusion on the three bargains.

7A PRELUDE TO THE INDUS WATERS TREATY: THE APRIL 1948 CRISIS AND ITS AFTERMATH

7.6. On 19 September 1960, Pakistan and India came together in Karachi to conclude a grand bargain: the Treaty. The bargain was ambitious, implementing a definitive and enduring division of the world's largest continuous irrigation system, the rivers of the Indus Basin, as they flowed through the territories of the two States. Furthermore, it was intended to implement the wider Peace Bargain, settling a significant conflict between co-riparians that, left unchecked, would almost certainly have turned violent.

7A.1 Large-scale irrigation works and the resolution of riparian disputes in British occupied India

7.7. The bargain of 1960 was a long time coming. Large scale hydraulic works on the Indus system of rivers began in 1851 under the British, in what was then a unified Punjab. By the early 1900s, an extensive network of canals throughout the region had been developed—

including the Chenab Canal, "one of the efficient and successful canal systems in India, if not the world", which converted 2.9 million acres of barren land into cotton and wheat fields.[459]

7.8. The British programme, however, was deliberately "devised irrespective of the territorial boundaries" between the provinces of British occupied India and the various Princely States.[460] This insensitivity to borders, both internal and international, led to regular disputes over water allocation. The most substantial of these culminated in the Province of Sind raising a formal complaint in 1939 regarding proposals by the Province of Punjab to dam the Sutlej. The 'Sind-Punjab Dispute' was eventually resolved by a three-member commission chaired by Sir Benegal Rau—then a Judge of the Calcutta High Court, and later a member of the International Court of Justice ("**ICJ**"). The Rau Commission issued a unanimous report in 1942, concluding that the planned interference with the Sutlej by the Punjabi projects "when superimposed upon the requirements of projects already in operation or about to be completed, are likely to cause material injury to Sind's inundation canals".[461] To that end, it directed a three-year delay in the commencement of Punjabi proposals such that less harmful designs could be investigated and a settlement negotiated.

7.9. The Rau Commission's recommendations were implemented via a 1945 Draft Agreement regarding the Sharing of the Waters of the Indus and the Five Punjab Rivers (the "**1945 Draft Agreement**") between the chief engineers of the two provinces. This allocated 75 per cent the water of the Indus River to the lower riparian Sind while allocating 96 per cent of the waters of its tributaries to the upper riparian Punjab; approved Punjab's plans for the Sutlej while rendering any future hydraulic works in the Indus system of rivers subject to Sindhi consent; and laid down a detailed schedule for the sharing of water supplies between the two provinces during times of lean flow.[462] Although the 1945 Draft Agreement never entered into force owing to disagreements on the settlement payable from Punjab to Sind, it nevertheless

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[459] F. J. Fowler, "Some Problems of Water Distribution between East and West Punjab" (1950) 4 *Geo Rev* 583, **Exhibit P-0271**, p. 585. *See also* and generally D. Gilmartin, *Blood and Water: The Indus River Basin in Modern History* (University of California Press 2020), **Exhibit P-0347**, pp. 156–157.

[460] *Completion Report of the Sirhind Canal* (1894), quoted in Laylin, 1957, **Exhibit P-0273**, p. 22 (emphasis removed). The statement was a *leitmotif* of British hydraulic policy across the Basin, and derived from a statement made in 1865 by the Secretary of State for India: R. B. Buckley, *The Irrigation Works of India and Their Financial Results, being a Brief History and Description of the Irrigation Works of India, and of the Profits and Losses Which They Have Caused the State* (WH Allen 1880), **Exhibit P-0348**, p. 161.

[461] *Report of the Indus (Rau) Commission* (1942), vol. 1, p. 57, quoted in Laylin, 1957, **Exhibit P-0273**, p. 25.

[462] Draft Agreement between the Punjab and Sind regarding the Sharing of the Waters of the Indus and Five Punjab Rivers, 28 September 1945 ("**1945 Draft Agreement**"), **Exhibit P-0349**.

showed the way with respect to an equitable distribution of the waters of the Indus system of rivers.

7A.2 The April 1948 Crisis and its aftermath

7.10. Although serious, the Sind-Punjab Dispute and other disagreements about the Indus system of rivers paled in comparison to what came next. In August 1947, Sir Cyril Radcliffe's Boundary Commission drew the line of Partition across Punjab. This had two immediate consequences for riparian rights as between a newly created India and Pakistan. First, West Punjab—and, by extension, Pakistan—were cut off from the headwaters of the Chenab, the Ravi and the Sutlej, and the entirety of the Beas.[463] Second, the headworks at Madhopur and Firozpur, on which West Punjab's irrigation substantially depended, were in East Punjab and so remained in Indian hands.

7.11. Despite these consequences, the Boundary Commission did not specifically provide for water deliveries from East to West Punjab. Nor did the associated Arbitral Tribunal charged with resolving post-Partition questions,[464] instead "hand[ing] down decisions premised on the continuation of irrigation supplies".[465] This omission was deliberate. As Sir Patrick Spens, the former Chief Justice of India, and the Chairman of the Arbitral Tribunal, recalled:

> "I remember very well suggesting whether it was not desirable that some order should be made about the continued flow of water … we were invited by both the Attorney-Generals [of India and Pakistan] to come to our decision on the basis that there would be no interference whatsoever with the then existing flow of water.… Our awards were published at the end of March 1948.… I was very much upset that almost within a day or two there was a grave interference with the flow of water on the basis of which our awards had been made."[466]

7.12. On 1 April 1948, literally the day after the post-Partition awards were handed down, and the Spens Tribunal rendered *functus officio*, East Punjab severed the water supply to West Punjab. Lahore was simultaneously deprived of its main source of municipal water as well as

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[463] The Indus has its headwaters in China, and the Jhelum has its headwaters in Kashmir. Both, like the Chenab, enter West Punjab through Kashmir, with the upper reaches of these rivers falling under Indian control by November 1947.
[464] *See* generally, P. Spens, "The Arbitral Tribunal in India 1947–48" (1950) 36 *TGS* 61, **Exhibit P-0272**.
[465] Laylin, 1957, **Exhibit P-0273**, pp. 26–27.
[466] P. Spens, "Statement before the East India Association and the Overseas League" (London, 23 February 1955), quoted in Laylin, 1957, **Exhibit P-0273**, p. 27. *See also* the summary of the *Kishenganga* Court in the *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 130−131.

power from the Mandi Hydroelectric scheme.[467] That day, "India cut off the flow of water in every irrigation canal which crossed the India-Pakistan boundary."[468]

7.13. The reason given by East Punjab for this ambush was that West Punjab had failed to renew a December 1947 standstill agreement, whereby East Punjab agreed to supply water to the Dipalpur Canal and to the lower reaches of the Upper Bari Doab Canal, which happened to expire on 31 March 1947. As the cost of renewal, East Punjab demanded that West Punjab recognise expressly that it had no right to the water.[469] When recognition was not given, the canals remained closed, resulting in acute distress for the people of Pakistan.

7.14. An authoritative historical account of the April 1948 crisis describes India's motivations for this dramatic step as follows:

> "What lay behind India's action at this time? Certainly many factors played a part. Pakistan had imposed an export duty on raw jute leaving East Bengal for the jute mills in West Bengal (India). Of far more importance was the situation in Kashmir, a situation which […] underlay almost every action and position taken by either country in the Indus Basin from this point forward. […] A further, fundamental factor also operated. Certain of the Indian leaders were completely unreconciled to the emergence of Pakistan as an independent state […]. They had gone along with Partition as the only way to secure Independence, but once Pakistan had been established, they felt entitled to use every means at their disposal to wreck her economy, to demonstrate that she could not succeed alone, and thus to bring her back to India. Denial of vital irrigation water would be one way to expedite the process. Finally, and perhaps most directly, the canal closures of April 1948 were an assertion of India's claim to all the water in all the rivers that flowed through her territory. At one stroke the closures not only destroyed the hopes expressed by Radcliffe in his Award, but they implemented the sentiment attributed by Moseley to Nehru, 'that what India did with India's rivers was India's affair'".[470]

7.15. The situation quickly became desperate. As Chaudry Muhammad Ali, then-Federal Secretary, and later Prime Minister of Pakistan, observed:

> "There was acute distress which, with every day that passed, became more and more intolerable. In large areas where the subsoil is brackish there was no drinking water. Millions of people faced the ruin of their crops, the loss of their herds, and eventual starvation due to lack of water."[471]

[467] Michel, 1967, **Exhibit P-0234**, p. 196.
[468] Government of Pakistan, "The Indus Basin Irrigation Water Dispute", 8 December 1952, **Exhibit P-0350**, ¶ 7.
[469] *Id.*.
[470] Michel, 1967, **Exhibit P-0234**, pp. 196–197.
[471] C. M. Ali, *The Emergence of Pakistan* (Columbia University Press 1967), **Exhibit P-0274**, p. 272.

7.16. The immediate crisis was ultimately ended one month later on 4 May 1948 via the Inter-Dominion Water Agreement, presented by India to Pakistan as a *fait accompli*, "to be signed without changing a word or a comma".[472] Pursuant to this document, some (but not all[473]) of the waters that flowed through the affected canals were returned to West Punjab in exchange for seigniorage payments. This hastily-concluded *modus vivendi* was temporary by design and contained no admission by either disputant as to the riparian rights of the other—although Pakistan was required by its terms to pay for water over which it asserted a legal entitlement. It recorded East Punjab's position as being that "the proprietary rights in the waters of the East Punjab vest wholly in the East Punjab Government and that the West Punjab Government cannot claim any share of these waters as a right".[474] The West Punjab position, conversely, was that the "the point has conclusively been decided in its favour by implication by the [Spens] Arbitral Award and that in accordance with international law and equity, West Pubjab has a right to the waters of the East Punjab Rivers".[475]

7.17. Although provisional, the Inter-Dominion Water Agreement restored a measure of calm to riparian relations between the two states. But the danger was clear. When David Lilienthal, the founding chairman of the Tennessee Valley Authority, visited the Indus Basin in 1951 for Collier's Magazine with the blessing of the U.S. State Department, he noted:

> "Pakistan includes some of the most productive food-growing lands in the world in western Punjab […] and the Sind. But without water for irrigation this would be desert. 20,000,000 acres would dry up in a week, tens of millions would starve. No army, with bombs and shellfire, could devastate a land as thoroughly as Pakistan could be devastated by the simple expedient of India's permanent shutting off the sources of water that keep the fields and people of Pakistan alive. India has never threatened such a drastic step, and indeed denies any such intention – but the power is there nonetheless."[476]

7.18. Mr Lilienthal also observed in the Pakistani people the lasting effects of the incident of 1948:

> "I saw the source of water supply for Lahore and the surrounding farming country near the border when (probably for some operating reason) India had cut down the flow;

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[472] *Id.*.
[473] Supplies were mostly restored in the principal Central Bari Doab and Dipalpur canal systems; but not in the Bahawalpur State Distributary which, prior to Partition, irrigated 62,000 acres: Laylin, 1957, **Exhibit P-0273**, fn. 19 on p. 27.
[474] Inter-Dominion Water Agreement, **PLA-0044**, ¶ 1 (*see* also, Annex to Annexure A of the Indus Waters Treaty 1960, **PLA-0001**).
[475] *Id.*.
[476] Lilienthal, 1951, **Exhibit P-0233**, quoted in Laylin, 1957, **Exhibit P-0273**, p. 31.

> every passer-by could see how low the canal's waters had fallen. An hour later I talked to Pakistanis so furious and worried they were ready to fight with their bare hands. Later in the day, the waters were up again; but the fear was still there. In the spring of 1948, during international negotiations as to the allocation of water for irrigation, India cut off most of the supply of water to Pakistan for a month, causing distress, loss of crops and general disruption. This rankles and makes Pakistan fearful of the future."[477]

7.19. He saw first-hand India's expansive canal-building and irrigation program, commenting that "[m]ost of this new withdrawal of water will come from rivers or canals within India which would otherwise flow on to Pakistan".[478] He visited one dam that was capable of storing "the entire flow of the Sutlej River for a year".[479]

7.20. The April 1948 crisis had demonstrated what India, though East Punjab, was capable of with respect to the waters of the Indus Basin. The effect of this crisis on Pakistan's leaders cannot be overstated, creating an enduring impression that would guide Pakistan's water policy moving forward. As one leading environmental historian has put it:

> "The fear and suspicion that East Punjab's shutting off of water in April 1948 produced among Pakistani leaders never evaporated. A new and vulnerable state like Pakistan, with a weak economy and a faltering political system, could hardly afford such a jolt to its stability."[480]

7.21. Pakistan was well aware that the Inter-Dominion Water Agreement was a stopgap, insufficient to safeguard its riparian rights. Between 1948 and 1951, Pakistan attempted but failed to reach a permanent agreement with India. India refused Pakistan's request to submit their dispute to the ICJ, or to another third-party dispute settlement mechanism. It was clear to Pakistan "that India's purpose was to prolong negotiations until construction of new irrigation canals and other engineering works in India had been completed, at which time those facilities would be used to deprive Pakistan of supplies of water upon which the country is totally dependent."[481] A grand technical bargain, akin to the 1945 Draft Agreement, was needed; one that would ensure that India's capacity to control or otherwise interfere with Pakistan's water supply was regulated and minimised—preferably to vanishing point.

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[477] Lilienthal, 1951, **Exhibit P-0233**, p. 8.
[478] *Id.*.
[479] *Id.*.
[480] D. Haines, *Rivers Divided: Indus Basin Waters and the Making of India and Pakistan* (Hurst 2017), **Exhibit P-0351**, p. 56.
[481] Government of Pakistan, "The Indus Basin Irrigation Water Dispute", 8 December 1952, **Exhibit P-0350**, ¶ 12.

7B THE PEACE BARGAIN

7.22. The reasonable apprehension generated by the April 1948 crisis was central to Pakistan in its approach to the Treaty and is reflected—as will be shown—in the terms of the Treaty itself.

7.23. Pakistan's apprehension informs each of the three bargains that underpin the Treaty. At the highest level, it is manifested in the Peace Bargain—the diplomatic settlement by which the Parties, realising the immense threat that riparian rights in the Indus system of rivers posed to regional stability, undertook to divide the waters of that Basin between them.

7B.1 Lilienthal's proposal and the commencement of negotiations

7.24. The Peace Bargain would not be realised easily. In the immediate aftermath of the April 1948 crisis, it fell to each of Pakistan and India to justify their positions with respect to the waters of the Basin. The legal gulf between them was wide. India asserted an absolute sovereignty over the rivers that rose in or flowed through territory under its control, without regard to the rights of any lower riparian. Pakistan, conversely, considered that the rights that its people had acquired over a portion of those same waters through long use were essential to the survival of the State as a viable territorial and economic unit.[482]

7.25. As part of his 1951 discussion of the Indus system of rivers, Lilienthal had proposed that it might be administered by an entity similar to his own Tennessee Valley Authority—the world's first integrated river-valley development agency—which held a number of economic and development competencies across state lines, including flood control, power generation and land management. He proposed the shared management of the waters:

[482] D. Haines, *Rivers Divided: Indus Basin Waters and the Making of India and Pakistan* (Hurst 2017), **Exhibit P-0351**, pp. 43–58. On the relative legal strength of these positions, *see* the recollection of Pakistan's foreign legal adviser, the American attorney John Laylin: Laylin, 1957, **Exhibit P-0273**, pp. 28–30. India retained as his opposite number the German professor Friedrich Berber, who was a prominent critic of liberal international law and "a scholar-propagandist for the Nazi foreign policy elite": K. Reitzler, "Fluid Boundaries in the Divisible College: The International Law Association and the Indus Waters Dispute in the 1950s", in M. M. Payk and K. C. Priemel (*eds*.), *Crafting the International Order* (OUP, 2021) 221, **Exhibit P-0352**, p. 227. It is notable that the Indian position was more or less refuted by the International Law Association in its Resolution on the Use of the Waters of International Rivers, providing that unless otherwise provided, "each co-riparian State is entitled to a reasonable and equitable share in the beneficial uses of the waters of the drainage basin": International Law Association, "Resolution on the Use on the Waters of International Rivers" from Report to the 48th Conference held in New York, 1–7 September 1958, **PLA-0045**, p. 1.

> "Pakistan's position - that she has the legal right to the uninterrupted flow of water, a right to a share of waters stored by India's dams upstream […] though inadequate, should be the starting point, should be accepted as a minimum, without question.
>
> The starting point should be […] to set to rest Pakistan's fears of deprivation and a return to desert. Her present use of water should be confirmed by India, provided she works together with India (as I believe she would) in a joint use of this truly international river basin on an engineering basis that would also (as the facts make clear it can) assure India's future use as well".[483]

7.26. The proposal required "an 'apolitical' approach based on technical and engineering data, and an assumption that the Indus Basin constituted a single hydrological unit".[484] The vision that Lilienthal sketched, together with his recommendation that the World Bank play a role in its establishment, caught the eye of the Bank's then-President, Eugene Black, who offered the Bank's good offices to Pakistan and India pursuant to specific terms of reference.[485] In his letter of 8 November 1951, Mr Black set out three "essential principles of Mr Lilienthal's proposal", namely:

> (a) The water resources of the Indus system of rivers are sufficient to continue all existing uses and to meet the further needs of both countries for water from that source.
>
> (b) The water resources of the Indus system of rivers should be cooperatively developed and used in such manner as most effectively to promote the economic development of the Indus system of rivers viewed as a unit.
>
> (c) The problem of development and use of the water resources of the Indus system of rivers should be solved on a functional and not a political plane, without relation to past negotiation and past claims and independently of political issues.[486]

7.27. Mr Lilienthal remained engaged in the background during this period, and wrote to India's Additional Secretary, Ministry of Natural Resources and Scientific Research, following

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483 Lilienthal, 1951, **Exhibit P-0233**, p. 9.

484 D. Haines, *Rivers Divided: Indus Basin Waters and the Making of India and Pakistan* (Hurst 2017), **Exhibit P-0351**, p. 107. *See also* D. Haines, "(Inter)Nationalist rivers?: cooperative development in David Lilienthal's plan for the Indus Basin, 1951" (2014) 6 *Water Hist* 133, **Exhibit P-0353**.

485 Letter from Mr Black to Prime Minister Khan, 6 September 1951, **Exhibit P-0354**; Letter from Mr Black to Prime Minister Nehru, 6 September 1951, **Exhibit P-0355**.

486 Letter from Mr Black to Prime Minister Nazimuddin, 8 November 1951, **Exhibit P-0356**, p. 1; Letter from Mr Black to Prime Minister Nehru, 8 November 1951, **Exhibit P-0357**, p. 1.

on from Mr Black's November 1951 letter. He stressed the lack of "explicitness"[487] in Mr Black's letters of 8 November 1951 of reference to the key issue identified in his earlier article, of Pakistan's concerns regarding a "return to desert". Mr Lilienthal recalled his previous discussions with the Indian Additional Secretary on this issue:

> "[The Secretary] stated that this point, as I made it in my article and proposal, had been brought up and discussed with your Prime Minister. The purport of what you told me was that Mr. Nehru had stated that he had no intention to build the well-being of the people of East Punjab on the misery and suffering of the common people of West Punjab. […] Take the case of ordinary farmers of Pakistan, feeding themselves and their families on land that now and prior to partition had been irrigated by the waters of the Indus. Need they fear that the quantity of water would be cut down by India, while these discussions of a joint plan were under way?
>
> […] Unless I wholly misunderstood you, you assured me that no such diminution and no such privation would occur; on the contrary, the whole purpose of India would be to increase the prosperity and livelihood of both the farmers of India and of Pakistan."[488]

7.28. Both States accepted the Bank's invitation and, notwithstanding certain proposed modifications, the principles set out in Mr Black's letter of 8 November 1951 provided "the broad basis on which the engineers [were to] meet".[489] It was agreed that the function of the working party, just as Mr Lilienthal had proposed, would be:

> "[T]o work out, and the ultimate objective is to carry out, specific engineering measures by which the supplies effectively available to each country will be increased substantially beyond what they have ever been. […] [They also agreed that] while the cooperative work continues with the participation of the Bank neither side will take any action to diminish the supplies available to the other side for existing uses."[490]

7B.2 The 1954 Proposal and the division of the Indus system of rivers

7.29. Following further discussions, and a comprehensive tour of the Basin by the working group, negotiations for the Treaty began in earnest in September 1953. The original concept of shared management of the Basin's resources failed at the outset. The reasons why were set out in a proposal, put forward by the Bank's representative in the negotiations, at the urging of Pakistan and India on 5 February 1954[491] (the "**1954 Proposal**"). In framing that Proposal, the

[487] Letter from Mr Lilienthal to Dr Khosla, 13 December 1951, **Exhibit P-0358**, p. 4 (emphasis removed).
[488] *Id*., pp. 4–5.
[489] World Bank, Notes for Mr Black's Party, "India-Pakistan Water Rights", 23 January 1952, **Exhibit P-0359**.
[490] Letter from Mr Black to Prime Minister Nazimuddin, 13 March 1952, **Exhibit P-0360**. An identical letter was sent to India.
[491] 1954 Proposal, **Exhibit P-0130**.

Bank identified three divisions between Pakistan and India that had caused Lilienthal's broad vision to fail:

(a) **First**, even assuming full development of the Indus system of rivers, there would not be enough water in the system to supply all the needs of the areas and the people dependent upon it. This meant that "[a]ny plan must involve a large element of compromise under which each country will have to forego some of the irrigation uses that it would wish to develop".[492]

(b) **Second**, the involvement of two sovereign States in the process meant that management of the Indus system of rivers as a single economic unit was not feasible, as each State "may also […] be reluctant to have works regulating water supplies on which they depend constructed in territory controlled by another country"—a statement in which the aftershocks of April 1948 were writ large. To that end, "[t]he prospects of being able to establish an efficient and smooth-running joint administration are not favorable", such that "any comprehensive plan must be framed with this limitation in mind".[493]

(c) **Third**, and most significantly:

> "The plans put forward by the two sides differ fundamentally in concept. An essential part of the Pakistan concept is that the existing uses of water must be continued from existing sources. Moreover, 'existing uses,' in the Pakistan plan, include not only the amounts of water that have actually been put to use in the past, but also allocations of water which have been sanctioned prior to Partition, even though the necessary supplies have not been available for use. This concept protects Pakistan's actual and potential uses on the Eastern rivers [i.e., the Ravi, Sutlej and Beas] and reserves most of the water in the Western rivers [i.e., Indus, Jhelum and Chenab] for use in Pakistan.
>
> The corresponding concept of the Indian plan, on the other hand, is that although existing uses (here defined to include actual historic withdrawals) must be continued, they need not necessarily be continued from existing sources. This concept permits the water in the Eastern rivers [i.e., the Ravi, Sutlej and Beas] which is now used in Pakistan to be released for use in India and replaced by water from the Western rivers [i.e., Indus, Jhelum and Chenab]."[494]

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[492] *Id.*, ¶¶ 9–10.
[493] *Id.*, ¶¶ 11–13.
[494] *Id.*, ¶¶ 14–15.

7.30. The 1954 Proposal concluded that "[t]his basic divergence of concept, together with the other two difficulties mentioned above, effectively blocks progress towards a settlement".[495]

7.31. In place of the negotiating parties' proposals, therefore, a new suggestion was put forward on the Bank's behalf "based on concepts of its own, which produce a fair and economic result".[496]

7.32. The new concept was based on a critical central principle:

> "The Bank proposal […] embodies the principle that, in view of existing circumstances, allocation of supplies to the two countries should be such as to afford the greatest possible freedom of action by each country in the operation, maintenance and future development of its irrigation facilities. *It is desirable, as far as practicable, to avoid control by India over waters on which Pakistan will be dependent*, and enable each country to control the works supplying the water allocated to it and determine in its own interests the apportionment of waters within its own territories. This principle has not merely the negative advantage of minimizing friction between the two countries (a matter of some significance in view of the disputes that have arisen from sharing waters from the same river) and of avoiding the necessity of a costly and perhaps ineffective permanent joint administration. It also has a positive advantage. There is every reason to believe that leaving each country free to develop its own water resources in the light of its own needs and resources, and without having to obtain the agreement of the other at each point, will in the long run most effectively promote the efficient development of the whole system".[497]

7.33. This principle, suggested by the Bank, was significantly less than Pakistan desired. Nonetheless, it met Pakistan's central negotiating objective, borne of the April 1948 crisis: Indian control over the waters that Pakistan relied upon was to be avoided "as far as practicable".[498] The significance of this compromise to Pakistan's approach to the Treaty, and to this case, cannot be overstated.

7.34. The 1954 Proposal, in essence, divided the Indus system of rivers between Pakistan and India. Pakistan would receive exclusive use of the 'Western Rivers'—the Jhelum, the Chenab and the Indus itself—passage of which through the Himalayas in Kashmir rendered them difficult for India to exploit for irrigation. India, in turn, would receive exclusive use of waters of the "Eastern Rivers"—the Ravi, the Sutlej and the Beas. These easily accessible

[495] *Id.*, ¶ 16.
[496] *Id.*, ¶ 20.
[497] *Id.*, ¶ 22 (emphasis added).
[498] *Id.*.

watercourses ran through the plains of Punjab and were the foundation of the British canal system that had watered Indian crops for decades.

7.35. This basic deal, which made provision for its implementation via a transition period, was presented in the following terms:

(a) The entire flow of the Western Rivers (Indus, Jhelum and Chenab) would be available for the exclusive use and benefit of Pakistan, and for development by Pakistan, except for the insignificant volume of Jhelum flow presently used in Kashmir.

(b) The entire flow of the Eastern Rivers (Ravi, Beas and Sutlej) would be available for the exclusive use and benefit of India, and for development by India, except that for a specified transition period India would continue to supply from these rivers, in accordance with an agreed schedule, the historic withdrawals from these rivers in Pakistan.

(c) The transition period would be calculated on the basis of the time estimated to be required to complete the link canals needed in Pakistan to make transfers for the purpose of replacing supplies from India.[499]

7.36. The Bank was clear at the time about the advantages of the 1954 Proposal:

> "One of the merits of the Bank proposal is that, unlike the plans of [Pakistan and India], it avoids the complexities that would require the establishment of a permanent joint commission.
>
> A further advantage of the Bank proposal lies in the fact that, after transfer works are completed, each country will be independent of the other in the operation of its supplies. Each country would be responsible for planning, constructing and administering its own facilities for its own interests and free to allocate supplies within its own territories as it sees fit. This should provide strong incentives to each country to make the most effective use of water, since any efficiency accomplished by works undertaken by either country for storage, transfer, reduction of losses and the like will accrue directly to the benefit of that country. The same will be true of efficiency achieved in operations. […] By contrast, if the supplies from particular rivers were shared by the two countries, the administrative complexity of arranging necessary adjustments to meet variations in flow and scheduling for crop needs would be formidable".[500]

[499] *Id.*, ¶ 24.
[500] *Id.*, ¶¶ 39–40.

7.37. The 1954 Proposal thereby provided the Peace Bargain that underpins the Treaty. Its fundamental premise of "mutual independence" whereby "[e]ach country will be free to use the waters allocated to it as it sees fit"[501] met Pakistan's negotiating objectives; namely, to limit India's control over its water supplies such that the events of April 1948 could not be repeated. It was commended as such by Mr Black in a letter to Pakistan's Prime Minister, which spoke of "a fair, understandable and definitive division of waters [that] would eliminate a point of serious friction between the two countries".[502] It was built upon, *inter alia*, in the Bank's 1956 Aide Memoire[503], which set out certain adjustments to the 1954 Proposal,[504] particularly insofar as the transition arrangements were concerned. The 1954 Proposal, as adjusted in the 1956 Aide Memoire, provided the basis of discussions moving forward.[505] And it remained unquestioned in the suggested Heads of Agreement that the Bank communicated to Pakistan and India on 13 May 1957[506] ("**May 1957 Heads of Agreement**").

7B.3 The May 1957 Heads of Agreement and the question of Indian hydropower on the Western Rivers

7.38. The May 1957 Heads of Agreement are significant and merit quoting in some detail. They commenced by restating the basic division and the exclusivity entailed in the proposed treaty, entrenching these features of Indo-Pakistani relations in the Indus Basin:

> "1. Subject to the provisions of the succeeding paragraphs of this Annex, the entire flow of the three Western Rivers of the Indus System (Indus, Jhelum and Chenab) shall be available for the exclusive use and benefit of Pakistan and for development by Pakistan, and the entire flow of the three Eastern Rivers of the Indus system (Ravi, Beas and Sutlej) shall, as from the expiration of the final transitional period hereinafter in this Annex referred to, be available for the exclusive use and benefit of India and for development by India.
>
> 2. (a) To the extent that historic irrigation uses in the State of Jammu and Kashmir have up to now been met from the flow of the Indus or of the Jhelum or of the Chenab or of the Ravi, they shall continue to be met.

[501] *Id*. ¶¶ 41 and 43.
[502] Letter from Mr Black to Prime Minister Mohammed Ali, 8 February 1954, **Exhibit P-0361**, p. 2.
[503] 1956 Aide Memoire, **Exhibit P-0131**.
[504] *Id*., ¶ 4: "[t]he Bank continues to hold the view that the 'division of the waters' contemplated by the Bank Proposal of February 1954 affords the best prospects for a settlement of the Indus Waters question".
[505] *See* **Chapter 2** and **Appendix A**.
[506] Letter from Mr Iliff to Mr Mueenuddin (with enclosure), 13 May 1957, **Exhibit P-0362**, Annex setting out some suggestions for 'Heads of Agreement' ("**May 1957 Heads of Agreement**").

> (b) Projects for the development of additional uses in the State of Jammu and Kashmir from the flow of the Indus, Jhelum or Chenab shall be subject to review and to determination in the manner provided by paragraph 10(g) of this Annex."[507]

7.39. Recognising that some form of monitoring of the division would be required, the Heads of Agreement further introduced the concept that would, in due course, become the Permanent Indus Commission established by Article VIII of the Treaty.[508] This earlier iteration of the Commission—then called the Indus Waters Commission—was to supervise the transition arrangements. But the Bank also envisaged a more enduring role for it that entrenched the principles of division and exclusive use that underpinned the 1954 Proposal and, in due course, the Treaty itself. This was based on the idea that India would be able to make strictly limited use of the Western Rivers as they flowed through Indian-controlled Kashmir. Thus:

> "10. The functions of the Commission shall be the following:
>
> […]
>
> (g) A review of, and determination of, all proposals for future local development in the State of Jammu and Kashmir from the flow waters of the Indus, the Jhelum or the Chenab. In carrying out any such review and in making any such determination, the Commission shall be guided by the principle that *such development shall comprise relatively insignificant consumptive uses*.
>
> (h) A review of, and a determination of, all proposals for the construction of works on the Indus, the Jhelum or the Chenab, outside the boundaries of Pakistan, *which are likely to interfere with the timing of the natural flow into Pakistan of the waters of any of these rivers*."[509]

7.40. These supervisory provisions reflect an exception that proves the general rule. In the Bank's mind, while India could exploit the Western Rivers whilst they flowed through territory that it controlled, such exploitation was to be "relatively insignificant", and the Commission was to have oversight of any project that was "likely to interfere" with the natural flow of these watercourses. Pakistan's downstream rights on the Western Rivers remained paramount and unquestioned.

7.41. Into this paradigm was introduced the question that has been the subject of every dispute of significance that has arisen under the Treaty—the capacity of India to exploit the

[507] *Id.*, May 1957 Heads of Agreement, ¶¶ 1–2.
[508] *Id.*, ¶ 3.
[509] *Id.*, May 1957 Heads of Agreement, ¶¶ 10(g)–(h) (emphasis added).

Western Rivers to produce hydroelectric power. This is also relevant to the Treaty Bargain and the Hydro Bargain discussed below in **Chapters 7C and 7D.**

7.42. Pakistan's initial position—as set out in a 14 June 1957 memorandum accepting the principled foundation of the May 1957 Heads of Agreement—was clear: "Pakistan […] could not agree to the control by India of the Western Rivers even through works for generation of Hydroelectricity".[510] India's position, while it also accepted the May 1957 Heads of Agreement as the basis for discussion moving forward,[511] was that it should be allowed to build HEPs on the Western Rivers. While Pakistan eventually acceded to Indian HEP construction in principle, the precise modalities of that principle—and its status as a limited exception to the general rule that Pakistan alone was to have use of the Western Rivers—were a central preoccupation of the negotiations as they moved forward.

7.43. This debate was not only about India's use of the waters. As explained in **Chapter 4** above, the operation of any HEP, save for the most basic designs,[512] often requires the storage of water in a reservoir. Not only does this allow the HEP operator to remove water from the watercourse—it can also give the HEP operator control over any water so removed, to be retained or released as the operator directs. For Pakistan, this potential control by India evoked memories of the trauma of the April 1948 crisis. It accordingly approached the possibility of Indian HEP construction on the Western Rivers with the utmost caution.

7.44. This much is demonstrated by contemporaneous internal Pakistani communications. On 17 August 1959, Pakistan's High Commissioner in London wrote to the Ministry of Works, Irrigation and Power in the following terms:

> "We are still working on the formula regarding non-consumptive uses [i.e., production of hydroelectric power] by India on the Western Rivers. The Bank gave us a formula (Enclosure I) which had been worked out between them and the Indians. I objected to it strongly, as I felt that it gave India the right to build whatever works she required provided that she restricted herself in their operation in certain conditions. *It was stressed by me that we do not want any works to be built which gave India the power to hurt us and that restriction should be built upon the design of such works.* A formula

[510] Pakistan's Memorandum, 14 June 1957, **Exhibit P-0363**, ¶ 6.
[511] Letter from Mr Gulhati to Mr Iliff (with enclosure), 25 July 1957, **Exhibit P-0364**, ¶ 5.
[512] For example, that of a turbine placed in an existing watercourse, or in a diversion that re-joins the watercourse without an overall interruption in downstream flow.

was worked out by us […] (Enclosure II) which we gave to the Bank and after some discussion we have left it with the Bank."[513]

7.45. So far as is material, the Enclosures read:

> [ENCLOSURE I – General Wheeler's draft – 15.8.59]
>
> "In a run-of-the-river hydro-electric plant, the works shall be so designed that they will not be able to retain water above the operating pool level except for a temporary retention due to surcharge storage. The operating level is the fluctuating level due to the weekly and daily loads. Surcharge storage is that above the maximum level of the operating pool.
>
> The works will be operated so that the volume of water received in the river upstream of a power house, during a seven-day period, will be delivered into the river below the power house during the same period."
>
> [ENCLOSURE II – Draft given by Pakistan non Hydel formula on 15.8.59]
>
> "1. No works shall be built to generate hydro-electric power on the Western River above Pakistan border except run-of-the-river hydro-plants which do not interfere with the natural flow of the river except for the temporary detention of surcharge storage above an uncontrolled spill way,
>
> […]
>
> 3. The design of any work […] shall be communicated to Pakistan in advance so as to afford Pakistan a reasonable opportunity of objecting before the construction of any part of it is begun. Any dispute as to whether the design conforms to the provisions […] shall be submitted to arbitration."[514]

7.46. Elements of both Enclosures eventually found their way into the final Treaty. But both addressed Pakistan's central concern—that India was not to be able to interfere with the natural flow of the Western Rivers. In particular, they recognised that the default position was to be that Indian HEP construction on the Western Rivers was limited to run-of-river HEPs. As discussed in more detail elsewhere in this Memorial, unlike more conventional HEPs, which rely on timed releases of water from a large reservoir to drive a turbine, run-of-river HEPs achieve the same result through the natural flow of the watercourse, with no or minimal storage.

7.47. Pakistan made these points in an *aide mémoire* dated 22 August 1959, which reflected points made to Mr Black by Pakistan's President, protesting a *volte face* by India. It deserves quoting in full:

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[513] Letter from Mr Mueenuddin to Mr W. A. Sheikh (with enclosures), 17 August 1959, **Exhibit P-0365**, ¶ 1 (emphasis added).

[514] *Id*., Enclosures I and II.

> "1. The World Bank had all along recognised that in return for surrendering her rights on the Eastern rivers Pakistan will get the natural flow of the three Western rivers along with their tributaries for her exclusive use and benefit and that India will give up all the rights she claims to the waters of these Western rivers. The only exception to which Pakistan was willing to agree under pressure of the Bank was to guarantee only the historic (pre-partition) uses in Jammu and Kashmir which has been met from the flow of the Chenab and Jhelum together with such insignificant additional uses which may be met by minor extensions from existing channels or from small feeder streams. This position was accepted both by India and the Bank.
>
> 2. India has now asked for her right to use of the water without limit of Indus, Jhelum above Wular Lake, and Chenab above RL 2000, covering Jammu and Kashmir as well as Indian territory. They also demand the right to construct storages.
>
> 3. This is a complete reversal of the position that the entire flow of the Western rivers excepting for the insignificant uses in Jammu and Kashmir will be available to Pakistan. Pakistan Government consider India's present demand untenable and cannot accept it. This demand, if acceded to, would put India in a position to control Western rivers also and at the same time prejudice Pakistan's stand on Kashmir. The Government of Pakistan have, therefore, requested the Bank to ensure that the use of the water of the Western rivers in Jammu and Kashmir remain truly insignificant and that the water treaty should be so worded as not to prejudice Pakistan's position regarding Jammu and Kashmir territory."[515]

7.48. This protest again reflected Pakistan's consistent negotiating priorities. As the price for giving up the Eastern Rivers, it demanded and expected Indian involvement in the Western Rivers to be minimised. Interference was to be minimal, control reduced and the ability of India to store water on those rivers to be limited to the greatest possible extent.

7B.4 The drafting of the Treaty and the emergence of the "let flow" obligation

7.49. Pakistan's concerns were recognised, and its priorities given voice in increasing detail as part of the Treaty drafting process. On 15 September 1959, the Bank produced a new Heads of Agreement[516] ("**Heads of Agreement 1959**"). These spelled out, with far greater granularity, Pakistan's rights to the waters of the Western River, and the corresponding restriction on India's interference with those waters, through the medium of the "let flow" obligation. Article IV of the Heads of Agreement 1959 provided:

> "(1) India shall let flow the waters of the Western Rivers free from any interference except for the following uses restricted in the case of each river to the drainage basin of that river:

[515] Letter from Mr Ahmad, Embassy of Pakistan to the United States, to Mr Laylin (with enclosure), 27 August 1959, **Exhibit P-0366**, enclosure (Aide Memoire dated 22 August 1959) (emphasis original).

[516] Indus Waters, Heads of Agreement, 15 September 1959 ("**Heads of Agreement 1959**"), **Exhibit P-0136**.

(i) Domestic uses;

(ii) Non-consumptive uses; and

(iii) Consumptive uses as set out below.

NOTE

The question of consumptive uses is being approached on the basis of fixing a quantum of use to be specified in the Treaty.

(2) India shall be entitled to generate hydro-electric power on the Western Rivers in accordance with the provisions of Annex 'B'.

(3) Pakistan shall be entitled to the unrestricted use of the waters of the Western Rivers except to the extent specified in Paragraphs (1) and (2) of this Article."[517]

7.50. Annex B to the Heads of Agreement 1959 was the forerunner of what became Annexure D of the Treaty—although it is fairly primitive by comparison, and was subject to elaboration before the Treaty was concluded. It set out design and operational constraints by India in respect of run-of-river HEPs constructed on the Western Rivers.

7.51. Again, internal Pakistan correspondence contemporaneous to the Heads of Agreement 1959 leaves no doubt as to what Pakistan required if it were to enter into the Treaty, which requirements were communicated to the Bank and India both. On 15 September 1959, Pakistan's High Commissioner again wrote to the Secretary of the Ministry of Works, Irrigation and Power. Commenting on the 1959 Heads of Agreement, he noted:

> "As regards our fears about Indian control over the waters of the Western Rivers, the Bank is refusing to take a definitive position. [Bank Vice-President WAB] Iliff contends that the Bank cannot formally admit that India might default from her Treaty obligations, but at the same time he appreciates and understands our fears. *I have, however, made it quite clear to [India's representative] that our Government would not, under any circumstances, agree to the construction of works which would give India the power to do us effective harm.* The question whether the potential for harm is effective or not can only be studied in the context of definite proposals."[518]

7.52. The first draft of the Treaty presented to the Governments, that of 9 December 1959 (the "**December 1959 draft**")[519], built upon the Heads of Agreement 1959. Article III of the

[517] *Id.*, Article IV, p. 6.
[518] Letter from Mr Mueenuddin to Mr W. A. Sheikh, 15 September 1959, **Exhibit P-0134**, ¶ 6 (emphasis added).
[519] Indus Waters Treaty 1960 draft of 9 December 1959 [without Annexures] ("**December 1959 draft**"), **Exhibit P-0139**.

December 1959 draft provided further granularity to India's "let flow" obligation in relation to the Western Rivers:

> "(1) Pakistan shall be entitled to receive for unrestricted use all those waters of the Western Rivers which India is under obligation to let flow under the provisions of Paragraph (2) of this Article.
>
> (2) India shall be under an obligation to let flow all the waters of the Western Rivers and shall not permit any interference with those waters except for the following uses, restricted […] in the case of each of the [Western Rivers] to the drainage basin thereof:
>
> (a) Domestic Use, subject to the provisions of Article IV (10);
>
> (b) Non-Consumptive Use;
>
> (c) Agricultural Use, as set out in Annexure C; and
>
> (d) Generation of hydro-electric power, as set out in Annexure D.
>
> […]
>
> (4) Except as provided in Annexure E, Indian shall not store any water of, or construct any storage works on, the Western Rivers." [520]

7.53. This language—which is clearly the basis of Article III of the Treaty as finally concluded—was significant for two reasons:

(a) **First**, it articulated the "let flow" obligation in Article III(1) and (2) in clear terms and matched it with a prohibition on "interference" with respect to the waters of the Western Rivers by India. "Interference with the waters", moreover, is defined very broadly in Article I(12), as referring to "any act of withdrawal therefrom or any man-made obstruction to their flow which causes a change in the volume of the daily flow of the waters".

(b) **Second**, and critically for the present case, it introduced in Article III(4) a prohibition on storage by India of the waters of the Western Rivers and the construction and operation of storage works thereon—save for those circumstances set out in Annexure E on storage works, which was yet to be drafted. The implications of such an arrangement were clear: storage by India was considered as a limited and tightly constrained exception to the "let flow"

[520] December 1959 draft, **Exhibit P-0139**, Article III.

rule, reflecting the paramountcy of Pakistan's right, per Article III(1), "to receive for unrestricted use all those waters of the Western Rivers".

7.54. The virtues of the approach to Article III set out in the December 1959 draft were apparent. It was originally proposed by the Bank's Vice-President and then-representative in the negotiations, Mr WAB Iliff, who would in due course sign the Treaty on the Bank's behalf. Writing to Pakistan's Finance Minister on 6 February 1960, Iliff said:

> "[W]e finally adopted the present language of Article III(1), and I myself must accept the credit, or the blame, for proposing that language.
>
> The present language achieves two results, namely:
>
> (a) It imposes an obligation on India to let the water flow; and
>
> (b) It establishes Pakistan's entitlement to that water thereby creating an international servitude.
>
> I am satisfied that there is no doubt and no reservation in the mind of any one, either in the Indian delegation, or the Bank, that the present language of Article III(1) and (2) imposes the treaty obligation on India to allow to flow down all waters of the Western Rivers, except those required for the uses to be permitted under the terms of Article III(2). This has been the intention of the language and I think the language satisfies the intention."[521]

7.55. This was also the understanding of both sides' negotiators. Mr Gulhati—India's principal negotiator—saw Iliff's letter and "voiced no dissent from its terms".[522] And reporting once more to the Secretary of Works, Irrigation and Power, Pakistan's High Commissioner to London noted that the December 1959 draft "by and large […] safeguards Pakistan's interests within the limits imposed by the agreement in principle reached between Mr Black and the Government of India and the Government of Pakistan".[523]

7B.5 Conclusions on the Peace Bargain

7.56. The Indus Waters Treaty has its origins in Partition and its immediate aftermath, the April 1948 crisis. During that crisis, India demonstrated that by exercising control over the Eastern Rivers, it could cut off irrigation and drinking water to large parts of Pakistan, destabilising the young State and placing millions in economic and/or physical danger from crop failure. Pakistan sought to resolve the fear and suspicion caused by the April 1948 crisis

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[521] Letter from Mr Iliff to Finance Minister Shoaib, 6 February 1960, **Exhibit P-0367**, p. 2 (emphasis original).
[522] Letter from Mr Iliff to Mr Mueenuddin, 2 April 1960, **Exhibit P-0240**.
[523] Letter from Mr Mueenuddin to Mr W.A. Sheikh, 15 December 1959, **Exhibit P-0140**, p. 1.

in the Treaty negotiation process, determined that it should never be repeated. It remains a central plank of Pakistan's water policy to this day.

7.57. While the Treaty was initially conceived of as a means for the shared management of the Indus system of rivers by Pakistan and India, it rapidly became apparent when negotiations commenced that this was impossible. The operating premise of the negotiations therefore became—via the 1954 Proposal—the definitive and enduring division of the Indus system of rivers between Pakistan and India, with Pakistan receiving the exclusive use of the Western Rivers and India receiving the exclusive use of the Eastern Rivers. In this way, the Treaty is akin to and has the same effect as a treaty of peace or a boundary treaty, intended to settle a profound and potentially deadly disagreement for all time. The terms of this settlement are reflected in the Treaty Bargain, discussed in the next section.

7C THE TREATY BARGAIN

7.58. By the beginning of 1960, the final version of the Treaty had taken shape. The fundamental deal at its heart was that, in exchange for giving up its rights to the Eastern Rivers, Pakistan expected, and obtained, full and comprehensive rights to the waters of the Western Rivers. Any use by India of those rivers was tightly controlled by the provisions of the Annexures, representing exceptions to the general rule—set down by Article III of the December 1959 draft treaty, and maintained in the final text—of their exclusive use by Pakistan with *de minimis* interference or storage by India.

7.59. Pakistan raised these matters early in the negotiations. They informed the positions of all participants throughout. In due course, they crystallised to form the central premise of the Parties' grand bargain—described by the Court of Arbitration in the *Kishenganga* case as "a defining characteristic of the Treaty".[524] The Treaty Bargain was premised on the division of the Western and Eastern Rivers, and the allocation of each for the exclusive use of Pakistan and India respectively.

7.60. Looming over all of this, from Pakistan's perspective, was the spectre of April 1948, and the existential terror that moment created. As if to confirm this, the final text of the Treaty included the Inter-Dominion Water Agreement that resolved that crisis as an annex to Annexure A, terminating it at the point at which the Treaty entered into force.

[524] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 410.

7.61. In the context of the present case, three elements of the Treaty Bargain are key to understanding the Treaty's operation:

(a) **First**, the core of Treaty Bargain itself, being the overall division of the waters of the Indus system of rivers between the two riparians, and granting each exclusive rights of use, as reflected principally in Articles II and III but informing the terms of the Treaty throughout.

(b) **Second**, the limited and strategic exceptions to that division so far as the Western Rivers were concerned, as acknowledged in Articles III(2) and (4) and operationalised by Annexures C, E and—critically for the present case—D.

(c) **Third**, the transitional arrangements whereby India would continue to supply Pakistan with water from the Eastern Rivers for a defined period, to allow Pakistan to construct the works necessary for it to transition to reliance on the Western Rivers for irrigation, as provided for in Articles II(5) and (6), IV(1) and V, and operationalised by Annexure H.

7.62. Within the context of the present case, the first two elements of the Treaty Bargain are key—the transition period having ended on 31 March 1970 as anticipated by Article II(6). The transition period will be referred to only to the extent necessary to understand the first and second elements.

7C.1 The scheme of the Treaty

7.63. Any understanding of the Treaty must begin with the overall scheme of that Treaty. An introduction to the scheme of the Treaty has been provided in **Chapter 6** above.

7.64. As explained in more detail in **Chapter 8** below, a treaty's preamble is often a useful tool in determining the purpose of the treaty and is part of the context of its terms.[525] In this case the Preamble to the Treaty provides:

> "The Government of India and the Government of Pakistan, being equally desirous of attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers and recognising the need, therefore, of fixing and delimiting, in a spirit of

[525] Vienna Convention on the Law of Treaties (adopted on 22 May 1969 and opened for signature on 23 May 1969, entered into force 27 January 1980) 1155 UNTS 331, 23 May 1969 ("**VCLT**"), **PLA-0005**, Article 31(2). *See* further R. Gardiner, *Treaty Interpretation* (OUP, 2nd ed. (2015)) ("**Gardiner, 2015**"), **PLA-0017**, pp. 216–217.

> goodwill and friendship, the rights and obligations of each in relation to the other concerning the use of these waters and of making provision for the settlement, in a cooperative spirit, of all such questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein, have resolved to conclude a Treaty in furtherance of these objectives."

7.65. This Preamble starts by setting out a broad goal: "attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers". But this statement, on its own, does not establish how this mission is to be accomplished: this is set out in the following clauses of the Preamble. Two directives are mentioned:

(a) **First**, "fixing and delimiting […] the rights and obligations of [Pakistan and India] in relation to the other concerning the use of these waters"; and

(b) **Second**, "making provision for the settlement […] of all such questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein".

7.66. The Treaty is a precise and carefully balanced bargain. It envisages that maximum utilisation of the waters of the Indus system of rivers swill be brought about, not through broad or open-ended concepts such as "equitable and reasonable" utilisation of the watercourse,[526] but through the stipulation of technical rights and obligations, and specification of how disagreements over these rights and obligations will be resolved.

7.67. To that end, the Treaty reflects a "self-contained regime", as the term is usually understood in international law,[527] that stands and falls within its own four walls.[528] This is confirmed by Paragraph 29 of Annexure G on applicable law, as discussed in **Chapter 8**.

7.68. This understanding of the Treaty is affirmed by its basic structure, which completes the division of the Indus system of rivers between Pakistan and India along self-contained and technical lines.

[526] *See*, e.g., Convention on the Law of the Non-Navigational Uses of International Watercourses, 21 May 1997, 2999 UNTS 1, **PLA-0046**, Article 5.
[527] *See*, e.g., *SS Wimbledon (Great Britain & Ors v Germany; Poland intervening)*, Judgment (1923) PCIJ Ser A No 1, **PLA-0047***,* pp. 23–24.
[528] *See also* in this respect Article XI of the Treaty, as discussed further below at paragraph 7.77.

7C.2 The division of the waters of the Indus system of rivers

7.69. In chronological terms, the division starts with the transition period. Per Article II(6), this began (retrospectively) on 1 April 1960 (which the Treaty, by Article I(16), refers to as the "Effective Date"), and was to last until 31 March 1970—with the possibility of an extension until 31 March 1973. Over the course of the transition period, Pakistan would progressively wean itself off dependence on the Eastern Rivers for irrigation by building a series of works to allow their replacement by the Western Rivers. Per the first sentence of Article II(9), "during the Transition Period, Pakistan shall receive for unrestricted use the waters of the Eastern Rivers which are to be released by India in accordance with the provisions of Annexure H". Per Article IV(1):

> "Pakistan shall use its best endeavours to construct and bring into operation, with due regard to expedition and economy, that part of a system of works which will accomplish the replacement, from the Western Rivers and other sources, of water supplies for irrigation canals in Pakistan which, on 15th August 1947, were dependent on water supplies from the Eastern Rivers."

7.70. Pakistan's transition to the Western Rivers was also to be in part facilitated by Articles V(1) and (2), which required India to contribute £62,060,000 (the equivalent of approximately £1.16 billion today) to the cost of the replacement works over the course of the transition period. Per Article V(3), India's contribution was to be administered by the Bank, in the form of an Indus Basin Development Fund. Further substantial contributions to the Fund were also to be made by Australia, Canada, Germany, New Zealand, the United Kingdom, the United States, and the Bank itself, pursuant to the terms of the separate Indus Basin Development Fund Agreement ("**IBDF Agreement**"), concluded on the same day as the Treaty itself.[529] Pakistan also made its own, smaller, financial contribution to the works.[530]

7.71. The generosity of the transition period was intended to reflect the fact that, pursuant to the second sentence of Article II(9), "[a]fter the end of the Transition Period, Pakistan shall have no claim or right to releases by India of any of the waters of the Eastern Rivers". India thereby achieved what East Punjab in April 1948 could not, as Pakistan agreed to "let flow" the waters of the Eastern Rivers, and grant India "unrestricted use" thereof before those rivers crossed finally into Pakistan.

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[529] IBDF Agreement, **PLA-0043**, § 2.01.

[530] *Id.*, Article II, § 2.04. Additional contributions were agreed via the Indus Basin Development Fund (Supplemental) Agreement, 31 March and 6 April 1964, 503 UNTS 388, **PLA-0048**.

7.72. The scope of Indian rights on the Eastern Rivers was confirmed in the main part of Article II. Article II(1) declared that "[a]ll the waters of the Eastern Rivers shall be available for the unrestricted use of India, except as otherwise provided in this Article". To that end, by Article II(2), Pakistan was permitted to use the waters of the Ravi and the Sutlej for Domestic and Non-Consumptive Use as defined by Articles I(10) and (11) where they crossed the Line of Control into Pakistan before returning to Indian-controlled territory, but was prohibited from using them for Agricultural Use within the meaning of Article I(9) or for the production of hydroelectric power. Aside from Domestic, Non-Consumptive and Agricultural Uses, Article II(3) declared that "Pakistan shall be under an obligation to let flow, and not permit any interference with, the waters (while flowing in Pakistan) of any Tributary which in its natural course joins the Sutlej Main or the Ravi Main before these rivers have finally crossed into Pakistan"—after which point, per Article II(4), "these rivers […] shall be available for the unrestricted use of Pakistan".

7.73. Today, India is in the process of rendering the residual clause of Article II(4) redundant. Through its canal and irrigation works, it will eventually divert all the waters of the Eastern Rivers prior to their final entry into Pakistan, save for excess caused by flood. In February 2024, it was reported that the completion of the Shahpur Kandi barrage had already "effectively ceased the flow of water from the Ravi river into Pakistan".[531] Pakistan will in the future receive no reliable water at all from the Sutlej, the Ravi or their Tributaries.[532]

7.74. The *quid pro quo* of India's rights under Article II, and the crux of the present case, was that Pakistan was given by Article III(1) the right to "receive for unrestricted use all those waters of the Western Rivers which India is under an obligation to let flow". This right is framed in the strongest terms. Like Article II with respect to Pakistan, it is subject only to very limited and tightly framed exceptions.

[531] "India completely stops Ravi river water flow to Pakistan. Historical context and significance", *The Economic Times* (Mumbai, 26 February 2024), available at: https://economictimes.indiatimes.com/news/india/india-completely-stops-ravi-river-water-flow-to-pakistan-historical-context-and-significance/articleshow/107980936.cms (last accessed 18 March 2024), **Exhibit P-0368**; "Flow of Ravi water to Pakistan fully stopped: Report", *The Times of India* (Mumbai, 26 February 2024) available at: https://timesofindia.indiatimes.com/india/flow-of-ravi-water-to-pakistan-fully-stopped-report/articleshow/107970921.cms (last accessed 18 March 2024), **Exhibit P-0369**.

[532] For the avoidance of doubt, the lawfulness of the situation that will result from India's diversion works is not accepted by Pakistan, but this issue does not fall to be determined by this Court of Arbitration. Pakistan mentions it here by way of essential background only.

7.75. The "let flow" obligations of Article II concerning the Eastern Rivers, and of Article III concerning the Western Rivers, were supplemented by Article IV. As already noted, this provision concerned Pakistan's obligation to construct the transition works, but it also contained important stipulations for maintenance of the status quo with respect to both the Eastern and Western Rivers.

7.76. Importantly, if either Party were to develop a use of the waters of the Eastern or Western Rivers that is not in accordance with the Treaty, Article IV(14) provides that that Party could not acquire "by reason of use any right, by prescription or otherwise, to the continuance of such use". And, by Article IV(15), Pakistan and India divorce the settlement of the Indus system of rivers question from the other territorial issues between them (e.g., concerning Kashmir) by providing that nothing in the Treaty could "be construed as affecting existing territorial rights over the waters of any of the Rivers or the beds or banks thereof, or as affecting existing property rights in municipal law over such waters or beds or banks".

7.77. A similar theme suffused Article XI of the Treaty, entitled 'General Provisions'. The purpose of this provision was to ensure that the grand bargain that the Treaty embodied did not affect Pakistan–India relations outside the terms of the settlement; *viz*. that per Article XI(1)(a), the Treaty was considered to govern "the rights and obligations of each Party in relation to the other with respect only to the use of the waters of the Rivers and matters incidental thereto", and further, per Article XI(2), that nothing in the Treaty could "be construed by the Parties as in any way establishing any general principle of law or any precedent".

7C.3 Duties of cooperation and the settlement of disputes

7.78. A further set of provisions give the Treaty Parties the capacity to undertake continuous monitoring of their bargain and to resolve any disagreements that might arise.[533] So far as Pakistan was concerned, this gave it the capacity—indispensable in securing its agreement to the Treaty—to ensure that India was keeping to its part of the deal. Those provisions require the regular reporting of information, co-operation in river development and site access on demand—whilst binding India into multiple forms of international adjudication.

(a) Article VI(1) requires the Parties (in reality, India) to engage in daily monitoring of several variables—including gauge and discharge data relating to river flow,

[533] *See* also, **Chapter 6** above and **PER-01**.

extractions or releases from reservoirs, withdrawals from government-operated headworks, and escapages from and deliveries to canals—and to deliver the data so collected to the other Party (in reality, Pakistan) on a monthly basis. Moreover, if the other Party, in its judgment, considers the data to be necessary for "operational purposes", it can request that the data be provided on a daily basis.

(b) Article VII(1) imposes a positive obligation on both Parties "to cooperate, by mutual agreement, to the fullest possible extent" in achieving optimum development of the rivers. By Article VII(2), if either Party plans to construct any engineering work that would affect the other Party materially, it is obliged to notify the other Party of its plans "as may be available and as would enable the other party to inform itself of the nature, magnitude and effect of the work".

(c) Article VIII(1) established a permanent supervisory body for the Indus system of rivers: the Commission. Comprising a Pakistani and an Indian Commissioner, the Commission was intended to serve as a deliberative body and channel of communication between the Parties "on all matters relating to the implementation of the Treaty". Per Article VIII(4):

> "The purpose and functions of the Commission shall be to establish and maintain co-operative arrangements for the implementation of this Treaty, to promote co-operation between the Parties in the development of the waters of the Rivers and, in particular,
>
> (a) to study and report to the two Governments on any problem relating to the development of the waters of the Rivers which may be jointly referred to the Commission by the two Governments: in the event that a reference is made by one Government alone, the Commissioner of the other Government shall obtain the authorization of his Government before he proceeds to act on the reference;
>
> (b) to make every effort to settle promptly, in accordance with the provisions of Article IX(1), any question arising thereunder;
>
> (c) to undertake, once in every five years, a general tour of inspection of the Rivers for ascertaining the facts connected with various developments and works on the Rivers;
>
> (d) to undertake promptly, at the request of either Commissioner, a tour of inspection of such works or sites on the Rivers as may be considered necessary by him for ascertaining the facts connected with those works or sites; and

> (e) to take, during the Transition Period, such steps as may be necessary for the implementation of the provisions of Annexure H."

7.79. Article IX provided a variety of mechanisms for the settlement of disagreements concerning the interpretation or application of the Treaty—vesting principally in the Commission under Article IX(1), but making provision also for a Neutral Expert to resolve a defined list of technical questions (Article IX(2)(a) and Annexure F), for inter-State negotiations (Article IX(4)) and for the convening of a Court of Arbitration with competence over any and all questions arising under the Treaty and with the capacity to give binding interpretations of its terms with respect to any general question presented (Article IX(5) and Annexure G). To prevent either Party from frustrating the adjudicative process, the Bank was given limited procedural functions for the appointment of a Neutral Expert and the constitution of a Court of Arbitration under Annexures F and G respectively.

7.80. Finally, by Article XII, the Parties ensured that what was jointly done could not by unilateral action be undone. Article XII(3) provided that the Treaty could only be modified via a negotiated and duly ratified agreement between its Parties. And Article XII(4) stated that it would continue in force unless or until it was terminated by mutual consent.

7C.4 Conclusions on the Treaty Bargain

7.81. The centrepiece of the Treaty is the definitive and absolute division and allocation of the waters of the Eastern and Western Rivers contained in Articles II and III. This was the central pillar of the 1954 Proposal and the focal point of subsequent negotiations leading up to the May 1957 Heads of Agreement, the Heads of Agreement 1959 and the December 1959 draft treaty. Everything else contained in the Treaty is a means to either supporting that central bargain or providing a discrete and limited exception to the same.

7.82. A primary feature of that division, and the operating principle of the Treaty Bargain, is the notion that Pakistan and India will each have "unrestricted use" of the Western and Eastern Rivers respectively. The "let flow" obligations placed on Pakistan and India are key elements of this. Together, the concepts of "unrestricted use" and "let flow" are the backbone of the Treaty, and as a matter of international law, constitute "an objective, in the light of which the other treaty provisions are to be interpreted and applied".[534]

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[534] *Oil Platforms (Islamic Republic of Iran v United States of America)*, Preliminary Objections [1996] ICJ Rep 803, **PLA-0049**, ¶ 28.

7.83. Against the background of the Peace Bargain, the Treaty Bargain is designed to solve permanently the main questions of riparian relations between Pakistan and India. In addition to the clarity of its provisions, and the extent to which it undertakes to regulate the Parties' actions–even on a day-to-day basis–the Treaty cannot be amended or terminated without the consent of Pakistan and India both. Until that consent is given, the Treaty remains in force indefinitely in the terms in which it was concluded.

7.84. The Treaty is also drafted in precise and technical terms with a view to ensuring maximum clarity. It contains relatively few open-ended concepts and, unlike other international instruments, does not defer points of disagreement to be decided in the future, but addresses them in the here-and-now.

7.85. It reflects a self-contained regime, whereby the Parties set out expressly to insulate their bargain from legal or factual elements outside the four walls of the agreement. This was only possible by consciously severing the question of the waters of the Indus system of rivers from the multitude of other Indo-Pakistani disputes, such that nothing within the Treaty could affect the Parties' rights and obligations in any other field.

7.86. Finally, the Treaty is set up in such a way that the Parties can monitor continuously implementation of the "unrestricted use"/"let flow" duality, with unparalleled oversight of the other Party.[535] This benefits Pakistan as lower riparian and reflects the seriousness of the bargain struck. India must measure a variety of inputs daily, and provide the data so collected to Pakistan monthly (or even daily if requested). It must inform Pakistan of any planned works likely to affect Pakistan's rights and interests and provide it with information as to the same. It is under a positive obligation to cooperate with Pakistan on river development, and to interact with it through the Commission. And it must give Pakistan—or, more particularly, its Commissioner—timely access to any facility it builds on Western Rivers on demand, such that its compliance with the Treaty may be assessed.

7D THE WESTERN RIVERS RUN-OF-RIVER HYDRO BARGAIN

7.87. The third bargain contained the Treaty is the Western Rivers Run-of-River Hydro Bargain. This builds on the Treaty Bargain by providing a narrow exception to India's "let flow"/non-interference obligation for the generation of hydroelectric power under certain

[535] *See* also **Chapter 6** and **PER-01**.

conditions. Consistent with the Peace Bargain, the Hydro Bargain seeks to ensure that India's potential control over the waters of the Western Rivers is strictly circumscribed, so that the April 1948 crisis cannot be repeated.

7.88. The Hydro Bargain begins with the 'rule', being the principles of "let flow", non-interference and no storage reflected in Article III. The rule is subject to tightly constrained exceptions addressed in Article III(2) and Annexures C, D and E. These provisions address India's agricultural use of the waters of the Western Rivers (Annexure C), the generation of hydroelectric power by India on the Western Rivers (Annexure D), and storage of waters by India on the Western Rivers (Annexure E). The rule and the exceptions together provide the scheme for the Hydro Bargain.

7.89. The exceptions to the rule are extremely limited. As explained in **Chapter 8**, these exceptions must be interpreted restrictively so as not to unsettle Pakistan's rights over the waters of the Western Rivers.

7.90. As is addressed further in **Chapter 8**, the various uses allowed by India of the Western Rivers—Domestic Use, Non-Consumptive Use, Agricultural Use, production of hydropower and storage—are framed expressly as derogations from the "let flow" principle of Article III. The Treaty places severe limits on each of the exceptions, but particularly the more water-intensive ones—with Annexures C and E placing firm caps of volume, geography, and/or design on Indian irrigation and storage on the Western Rivers. The careful balance struck in the Hydro Bargain is confirmed through the design and operational restrictions in Annexure D, as well as the cooperation and reporting requirements, which enable Pakistan to monitor and supervise Indian HEP construction and operation on the Western Rivers, such that any issues can be identified early and resolved in accordance with the processes set out in Article IX.

7E CONCLUSION ON THE THREE BARGAINS

7.91. Notwithstanding the existential importance of the waters of the Indus system of rivers for Pakistan, the Treaty reflected a true bargain between the Parties. The April 1948 crisis had created in Pakistan's leaders an enduring fear of Indian control over its water supply and represents an origin myth of sorts for the Treaty. Termination of that supply was entirely within India's power, and if exercised, could render Pakistan unviable as an economic and political entity. As a result, in accordance with the Peace and Treaty Bargains, Pakistan was prepared to give up access to the Eastern Rivers—which had historically met nearly all its irrigation and hydropower needs—in order to bring about water independence via unrestricted use of the Western Rivers.

7.92. It is evident from the *travaux préparatoires* (more fully set out in **Appendix A**) that Pakistan considered that it was paying a historical price for giving up the Eastern Rivers. India had chipped away at Pakistan's starting point of the negotiations that the "entire flow" of the Western Rivers would be for the exclusive use and benefit of Pakistan. Article III in its final form imposed an "obligation" on India to "let flow all the waters of the Western Rivers", subject to narrow exceptions including for India's generation of hydro-electric power. This compromise—reflected in the Hydro Bargain—was hard fought.

7.93. All of this demonstrates the falsity of India's repeated claims that the Treaty is an unfair instrument. Its constant refrain is that "the use of about 20% of the waters of these [Western and Eastern] rivers was allocated to India, and about 80% to Pakistan".[536] However, as explained in **Chapter 3**, approximately 59% of the surface area of the Indus Basin is located in Pakistani territory and only approximately 21% of the surface area falls within India territory (including Indian-administered Kashmir, which is claimed by Pakistan).

7.94. The three bargains at the heart of the Treaty represent a true compromise, which cannot be undone by historical revisionism or evolutionary readings of the text. The bargains inform the interpretation of the Treaty, the principles of which are set out in the next Chapter.

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[536] *See*, e.g., India's Counter-Memorial (*Kishenganga* arbitration), 23 November 2011, **Exhibit P-0123**, ¶ 2.18.

CHAPTER 8: PRINCIPLES OF TREATY INTERPRETATION

8.1. This Chapter outlines the principles of treaty interpretation relevant to the interpretation of Article III and Paragraph 8 of Annexure D, and related provisions which are to be applied by the Court. It proceeds as follows:

(a) **Section A** provides an overview of the relevant principles and sources, including the requirements of Paragraph 29 of Annexure G ("the law to be applied by the Court" in interpreting or applying the Treaty);

(b) **Section B** explains why the approach of the *Baglihar* Neutral Expert to treaty interpretation was not only misplaced, but also wrong in substance; and

(c) **Section C** provides Pakistan's answer to the Court's question (a) in paragraph 35 of PO6.[537]

8A PRINCIPLES AND SOURCES RELEVANT TO TREATY INTERPRETATION

8A.1 The central importance of the findings of the *Kishenganga* Court

8.2. As addressed below, there are a number of findings of both the *Kishenganga* Court and of *this* Court that are highly material to, and indeed in some cases dispositive of, key issues of Treaty interpretation that arise in the present phase of the proceedings. As discussed in detail below, findings of fact and conclusions of law by a Court of Arbitration established pursuant to Article IX of the Treaty are dispositive, binding on and relevant to the Parties, the Court and the Neutral Expert. The binding character of the decisions of a Court of Arbitration follows from Paragraph 23 of Annexure G. The dispositive quality of the Court's findings and conclusions follows from its general competence to address any question concerning the interpretation or application of the Treaty and the *res judicata* effect of final decisions by a competent court on a given matter between the same parties. This may be contrasted with the findings of the Neutral Expert in the *Baglihar* Determination, which as noted in **Chapters 1** and **2** above, and explained below in **Chapter 8C**, are controlling only with respect to the

[537] In PO6, paragraph 35(a), the Court asked the following question: "To what extent and on what basis are the decisions of past dispute resolution bodies established pursuant to Article IX of the Treaty concerning (i) competence, (ii) matters of fact, (iii) the interpretation of the Treaty, or (iv) the application of the Treaty in particular factual circumstances, binding or otherwise controlling with respect to (a) the Parties, (b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert? Insofar as such decisions are binding or otherwise controlling, what—if any—exceptions or limitations may limit their binding/controlling effect?"

Baglihar HEP—and in any event were based on a methodologically flawed approach to interpreting the Treaty.

8.3. Accordingly, while this Chapter sets out for completeness the general principles relating to treaty interpretation under international law and under this Treaty, the Court will also wish to be mindful that a number of key issues were the subject of determination by the *Kishenganga* Court, and others have already been determined by this Court.

8A.2 The Treaty itself

8.4. As the Court has already found in its Competence Award, the primary source of law for the Court to apply in deciding a dispute is the Treaty itself.[538] Paragraph 29 of Annexure G to the Treaty provides that:

> "Except as the Parties may otherwise agree, the law to be applied by the Court shall be this Treaty and, whenever necessary for its interpretation or application, but only to the extent necessary for that purpose, the following in the order in which they are listed:
>
> (a) International conventions establishing rules which are expressly recognized by the Parties.
>
> (b) Customary international law."

8.5. The Treaty does not set out general rules on the method for treaty interpretation.[539] It does not need to: these are provided by Articles 31 to 32 of the VCLT.[540] While neither India nor Pakistan is a Party to the VCLT,[541] both have acknowledged[542]—and it is widely accepted[543]—that the principles of treaty interpretation set out in Articles 31 (general rule of interpretation) and 32 (supplementary means of interpretation) VCLT reflect customary international law. As such, those principles bind both Pakistan and India and, "to the extent

[538] Competence Award, ¶ 121.
[539] *Id.*, ¶ 122.
[540] VCLT, **PLA-0005**. It is uncontroversial that, notwithstanding Article 4 (non-retroactivity of the present Convention) of the VCLT, the customary rules of treaty interpretation encapsulated in the VCLT apply to "treaties", such as the 1960 Indus Water Treaty, which pre-date it (i.e., which were concluded before 27 January 1980). The *Kishenganga* Court confirmed the application of the customary rules of treaty interpretation expressed in Article 31 of the VCLT to the Indus Waters Treaty in its Decision on India's Request for Clarification or Interpretation (20 December 2013, **PLA-0021**, fn. 34).
[541] Pakistan signed the VCLT on 29 April 1970. India has not signed (or ratified) the VCLT. See Extract from the UN Treaty Collection website, Chapter XXIII: Law of Treaties, **PLA-0051**.
[542] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 174, fn. 101 (India); Transcript of Hearing on Competence, Day 1 (11 May 2023), p. 193, line 21–p. 194, line 2 (Mr Fietta); Pakistan's Response, ¶ 129, fn. 97 (Pakistan).
[543] *See* generally, Competence Award, ¶ 122; citing "Report of the Commission to the General Assembly on the work of its seventieth session" (2018) II(2) *Yearbook of the International Law Commission* 1, **PLA-0052**, p. 27, ¶ 4 (and citations therein).

necessary" for the interpretation or application of the Treaty, may be applied by the Court.[544] This is consistent both with the approach taken by the Court in the *Kishenganga* arbitration[545] and the approach of this Court in its Competence Award.[546]

8.6. Each of Articles 31 and 32 of the VCLT are now examined in turn.

8A.3 Article 31 of the VCLT (general rule)

8.7. The starting point for treaty interpretation is the rule of interpretation set out in Article 31 of the VCLT, which provides as follows:

> "1. A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.
>
> 2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes:
>
> (a) Any agreement relating to the treaty which was made between all the parties in connexion with the conclusion of the treaty;
>
> (b) Any instrument which was made by one or more parties in connexion with the conclusion of the treaty and accepted by the other parties as an instrument related to the treaty.
>
> 3. There shall be taken into account, together with the context:
>
> (a) Any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions;
>
> (b) Any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation;[[547]]
>
> (c) Any relevant rules of international law applicable in the relations between the parties.[[548]]

[544] In the words of Paragraph 29 of Annexure G.
[545] See *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 401 (noting that "the Court is guided by the fundamental rules of treaty interpretation as set out in Article 31(1) of the VCLT"), and, more generally, § IV.B.3.
[546] Competence Award, ¶ 122.
[547] Article 31(3)(a) or (b) are not addressed in this note because there is no relevant "subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions" or "subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation". There is, however, at least one "subsequent agreement", but it is not relevant to the issues in dispute in these proceedings; namely, the Agreement Between the Government of the Islamic Republic of Pakistan and the Government of the Republic of India Regarding the Design of the Salal Hydro-Electric Plant on the Chenab River Main, 14 April 1978, **PLA-0053**.
[548] In *Kishenganga*, the Court observed that it was "required" to "take account of relevant customary international law—including international environmental law—when interpreting the Treaty", both by virtue of Paragraph 29

> 4. A special meaning shall be given to a term if it is established that the parties so intended."[549]

8.8. The general rule of treaty interpretation in VCLT Article 31(1) comprises four elements: (i) good faith, (ii) ordinary meaning, (iii) context, and (iv) object and purpose. The VCLT does not establish an order or priority in relation to these criteria.[550] In its Commentary to the VCLT, the International Law Commission ("**ILC**")[551] emphasised that the application of the means of interpretation in Article 31 would be a "single combined operation", and that "[a]ll the various elements [terms, context, object and purpose] would be thrown into the crucible, and their interaction would give the legally relevant interpretation."[552] The ICJ has also confirmed that the elements of Article 31 should be "considered as a whole".[553] Each of these criteria is discussed in turn in the following subsections.

(a) Ordinary meaning and special meaning

8.9. Article 31(1) provides that a treaty shall be interpreted "in accordance with the ordinary meaning to be given to the terms of the treaty". The "ordinary meaning" of the text is the starting point of interpretation and, as the ICJ has confirmed, "[i]nterpretation must be based

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of Annexure G, and as a result of the customary international law rule of treaty interpretation embodied in Article 31(1)(c) VCLT (*Kishenganga* arbitration, Partial Award, **PLA-0003**, fn. 654). However, in applying substantive rules of customary international law, the Court relied exclusively on Paragraph 29 of Annexure G and justified its resort to such rules by the "necessity" of doing so (see *id.*, ¶ 452; *Kishenganga* arbitration, Final Award, **PLA-0004**, ¶¶ 87 and 111–112). Paragraph 29 of Annexure G may thus be viewed as a *lex specialis* of Article 31(3)(c), rendering unnecessary resort to Article 31(3)(c) VCLT. (The *Kishenganga* Court explicitly took this approach vis-à-vis Paragraph 28 of Annexure G, which it described as a "kind of *lex specialis* prescribed by the framers of that provision that makes unnecessary the imposition of further requirements" of the kind set out in Article 41 of the ICJ Statute (*Kishenganga* arbitration, Order on Interim Measures, **PLA-0042**, ¶ 130).) This means that recourse by the Court to "relevant rules of international law" – namely, "international conventions establishing rules which are expressly recognized by the Parties" and "customary international law" – is *possible* only when it is *necessary* for the "interpretation or application" of the Treaty. Article 31(3)(c), by contrast, *always demands* such rules to be "taken into account, together with the context". This is consistent with the approach of this Court in its Competence Award: it recognised that resort to the customary rules on treaty interpretation reflected in the VCLT was *possible* because it was *necessary* for interpreting the Treaty (Competence Award, ¶¶ 120–122). For this reason, this Memorial addresses Paragraph 29 of Annexure G (in **Chapter 8A.5**) but does not address further Article 31(3)(c) of the VCLT.

[549] VCLT, **PLA-0005**, Article 31.

[550] A. Aust, *Handbook of International Law*, (2nd Edition: Cambridge University Press 2010), **PLA-0054**, p. 89; O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, p. 580.

[551] The International Law Commission was established by the UN General Assembly in 1947, to undertake the mandate of the Assembly, under article 13(1) of the UN Charter, to "initiate studies and make recommendations for the purpose of […] encouraging the progressive development of international law and its codification."

[552] UNGA, *Yearbook of the International Law Commission* (Vol. II, 1966), **PLA-0055**, pp. 219–220.

[553] *Arbitral Award of 3 October 1899 (Guyana v. Venezuela)*, *Jurisdiction of the Court, Judgment, I.C.J. Reports 2020*, p. 455, **PLA-0056**, ¶ 71; *Maritime Delimitation in the Indian Ocean (Somalia v. Kenya)*, *Preliminary Objections, Judgment, I.C.J. Reports 2017*, p. 3 **PLA-0057**, ¶ 64.

above all upon the text of the treaty."[554] In its Partial Award, the *Kishenganga* Court followed this approach, for example, by commencing its interpretation of Paragraph 15(iii) of Annexure D with "the text of Paragraph 15, and specifically with the ordinary meaning of the terms there used."[555] It turned next to "context"[556], and finally to "object and purpose"[557] (see further below).

8.10. The "ordinary meaning" is generally the meaning attributed to the terms at the time the treaty is concluded. This reflects the well-established principle of treaty interpretation, known as the "principle of contemporaneity". Sir Gerald Fitzmaurice, a special rapporteur for the ILC's work on the Law of Treaties, defined the principle as follows:

> "The terms of a treaty must be interpreted according to the meaning which they possessed, or which would have been attributed to them, and in the light of current linguistic usage, at the time when the treaty was originally concluded."[558]

8.11. As the ILC observed in its Commentary, the requirement that a treaty should be interpreted by reference to the linguistic usage at the time of its conclusion is "one both of common sense and good faith".[559] The principle has been routinely applied by the ICJ and other international courts and tribunals.

(a) For example, in the case concerning *Rights of Nationals of the United States of America in Morocco (France v. United States of America)*, the ICJ applied the principle of contemporaneity in the course of determining the meaning of certain terms employed in two treaties concluded between Morocco and the United States in 1787 and in 1836. It observed that:

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[554] *Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Qatar v. United Arab Emirates)*, *Preliminary Objections, Judgment, I.C.J. Reports 2021*, p. 71, **PLA-0058**, ¶ 81; *Territorial Dispute (Libyan Arab Jamahiriya/Chad), Judgment, I.C.J. Reports 1994*, p. 6, **PLA-0059**, ¶ 41. *See* also *Polish Postal Service in Danzig* (Advisory Opinion) P.C.I.J. Series B No. 11, **PLA-0060**, p. 39 ("It is a cardinal principle of interpretation that words must be interpreted in the sense which they would normally have in their context, unless such interpretation would lead to something unreasonable or absurd"); *Arbitral Award of 31 July 1989*, *Judgment, I.C.J. Reports 1991*, p. 53, **PLA-0061**, ¶ 48, quoting *Competence of Assembly regarding admission to the United Nations, Advisory Opinion*: *I.C.J. Reports 1950*, p. 4, **PLA-0062**, p. 8 ("the first duty of a tribunal which is called upon to interpret and apply the provisions of a treaty, is to endeavour to give effect to them in their natural and ordinary meaning, in the context in which they occur.").

[555] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 402. *See* also *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, 20 December 2013, **PLA-0021**, ¶ 29.

[556] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 406–409.

[557] *Id.*, ¶¶ 410-413.

[558] G. Fitzmaurice, "The Law and Procedure of the International Court of Justice 1951-4: Treaty Interpretation and Other Treaty Points" (1957) 33 Brit YB Int'l L 203, **PLA-0063**, p. 212.

[559] UNGA, *Yearbook of the International Law Commission* (Vol. II. 1966)), **PLA-0055**, p. 96.

> "[I]n construing the provisions of Article 20 [which was substantially identical in each treaty]—and, in particular, the expression 'shall have any dispute with each other'—it is necessary to take into account the meaning of the word 'dispute' at the times when the two treaties were concluded."[560]

(b) Similarly, in *South West Africa (Ethiopia v. South Africa; Liberia v. South Africa)*, in determining the parties' rights under the Mandate for South West Africa and the Covenant of the League of Nations, the ICJ noted that it must "place itself at the point in time when the mandates system was being instituted" and "have regard to the situation as it was at that time, which was the critical one, and to the intentions of those concerned as they appear to have existed, or are reasonably to be inferred, in the light of that situation".[561] This was required, the Court said, because "the meaning of a juridical notion in a historical context, must be sought by reference to the way in which that notion was understood in that context."[562]

(c) Numerous other international courts and tribunals have adopted the same approach.[563]

8.12. In this regard, Pakistan notes that at the time the Treaty was negotiated, the drafters of the Treaty, and in particular the expert engineers on both sides, and for the World Bank, would have been well aware of the leading contemporary publications on HEP design and operation, such as the *Hydro-Electric Handbook* by WP Creager & JD Justin.[564] Yet, as the Chapters in

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[560] *Case concerning rights of nationals of the United States of America in Morocco*, *Judgment of August 27th, 1952: I.C.J. Reports 1952*, p. 176, **PLA-0064**, p. 189.
[561] *South West Africa, Second Phase, Judgment, I.C.J. Reports 1966*, p. 6, **PLA-0065**, ¶ 16.
[562] *Id.*.
[563] *Delimitation of Maritime Boundary between Guinea-Bissau and Senegal (Guinea-Bissau/Senegal)*, Award (1989) XX RIAA 119, **PLA-0066**, ¶ 85 (where the arbitral tribunal considered that the 1960 agreement between France and Portugal, relating to the maritime boundary between Senegal (which at that time was a French dependent territory) and Guinea-Bissau, must be interpreted "in the light of the law in force at the date of its conclusion" [translation of Counsel for Pakistan]); *Boundary Dispute between Argentina and Chile concerning the Frontier Line between Boundary Post 62 and Mount Fitzroy (Argentina/Chile)*, Decision (1994) XXII RIAA 3, **PLA-0067**, ¶¶ 128-130 (where, in determining the meaning of the term "water-parting" in the boundary dispute between Argentina and Chile, the arbitral tribunal noted that "the concept of 'water-parting' […] is protected by the *res judicata* and is not susceptible of any subsequent change through usage, evolution of the language, or acts or decisions of one of the Parties to the dispute"), and, more recently, *Wintershall Aktiengesellschaft v. Argentine Republic*, ICSID Case No. ARB/04/14, Award, 8 December 2008, **PLA-0068**, ¶ 128, (noting that the applicable BIT must be interpreted "in the light of the [VCLT], as well as [of] the principle of contemporan[e]ity"). Many other investor-State tribunals have examined contemporaneous practice for the interpretation of an investment treaty without expressly invoking the principle of contemporaneous interpretation. For a list of examples, see *İçkale İnşaat Limited Şirketi v. Turkmenistan*, ICSID Case No. ARB/10/24, Partially Dissenting Opinion of Carolyn B. Lamm, **PLA-0069**, ¶ 4.
[564] W. P. Creager and J. D. Justin (*eds.*), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309**.

Part IV of this Memorial point out, in many ways the Treaty's terms, by express design, depart from conventional, contemporaneous usage. The meaning expressly given in the Treaty to certain terms is distinctive and unique. For example, the ordinary meaning of "pondage" is "[t]he storage of water; the capacity of a pond".[565] In engineering parlance, "pondage" refers to "short-term storage of water, usually on a daily basis, to meet the diurnal variations in power demand".[566] However, for purposes of Annexure D of the Treaty the term "Pondage" is given a special meaning in Paragraph 2(c) of Annexure D, namely: "Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the plant." The Court must, as a matter of law, give effect to the special meaning accorded to these (and other) terms by the Treaty, in contrast to the meaning of the equivalent engineering terms as they are now used, or as they were used at the time. It is part of the general rule of treaty interpretation that "[a] special meaning shall be given to a term if it is established that the parties so intended" (Article 31(4) VCLT). Conversely, no special meaning shall be ascribed if it was not intended by the parties.

(b) Context

8.13. There are two main roles for the reference to "context" in VCLT Article 31(1). The first role is an "immediate qualifier" of the ordinary meaning of terms used in the treaty.[567] In other words, "the primary reason for looking to the context is to confirm an ordinary meaning if a single contender emerges or to assist in identifying the ordinary meaning if two or more possibilities come forward".[568] Context can therefore be used to clarify particular terms of the treaty, for example, by comparison with those in other provisions of the treaty.[569]

8.14. The *Kishenganga* Court deployed this type of "context" in relation to its interpretation of Paragraph 15 of Annexure D. It observed that "[a] review of the context of Paragraph 15 makes clear that the provision is placed within a continuum of design, construction and operation that cannot properly be separated into watertight compartments"[570] The "context",

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565 "Pondage", *Shorter Oxford English Dictionary*, (5th Edition: OUP 2003), Volume 2, **Exhibit P-0418**, p. 2279.
566 J. S. Gulliver and R. E. A. Arndt (*eds*.), *Hydropower Engineering Handbook*, (McGraw-Hill Book Co 1991), **Exhibit P-0477**.
567 Gardiner, 2015, **PLA-0017**, p. 197.
568 *Id*., p. 198.
569 *Id*., p. 204. *See* e.g., *Daniel W. Kappes and Kappes, Cassidy & Associates v. Republic of Guatemala*, ICSID Case No. ARB/18/43, Decision on Respondent's Preliminary Objections, 13 March 2020, **PLA-0070**, ¶ 131, (noting that "any VCLT interpretation must rest not on construction of a treaty provision in isolation, but rather on that provision in the context of surrounding or otherwise relevant treaty provisions.").
570 *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 407.

for that purpose, was Part 3 of Annexure D. Following its review of the relevant provisions of Part 3, the Court concluded that "the various paragraphs contained in Part 3 of Annexure D must be interpreted in a mutually reinforcing manner to avoid forbidding with one provision what is permitted by others."[571] It added that:

> "It would make little sense, and cannot have been the Parties' intention, to read the Treaty as permitting new Run-of-River Plants to be designed and built in a certain manner, but then prohibiting the operation of such a Plant in the very manner for which it was designed. Such an interpretation of the various paragraphs of Part 3 in isolation from one another would render ineffective those provisions that specifically permit the development of hydro-electric power in accordance with the design constraints of Annexure D."[572]

8.15. The second role of the reference to "context" is interpretation by reference to the structure of the treaty.[573] Article 31(2) provides:

> "2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes:
>
> (a) Any agreement relating to the treaty which was made between all the parties in connexion with the conclusion of the treaty;
>
> (b) Any instrument which was made by one or more parties in connexion with the conclusion of the treaty and accepted by the other parties as an instrument related to the treaty."

8.16. The interpretation process therefore involves a spectrum of elements—those that are "fairly immediate", such as the wording of surrounding provisions and headings of articles—as well as "more remote elements", such as comparisons with other treaty provisions on similar matters or using similar wording.[574] This approach is consistent with the broader interpretive principle of consistency with the "object and purpose" of the treaty.[575]

8.17. The *Kishenganga* Court took precisely this approach when considering the permissibility of depletion below Dead Storage Level. On that question, the Court looked both to the "specific provisions in Annexure D (and, through incorporation by reference, Annexure

[571] *Id.*, ¶ 409.
[572] *Id.*.
[573] Gardiner, 2015, **PLA-0017**, p. 197.
[574] *Id.*, pp. 197 and 209 (noting that, "[i]n the absence of any specific indication in a treaty that a term has a particular meaning in a specific part of the treaty (such as a definition provision for a particular part), it is both the immediate context and the wider context which will be significant determinants of the meaning").
[575] *Id.*, p. 197.

E)", but also to the "context of the Treaty as a whole—in particular […] the background of permissible uses and the allocation of rights on the Western Rivers."[576]

(c) *Object and purpose*

8.18. The final words of Article 31(1) refer to a treaty's "object and purpose". This introduces the "teleological or functional element into the general rule of interpretation".[577] It brings into the treaty interpretation process the principle of "effectiveness": that is, "[a]ny interpretation that would render parts of the treaty superfluous or diminish their practical effect is to be avoided."[578] It also requires that account be taken not only of the rights and obligations created by a treaty, but also the "general result" that the parties to a treaty wanted to achieve.[579] As foreshadowed in **Chapter 7**, the three bargains at the heart of the Treaty—the Peace Bargain, the Treaty Bargain and the Hydro Bargain—are crucial to the interpretation of its object and purpose.

8.19. As with the "context", one of the guiding sources for determining the "object and purpose" of a treaty is its preamble.[580] This is particularly so in relation to the Indus Waters Treaty, since the preamble is specifically referenced and given prominence as an integral part of the Indus Waters Treaty in Article XII(1).[581] Even absent any equivalent of Article XIII(1) of the Indus Waters Treaty, international courts and tribunals, including the ICJ, routinely refer to a treaty's preamble when ascertaining its object and purpose.[582] However, both the VCLT (Article 31(2)) and the jurisprudence of international courts and tribunals make it clear that an

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[576] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 503. *See* also *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, 20 December 2013, **PLA-0021**, ¶¶ 30-32.

[577] O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, p. 584 (emphasis removed).

[578] *Id.*. The ICJ has confirmed the application of this principle on multiple occasions: *see*, for example, *Alleged Violations of Sovereign Rights and Maritime Spaces in the Caribbean Sea (Nicaragua v. Colombia)*, *Preliminary Objections, Judgment, I.C.J. Reports 2016*, p. 3, **PLA-0071**, ¶ 43; *Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia* v. *Russian Federation),* Preliminary Objections [2011] ICJ Rep 70, **PLA-0031**, pp. 125-126, ¶ 133; *Corfu Channel case, Judgment of December 15th, 1949: I.C.J. Reports 1949*, p. 244, **PLA-0072**, p. 24

[579] O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, p. 585.

[580] Gardiner, 2015, **PLA-0017**, p. 213.

[581] Article XII(1) provides that: "This Treaty consists of the Preamble, the Articles hereof and Annexures A to H hereto, and may be cited as 'The Indus Waters Treaty 1960'", Indus Waters Treaty 1960, **PLA-0001**.

[582] *Arbitral Award of 3 October 1899 (Guyana v. Venezuela)*, *Jurisdiction of the Court, Judgment, I.C.J. Reports 2020*, p. 455, **PLA-0056**, ¶ 73; *Alleged Violations of Sovereign Rights and Maritime Spaces in the Caribbean Sea (Nicaragua v. Colombia)*, *Preliminary Objections, Judgment, I.C.J. Reports 2016*, p. 3, **PLA-0071**, ¶ 41; *Territorial Dispute (Libyan Arab Jamahiriya/Chad), Judgment, I.C.J. Reports 1994*, p. 6, **PLA-0059**, ¶ 52; *Case concerning Sovereignty over certain Frontier Land, Judgment of 20 June 1959: I.C.J. Reports 1959*, p. 209, **PLA-0073**, pp. 221–222; *Dispute between Argentina and Chile concerning the Beagle Channel,* Report and Decision of the Court of Arbitration (1977) XXI RIAA 53, **PLA-0074**, ¶ 19.

interpreter needs to look at the "whole text" of the treaty to determine its object and purpose.[583] Further, the "object and purpose" of a treaty is to be distinguished from the "circumstances of its conclusion" in Article 32 of the VCLT, which is a supplementary means of interpretation. Such supplementary material "may […] shed light on the object and purpose of [a treaty] if these are difficult to ascertain from the text".[584]

8.20. While an interpretation that does not accord with a treaty's "object and purpose" is unlikely to be accepted,[585] on the other hand, the relevance of the "object and purpose" of a treaty is limited by the ordinary meaning of the text of the treaty.[586] So, for example, any general references in the preamble as to the object and purpose of a treaty cannot be used to alter or enlarge the meaning of a term of treaty.[587]

8.21. As a result, in its Partial Award, the *Kishenganga* Court gave its assessment of the object and purpose of the Treaty, in the context of interpreting and applying Paragraph 15(iii) of Annexure D. Its assessment reflects the Treaty and Hydro Bargains discussed in **Chapter 7** above:

> "The deliberate division and allocation of the six main watercourses of the Indus system of rivers between the Parties is a defining characteristic of the Treaty. The inevitable conclusion is that Pakistan is given priority in the use of the waters of the Western Rivers, just as India has priority in the use of the waters of the Eastern Rivers.
>
> Pakistan's right to the Western Rivers is not absolute since it relates only to those waters of the Western Rivers 'which India is under an obligation to let flow under the provisions of [Article III(2) of the Treaty].' The right is subject to expressly enumerated Indian uses on the Western Rivers, including the generation of hydro-electric power to the extent permitted by the Treaty.
>
> […]

[583] Gardiner, 2015, **PLA-0017**, p. 213; O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)) **PLA-0019**, p. 585. For example, the Appellate Body at the WTO has referred to preambles on a number of occasions, but it does so in the course of "very detailed consideration of the relevant treaty's substantive provisions" (Gardiner, 2015, **PLA-0017**, p. 218 (fn. 184), referring to, *inter alia*, *US—Import Prohibition of Certain Shrimp and Shrimp Products (1998)* WT/DS58/AB/R, ¶¶ 12 and 17; *EC—Measures Concerning Meat and Meat Products (Hormones)* (1998) WT/DS26/AB/R and WT/DS48/AB/R, ¶ 70; *Chile—Price Band System* (2002) WT/DS207/AB/R, ¶¶ 196–197).
[584] Gardiner, 2015, **PLA-0017**, pp. 214–215.
[585] *See*, for example, *Certain Iranian Assets (Islamic Republic of Iran v. United States of America), Preliminary Objections, Judgment, I.C.J. Reports 2019*, p. 7, **PLA-0075**, ¶ 57; *Alleged Violations of Sovereign Rights and Maritime Spaces in the Caribbean Sea (Nicaragua v. Colombia), Preliminary Objections, Judgment, I.C.J. Reports 2016*, p. 3, **PLA-0071**, ¶ 41.
[586] O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, pp. 586–587.
[587] Gardiner, 2015, **PLA-0017**, pp. 218–219; *see*, e.g., *Federal Reserve Bank of New York v Bank Markazi,* Case A 28 (2000), 36 Iran-US Claims Tribunal Reports 5, **PLA-0076**, ¶ 58.

> […] although the chapeau of Annexure D confirms India's right to generate hydro-electric power on the Western Rivers in language similar to that of Pakistan's unrestricted 'let flow' right, it is circumscribed by the terms of Annexure D itself[.]"[588]

8.22. The Court added that, with respect to the object and purpose of the Treaty relevant to the interpretation of Article III and Annexure D:

> "The Treaty allocates the use of the waters of the Western Rivers (including the Jhelum and its tributaries) to Pakistan, curtailing, sometimes quite severely, India's freedom to utilize the waters of the Western Rivers for the generation of hydro-electric power and limiting, for the most part, the use of those waters to certain agricultural uses, and to domestic and non-consumptive uses."[589]

8.23. However, the *Kishenganga* Court also accepted that "in view of the acute need both of India and Pakistan for hydro-electric power, that India might not have entered into the Treaty at all had it not been accorded significant rights to the use of those waters to develop hydro-electric power on the Western Rivers."[590] It therefore adopted an approach which remained cognisant both of the division of waters, giving Pakistan the right to the use of the waters of the Western Rivers (the Treaty Bargain), and of India's need to utilise the Western Rivers for the generation of hydro-electric power—but crucially only "once a Plant complies with the provisions of Annexure D" (the Hydro Bargain).[591]

8.24. The *Kishenganga* Court also made a number of determinations regarding the object and purpose of the Treaty as part of its decision on the permissibility under the Treaty of drawdown flushing. In particular, it found that:

> "[O]ne of the primary objectives of the Treaty is to limit the storage of water by India on the Western Rivers (and, correspondingly, to prohibit entirely the storage of water by Pakistan on the upper reaches of the Eastern Rivers). […] The outcome was significant in that it achieved a careful balance between the Parties' respective negotiating positions, allowing India hydro-electric use of the waters of the Western Rivers while protecting Pakistan against the possibility of water storage on the upstream reaches of those Rivers having an unduly disruptive effect on the flow of water to Pakistan.
>
> […]
>
> [I]n many instances the Treaty does not simply restrict the Parties from taking certain actions, but also constrains their entitlement to construct works that would enable such actions to be taken. Thus, India is not only restricted in storing water on the Western

[588] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 410-412, *see* also ¶ 509.
[589] *Id.*, ¶ 418.
[590] *Id.*, ¶ 420.
[591] *Id.*, ¶ 433.

> Rivers; it is also prohibited from constructing Storage Works except within the limited capacity permitted by the Treaty."[592]

8.25. The Court was aware of this "careful balance"—between setting out "strict limits on all types of storage other than Dead Storage"[593] and allowing India hydro-electric use of the waters of the Western Rivers—when carrying out its evaluation of the "necessity" of drawdown flushing for power generation on the Western Rivers. In that respect, it found that:

> "In carrying out this evaluation, the Court emphasizes that it is not considering whether the development of hydro-electric power without recourse to drawdown flushing is preferable for India. It is not for the Court to apply 'best practices' in resolving this dispute. […] [A]ny exercise of design involves consideration of a variety of factors—not all of them technical. Hydrologic, geologic, social, economic, environmental and regulatory considerations are all directly relevant, and the Court considers the Treaty restraints on the construction and operation by India of reservoirs to be such a regulatory factor. For the Court, the optimal design and operation of a hydro-electric plant is that which can practically be achieved within the constraints imposed by the Treaty."[594]

8.26. The Court reiterated this finding in its Decision on India's Request for Clarification or Interpretation, adding that "it is for India to secure appropriate locations and to draw appropriate designs for its Run-of-River Plants", bearing in mind the "constraints that are part of the Treaty's essential bargain".[595] As has been demonstrated in **Chapter 3**, both Pakistan and India are acutely vulnerable to the effects of climate change, including water scarcity, with Pakistan being particularly vulnerable because of its relatively high dependence on the waters of the Indus Basin.[596] The reality of climate change can be taken into account when interpreting the Treaty. At the same time, Pakistan notes that water shortage was already a key concern when the Treaty was negotiated and climate change does not alter the three bargains at the heart of the Treaty and the rights it establishes. Climate change is therefore not a licence for an evolutionary approach or the adoption of "best practices" that fall outside the constraints established in the Treaty.

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[592] *Id.*, ¶¶ 504 and 506.
[593] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, 20 December 2013, **PLA-0021**, ¶ 30.
[594] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 522 (citations omitted).
[595] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, 20 December 2013, **PLA-0021**, ¶ 34.
[596] **Chapter 3**.

8.27. As pointed out at the start of this Chapter, and explained more fully below in **Chapter 8C**, the findings of the *Kishenganga* Court, and indeed of this Court, on these and other matters of treaty interpretation are dispositive for, and binding on, this Court.

(d) Restrictive interpretation of exceptions to a rule

8.28. An important principle of treaty interpretation is that exceptions to a general rule must be interpreted restrictively.[597] Nearly a century ago, the Permanent Court of International Justice ("**PCIJ**"), in the *Certain German Interests in Upper Silesia* case,[598] held that the liquidation of rural estates pursuant to treaties was an exception to a general rule of international law was to be interpreted restrictively: "the liability to expropriation of rural

[597] The principle has been widely applied, albeit often (although not always) without explicit acknowledgment, by international courts and tribunals. See, for example, *Certain Iranian Assets (Islamic Republic of Iran v United States of America),* ICJ General List No. 164, Judgment, 30 March 2023, **PLA-0041**, ¶ 108 (concerning the application of the exception contained in the Treaty of Amity, Economic Relations, and Consular Rights between the United States of America and Iran, 15 August 1955, 284 UNTS 93, Article XX(1)(d)). *See* also the approach of international courts and tribunals to the interpretation of the "military activities" exception in Article 298(1)(b) of the UN Convention on the Law of the Sea: *Dispute Concerning Coastal State Rights in the Black Sea, Sea of Azov, and Kerch Strait (Ukraine v. the Russian Federation)*, PCA Case No. 2017-06, Award Concerning the Preliminary Objections of the Russian Federation, 21 February 2020, **PLA-0077**, ¶¶ 334–335 ("The Arbitral Tribunal does not consider, however, that mere involvement or presence of military vessels is in and by itself sufficient to trigger the military activities exception. […] Forces that some governments treat as civilian or law enforcement forces may be designated as military by others, even though they may undertake comparable tasks."); *The South China Sea Arbitration (The Republic of Philippines v. The People's Republic of China),* PCA Case No. 2013-19, Award, 12 July 2016, **PLA-0078**, ¶ 1158 ("the relevant question [is] whether the dispute itself concerns military activities, rather than whether a party has employed its military in some manner in relation to the dispute"); *Case concerning the detention of three Ukrainian naval vessels (Ukraine v. Russian Federation)*, Provisional Measures, ITLOS Case No. 26, Order, 25 May 2019, **PLA-0079**, ¶¶ 64 and 66 ("the distinction between military and law enforcement activities cannot be based solely on whether naval vessels or law enforcement vessels are employed in the activities in question […]. [T]he distinction between military and law enforcement activities must be based primarily on an objective evaluation of the nature of the activities in question […]"); *The Arctic Sunrise Arbitration (Netherlands v. Russia)*, PCA Case No. 2014-02, Award on Jurisdiction, 26 November 2014, **PLA-0080**, ¶ 9 (recalling that in the Arctic Sunrise arbitration, the Russian Federation invoked the exclusion for "law-enforcement activities", rather than invoking the "military activities" exclusion, notwithstanding the involvement of coast guard vessels and special forces of the Russian Federation). *See* also *Aegean Sea Continental Shelf, Interim Protection, Order of 11 September 1976, I.C.J. Reports 1976,* p. 3, Dissenting opinion of Judge Stassinopoulos, **PLA-0081** (noting that "reservations are exceptions to a general rule, and all exceptions, restrictions and limitations of a rule are, as a general principle of law, always interpreted restrictively"), pp. 79–80, ¶ 16; *Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory*, *Advisory Opinion, I.C.J. Reports 2004*, p. 136, Separate opinion of Judge Elaraby, **PLA-0082**, p. 257, ¶ 3.2; *Canfor Corporation, Terminal Forest Products Ltd., Tembec et al. v. United States of America (Consolidated)*, Decision on Preliminary Question, 6 June 2006, **PLA-0083**, ¶ 187; *Nationality Decrees Issued in Tunis and Morocco* (Advisory Opinion) P.C.I.J. Series B No. 4 , **PLA-0084**, p. 25. It is also well-established in the case law of the European Court of Human Rights that "an exception to a right guaranteed by the Convention, is to be narrowly interpreted" (*see Klass and others v. Germany* (Application no. 5029/71), Judgment of 6 September 1978, **PLA-0085**, ¶ 42; *Funke v. France* (Application no. 10828/84), Judgment of 25 February 1993, **PLA-0086**, ¶ 55; *Litwa v Poland* (Application no. 26629/95), Judgment of 4 April 2000, **PLA-0087**, ¶ 59; *Rotaru v. Romania* (Application no. 28341/95), Judgment of 4 May 2000, **PLA-0088**, ¶ 47). *See* also R. Jennings and A. Watts (*eds*.), *Oppenheim's International Law* (9th Edition: OUP 1996), **PLA-0089**, p. 1279. *See* further **Chapter 9** of this Memorial.

[598] *Case Concerning Certain German Interests in Polish Upper Silesia (Germany v. Poland)*, Judgment (1926) PCIJ Ser A No 7, **PLA-0022**, p. 76.

property constitutes under the Geneva Convention, an exception; in case of doubt as to the scope of this exception, its terms must therefore be strictly construed."[599]

8.29. The VCLT does not expressly include a principle of restrictive interpretation of exceptions, but it is clear from its *travaux préparatoires* that there was an understanding that exceptions to general rules should be strictly interpreted in order to promote the stability and security of treaties. During the second session of the UN Conference on the Law of Treaties in 1969 (which led to the conclusion of the VCLT),[600] the delegate of Iran stated that exceptions to the general rule that the consent of a State to be bound by signature should be "treated very strictly, like all exceptions".[601] In the view of the Syrian delegate, exceptions should be stated "in the most unequivocal terms".[602] Reflecting generally on the VCLT, the delegate of Uruguay noted that "the purpose of the codification of the law of treaties was to provide stability and security in treaty relations", and that whenever this body of law made an exception "to the *pacta sunt servanda* rule, it had done so in clear, precise and detailed terms".[603] When debating the grounds that could be invoked for invalidating, terminating or suspending the operation of a treaty, the Polish delegate argued that "all such grounds must be expressly mentioned, as each of them was an exception to the general rule", and that it was "common knowledge that no exception allowed of extensive interpretation".[604]

8.30. Further, the object and purpose of a treaty will call for a restrictive interpretation where the rule purportedly derogated from is of particular importance to the scheme of the parties' agreement.[605] In the *Enron v Argentina* case, the tribunal held:

[599] *Id.*, p. 76.
[600] Official Records of the United Nations Conference on the Law of Treaties, Second session, Vienna, 9 Apr.–22 May 1969 (Summary records of the plenary meetings and of the meetings of the Committee of the Whole) UN Doc. A/CONF.39/11/Add.1, **PLA-0090**.
[601] *Id.*, p. 25, ¶ 79, Statement by Mr Matine-Daftary (Iran). The Iranian delegate was commenting on draft Art. 10(1)(c), which provided that "[t]he intention of the State to give that effect to the signature appears from the full powers of its representative or was expressed during the negotiation" (*id.*, p. 25). This was considered to be an exception to the general rule that the consent of a State to be bound by a treaty is expressed by the signature of its representative when the treaty provides that signature shall have that effect, which is set out in Art. 10(1)(a). It was suggested that the phrase 'or was expressed during the negotiations' be deleted because it made the provision too flexible and as such a source of misunderstanding. Mr Eschauzier, delegate of the Netherlands, also thought that this phrase should be deleted because it might cause confusion by implying that the representative of the State could himself express the intention to give that effect to the signature or that he could alter his full powers (*id.*, p. 25, ¶ 75).
[602] *Id.*, p. 65, ¶ 62, Statement by Mr Shukri (Syria).
[603] *Id.*, p. 106, ¶ 56, Statement by Mr Alvarez (Uruguay).
[604] *Id.*, p. 135, ¶ 26, Statement by Mr Nahlik (Poland).
[605] *See* e.g., *Whaling in the Antarctic (Australia v. Japan: New Zealand intervening)*, *Judgment, I.C.J. Reports 2014*, p. 226, **PLA-0091**, ¶ 58.

> "[T]he object and purpose of the Treaty is, as a general proposition, to apply in situations of economic difficulty and hardship that require the protection of the international guaranteed rights of its beneficiaries. To this extent, any interpretation resulting in an escape route from the obligations defined cannot be easily reconciled with that object and purpose. Accordingly, a restrictive interpretation of any such alternative is mandatory."[606]

8.31. In this case, the rule is "let flow"/non-interference/no storage by India on the Western Rivers, and the exceptions are the limited uses that India may make of the waters, most relevantly for the generation of hydro-electric power in accordance with Annexure D. As demonstrated in **Chapter 7** and recognised by the *Kishenganga* Court, the object and purpose reflects the Peace, Treaty and Hydro Bargains, which were—and are—of existential importance to Pakistan. A restrictive interpretation of exceptions is therefore mandatory.

8.32. The burden is on the party that seeks to benefit from the exception to prove its application.[607] This is obviously a point of particular importance in this proceeding, where India could and should be participating—but is choosing not to do so.

(e) Good faith

8.33. Article 31(1) provides that "a treaty shall be interpreted in good faith". The principle of good faith is a cornerstone principle of international law in general, and specifically of treaty interpretation. It indicates how the task of interpretation is to be undertaken; and it is to be applied to every aspect of the process of interpretation.[608] The ICJ has explained that the principle of good faith "obliges the Parties to apply [a treaty] in a reasonable way and in such a manner that its purpose can be realized."[609] Indeed, the Court has recognised good faith as

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[606] *Enron Creditors Recovery Corporation (formerly Enron Corporation) & Ponderosa Assets LP v Argentine Republic*, ICSID Case No. ARB/01/3, Award, 22 May 2007, **PLA-0092**, ¶¶ 331, concerning application of the Treaty between United States of America and the Argentine Republic concerning the Reciprocal Encouragement and Protection of Investment, 14 November 1991, 31 ILM 124, Article XI.

[607] *See* e.g., *Certain Iranian Assets (Islamic Republic of Iran v United States of America)*, ICJ General List No. 164, Judgment, 30 March 2023, **PLA-0041**, ¶ 108, concerning the application of the exception contained in the Treaty of Amity, Economic Relations, and Consular Rights between the United States of America and Iran, 15 August 1955, 284 UNTS 93, Article XX(1)(d).

[608] Gardiner, 2015, **PLA-0017**, pp. 171–172. As Professor Gardiner further notes, most of the current rules of treaty interpretation are "the elaboration of the fundamental theme that contracts must be interpreted in good faith" (*id.*, pp. 166–167, H. Lauterpacht, "Restrictive Interpretation and the Principle of Effectiveness in the Interpretation of Treaties" (1949) XXVI BYBIL 48, p. 56). *See* also O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, p. 587.

[609] *Gabčíkovo-Nagymaros Project (Hungary/Slovakia), Judgment, I.C.J. Reports 1997*, p. 7, **PLA-0094**, ¶ 142.

"[o]ne of the basic principles governing the […] performance of legal obligations, whatever their source".[610]

8.34. The principle of good faith is recalled in the preamble of the VCLT, which notes that "the principles of free consent and of good faith and the *pacta sunt servanda* rule are universally recognized".[611] As noted in commentary, good faith, in the way it is expressed in the preamble of the VCLT, applies to the "whole process of interpreting a treaty rather than solely to the meaning of particular words or phrases within it".[612]

8.35. The principle of good faith is also highlighted in Article 26 of the VCLT ("Pacta sunt servanda"), which provides that "[e]very treaty in force is binding upon the parties to it and must be performed by them in good faith". The "*pacta sunt servanda*" rule implies that "a party may not unilaterally free itself from the engagements of a treaty, or modify the stipulations thereof, except by the consent of the contracting parties".[613] This means that, as long as a treaty remains in force, it must be "observed as it stands"; it is not for the treaty to "adapt itself to conditions".[614] It follows that good faith would not be served by interpreting a treaty as broadly as possible, but by abiding by the parties' agreement and the principle of *pacta sunt servanda*.

8.36. Finally, in the case of uncertainty or divergent interpretations, the principle of "good faith" requires the interpreter to "look to the proposal that led to the text [of the treaty] and the good faith of the parties in negotiating on that basis".[615] This application of good faith is reflected in the supplementary means of interpretation set out in Article 32 of the VCLT, with its reference to the preparatory work of the treaty and the circumstances of its conclusion, as set out below.[616]

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[610] *Nuclear Tests Case (Australia v. France),* Judgment [1974] ICJ Rep 253, **PLA-0025**, ¶ 46.
[611] VCLT, **PLA-0005**, Preamble.
[612] Gardiner, 2015, **PLA-0017**, p. 168.
[613] B. Cheng, *General principles of law as applied by international courts and tribunals* (reissue: Cambridge University Press 2006), **PLA-0095**, p. 113.
[614] *Id.*.
[615] Gardiner, 2015, **PLA-0017**, pp. 174–175.
[616] For example, in concluding that the VCLT reflected customary international law and were applicable to the case, the tribunal in *Rhine Chlorides (Netherlands/France)* (2004) referred to an earlier award in which certain general rules for treaty interpretation had been formulated, including the proposition: "In so far as the text is not sufficiently clear, it is allowable to have recourse to the intentions of the parties concerned. If, in this case, the intentions are clear and unanimous, they must prevail over every other possible interpretation. If, on the contrary, they diverge or are not clear, that meaning must be sought which, within the context, best gives either a reasonable solution of the controversy, or the impression which the offer of the party which took the initiative must reasonably and in good faith have made on the mind of the other party." (Gardiner, 2015, **PLA-0017**, p. 174 (fn. 48) referring

8A.4 Article 32 of the VCLT (supplementary means)

8.37. Article 32 of the VCLT introduces the concept of "supplementary means" of interpretation. The provision regulates what material outside the text of the treaty itself may be used in the process of interpretation.[617] It reads:

> "Recourse may be had to supplementary means of interpretation, including the preparatory work of the treaty and the circumstances of its conclusion, in order to confirm the meaning resulting from the application of article 31, or to determine the meaning when the interpretation according to article 31:
>
> (a) leaves the meaning ambiguous or obscure; or
>
> (b) leads to a result which is manifestly absurd or unreasonable."

8.38. The use of supplementary means of interpretation is therefore not restricted to cases in which the result of the application of the general rule under Article 31 would be ambiguous, obscure, or manifestly absurd or unreasonable. Material constituting "supplementary means" could also have a "confirmatory role".[618] The Tribunal in *HICEE v. Slovakia* explained the supplementary role of Article 32 as follows:

> "[…] the door to the employment of supplementary means of interpretation is not opened exclusively in the case of ambiguity or obscurity. As Article 32 says, recourse may be had to the same supplementary means in the case where interpretation in accordance with Article 31 leads to a meaning which is manifestly absurd or unreasonable. But equally the same supplementary means are admissible, too, to 'confirm' the meaning resulting from the application of Article 31."[619]

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to *Auditing of Accounts between the Netherlands and France pursuant to the Additional Protocol of 25 September 1991 to the Convention on the Protection of the Rhine against Pollution by Chlorides of 3 December 1976 (Netherlands/France)*, Award (2014) 144 ILR 259, **PLA-0016**, ¶ 74.)).

[617] O. Dörr & K. Schmalenbach (eds.), *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2nd ed. (2018)), **PLA-0019**, p. 617.

[618] *See* Gardiner, 2015, **PLA-0017**, p. 45, referring to *Auditing of Accounts between the Netherlands and France pursuant to the Additional Protocol of 25 September 1991 to the Convention on the Protection of the Rhine against Pollution by Chlorides of 3 December 1976 (Netherlands/France)*, Award (2014) 144 ILR 259, **PLA-0016**, ¶ 70. The ILC Commission pointed out that "the provisions of article [now 32] by no means have the effect of drawing a rigid line between the 'supplementary' means of interpretation and the means included in article [31]. The fact that article [32] admits recourse to the supplementary means for the purpose of 'confirming' the meaning resulting from the application of article [31] establishes a general link between the two articles and maintains the unity of the process of interpretation." (UNGA, *Yearbook of the International Law Commission*(Vol. II, 1966) 1966, Vol. II, **PLA-0055**, ¶ 10).

[619] *HICEE B.V. v. The Slovak Republic*, PCA Case No. 2009-11, Partial Award, 23 May 2011, **PLA-0050**, ¶ 118. This assessment is also reflected in academic commentary. As Professor Gardiner observes, Article 32 of the VCLT provides two "gateways" for the use of supplementary means: "The first gateway is where application of the general rule has produced what appears to be the correct meaning which may lead to recourse to supplementary means to confirm the meaning. […] The second gateway is where, after application of the general rule, there remains one or more of ambiguity, obscurity, manifest absurdity, or unreasonableness. This gateway leads to use of supplementary means to determine the meaning." (Gardiner, 2015, **PLA-0017**, p. 359 (citations omitted)).

8.39. While the use of supplementary means of interpretation is not expressed to be mandatory ("recourse may be had")—in contrast to the general rule of interpretation under Article 31 of the VCLT ("[a] treaty shall be interpreted")—this does not mean that supplementary rules can be characterised as always "subordinate" to the general rule. To the contrary, and as noted in commentary, supplementary means have a "dominant" role when used to "determine" the meaning of a term.[620] As explained at **Chapter 8A.3** above, the interpretation of a treaty consists of a "single combined operation, which places appropriate emphasis on the various means of interpretation indicated, respectively, in articles 31 and 32."[621]

8.40. Under Article 32 of the VCLT, supplementary means include (but are not limited to) the preparatory work of the treaty, commonly referred to as *travaux préparatoires*, and the circumstances of its conclusion.[622] International courts and tribunals routinely have recourse to those means, in particular the negotiating history of a treaty, including its *travaux préparatoires*.[623] **Chapter 7** has already referred to the insights from the *travaux* of the Indus Waters Treaty in terms of the three Bargains underpinning the Treaty. The relevance of "supplementary means" of interpretation to the interpretation of the Indus Waters Treaty is further addressed in **Appendix A**, which provides an overview of the *travaux préparatoires* and circumstances of conclusion of the Treaty relevant to the questions of systemic interpretation before the Court.

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[620] Gardiner, 2015, **PLA-0017**, pp. 358 and 409.

[621] ILC, "Report of the Commission to the General Assembly on the work of its seventieth session" (2018) Vol. II(2), *Yearbook of the International Law Commission*, **PLA-0052**, p. 24, draft conclusion 2, ¶ 5. Article 33 relates to the interpretation of treaties authenticated in two or more languages. The Indus Waters Treaty was concluded in English only; as such, this provision is not considered further.

[622] The "supplementary means" of interpretation indicated in Article 32 are not an exhaustive list (Gardiner, 2015, **PLA-0017**, p. 409). *See* e.g., *Churchill Mining plc v Indonesia*, ICSID Case No. ARB/12/14, Decision on Jurisdiction of 24 February 2014, **PLA-0096**, ¶¶ 181, (noting that "Article 32 VCLT allows recourse to the preparatory work of the treaty and the circumstances surrounding the treaty's conclusion. It does not give an exhaustive list of admissible materials and the Tribunal thus has latitude to include any element capable of shedding light on the interpretation of 'shall assent'").

[623] *See* e.g., *Territorial and Maritime Dispute (Nicaragua v. Colombia), Preliminary Objections, Judgment, I.C.J. Reports 2007*, p. 832, **PLA-0097**, ¶ 116 (noting that "a careful examination of the pre-ratification discussions of the 1928 Treaty by and between the "Parties confirms that neither Party assumed at the time that the Treaty and Protocol were designed to effect a general delimitation of the maritime spaces between Colombia and Nicaragua"). *See* also *Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Qatar v. United Arab Emirates)*, *Preliminary Objections, Judgment, I.C.J. Reports 2021*, p. 71, **PLA-0058**, ¶ 89; *Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia v. Russian Federation)*, Preliminary Objections [2011] ICJ Rep 70, **PLA-0031**, ¶ 142; *Territorial Dispute (Libyan Arab Jamahiriya/Chad), Judgment, I.C.J. Reports 1994*, **PLA-0059**, ¶ 55; *Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain)*, *Jurisdiction and Admissibility, Judgment, I.C.J. Reports 1995*, p. 6, **PLA-0098**, ¶ 40; *Sovereignty over Pulau Ligitan and Pulau Sipadan (Indonesia/Malaysia)*, Judgment [2002] ICJ Rep 265, **PLA-0029**, ¶ 53.

8.41. The *Kishenganga* Court had recourse to "supplementary means" under Article 32 VCLT to confirm its interpretation of Article IX of the Treaty and Paragraph 15(iii) of Annexure D.[624] This Court has also had recourse to "supplementary means" in interpreting and applying Article IX of the Treaty.[625]

8A.5 Paragraph 29 of Annexure G

8.42. As explained at the outset of this Chapter, "the primary source of law for this Court to interpret and apply is the Treaty". However, where "necessary for the Treaty's interpretation or application", the Court may apply "international conventions and customary international law as indicated by Paragraph 29 [of Annexure G]."[626] This section sets out the meaning of that provision, which is reproduced at paragraph 8.4 above.

8.43. Paragraph 29 of Annexure G is the applicable law clause for a Court of Arbitration constituted under the Indus Waters Treaty. It permits the Court to resort to (a) "international conventions establishing rules which are expressly recognized by the Parties" and (b) customary international law in limited circumstances; namely, "whenever necessary for [the] interpretation or application [of the Treaty], but only to the extent necessary for that purpose". Accordingly, under Paragraph 29, while a Court seised of a dispute concerning the interpretation or application of the Treaty may look beyond the terms of the Treaty, it may do so only when this is "necessary" for its interpretation or application, and then "only to the extent necessary for that purpose".[627]

8.44. While the *Kishenganga* Court was "guided by the fundamental rules on treaty interpretation" set out in Article 31(1) of the VCLT,[628] it was also careful to observe that the Treaty "expressly limits the extent to which the Court may have recourse to, and apply, sources of law beyond the Treaty itself."[629] In the *Kishenganga* Court's view, recourse to customary international law (for example, in the field of international environmental law), would not be permissible if the result would be to "negate rights expressly granted in the Treaty" as this

[624] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 380 (fn. 586) and ¶ 477 (fn. 687).
[625] Competence Award, ¶ 198 (fn. 456).
[626] *Id.*, ¶ 121.
[627] *See* also fn.548 above.
[628] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 401 and 406.
[629] *Kishenganga* arbitration, Final Award, **PLA-0004**, ¶ 111.

would "no longer be 'interpretation or application' of the Treaty but the substitution of customary law in place of the Treaty".[630] In its Final Award, the Court explained that:

> "As the Court held in its *Partial Award*, 'States have "a duty to prevent, or at least mitigate" significant harm to the environment when pursuing large-scale construction activities.' In light of this duty [of customary international law], the Court has no difficulty concluding that the requirement of an environmental flow (without prejudice to the level of such flow) is necessary in the application of the Treaty. At the same time, the Court does not consider it appropriate, and certainly not 'necessary,' for it to adopt a precautionary approach and assume the role of policymaker in determining the balance between acceptable environmental change and other priorities, or to permit environmental considerations to override the balance of other rights and obligations expressly identified in the Treaty—in particular the entitlement of India to divert the waters of a tributary of the Jhelum. The Court's authority is more limited and extends only to mitigating significant harm. Beyond that point, prescription by the Court is not only unnecessary, it is prohibited by the Treaty. If customary international law were applied not to circumscribe, but to negate rights expressly granted in the Treaty, this would no longer be '*interpretation or application*' of the Treaty but the substitution of customary law *in place of* the Treaty. Echoing the Court's caution in the *Partial Award*, the prioritization of the environment above all other considerations would effectively 'read the principles of Paragraph 15(iii) [of Annexure D] out of the Treaty.' That Paragraph 29 does not permit."[631]

8.45. Paragraph 29 of Annexure G therefore carefully circumscribes the circumstances in which this Court may have regard to sources of law—whether of a customary or conventional nature—external to the Indus Waters Treaty itself.[632] This Court must exercise caution in resorting to such sources.

8A.6 Interpretation of treaties of peace and boundary treaties

8.46. Paragraph 29 of Annexure G also reflects the Treaty's status as akin to a treaty of peace or a treaty that settles a boundary between States—a "hydraulic boundary treaty", in the words of Professor Crawford in his submissions before the *Kishenganga* Court.[633] It is not an applicable law clause that endorses evolutionary interpretation, which is when treaty terms are

[630] *Id.*, ¶ 112, citing *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 446.
[631] *Kishenganga* arbitration, Final Award, **PLA-0004**, ¶ 112 (citations omitted, emphasis original).
[632] Since Paragraph 29 of Annexure G may be regarded as the *lex specialis* of Article 31(3)(c) of the VCLT (as set out in fn. 548 above, but not of other aspects of the general or supplementary rules of treaty interpretation reflected in the remainder of Article 31 and at Article 32, those rules apply in the form set out in the VCLT.
[633] Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 7, 28 August 2012, **Exhibit P-0488**, p. 19, line 6 (Professor James Crawford), and further p. 45, line 5–p. 46, line 1 (Professor James Crawford); Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 10, 31 August 2012, **Exhibit P-0129**, p. 45, line 25–p. 46, line 5 (Professor James Crawford). As O. Dörr and K. Schmalenbach observe in *Vienna Convention on the Law of Treaties: A Commentary*, **PLA-0019**, p. 585, treaties such as boundary treaties may "attract an assumption of a particular object and purpose", namely (in the case of boundary treaties) "final and stable fixing of frontiers" (referring to Gardiner, 2015, **PLA-0017**).

"intended to evolve in response to changes in legal and social concepts".[634] The law to be applied by the Court when it comes to the settlement of disputes "shall be this Treaty", save only when wider recourse is necessary for fulfilment of the Court's dispute settlement task. It is the type of provision that "clearly attempts to limit recourse to extraneous application of international rules".[635] In other words, Paragraph 29 reflects that "[i]t is the duty of the Court to interpret the Treaties, not to revise them".[636]

8.47. As explained by the ICJ in the *Temple of Preah Vihear* case:

> "In general, when two countries establish a frontier between them, one of the primary objects is to achieve stability and finality. This is impossible if the line so established can, at any moment, and on the basis of a continuously available process, be called in question, and its rectification claimed, whenever any inaccuracy by reference to a clause in the parent treaty is discovered. Such a process could continue indefinitely, and finality would never be reached so long as possible errors still remained to be discovered. Such a frontier, so far from being stable, would be completely precarious".[637]

8.48. Other international tribunals have also affirmed the critical import of the stability of boundaries: for instance the Tribunal in the Bay of Bengal case (*Bangladesh v. India*) observed that boundaries "must be stable and definitive to ensure a peaceful relationship between the States concerned in the long term."[638]

8.49. As discussed in **Chapter 7**, in the Indus Water Treaty, Pakistan and India have established a series of Bargains in order to achieve "the most complete and satisfactory utilisation of the waters of the Indus system of rivers".[639] If there was, in the words of the ICJ, a "continuously available process" that called into question the balance struck, it would render the Bargains, and therefore the operation of the Treaty, "completely precarious".

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634 E. Bjorge, *The Evolutionary Interpretation of Treaties* (Oxford University Press 2014), **PLA-0099**, p. 126, referring to H. Waldock, 'The Evolution of Human Rights Concepts and the Application of the European Convention on Human Rights' in *Mélanges offerts à Paul Reuter—Le droit international: unité et diversité* (Pedone 1981).
635 Gardiner, 2015, **PLA-0017**, at p. 342.
636 *Interpretation of Peace Treaties with Bulgaria, Hungary and Romania (Second Phase)*, Advisory Opinion [1950] ICJ Rep 221, **PLA-0023**, p. 229.
637 *Case concerning the Temple of Preah Vihear (Cambodia v. Thailand), Merits, Judgment of 15 June 1962: I.C.J. Reports 1962,* p. 6, **PLA-0101**, p. 34.
638 *The Bay of Bengal Maritime Boundary Arbitration between the People's Republic of Bangladesh and the Republic of India*, Award (2014) XXXII RIAA 1, **PLA-0102**, ¶ 216.
639 Indus Waters Treaty 1960, **PLA-0001**, Preamble.

8B THE APPROACH OF THE *BAGLIHAR* NEUTRAL EXPERT TO TREATY INTERPRETATION WAS MISPLACED AND WRONG IN SUBSTANCE

8.50. The approach of the Neutral Expert in the *Baglihar* Determination to the interpretation of the Treaty was deeply flawed.

8B.1 The Neutral Expert's approach

8.51. The Neutral Expert adopted a flawed theory of treaty interpretation. As an engineering expert, his Determination opened with a seven-page exposition on how he considered the Treaty should be interpreted as a matter of international law.[640] That exposition contained detailed references to what the Neutral Expert considered to be the applicable principles of treaty interpretation, academic commentaries,[641] as well as case law from other international courts and tribunals on subjects as diverse as (*inter alia*) border demarcation,[642] sovereignty over islands,[643] the legality of nuclear tests,[644] account auditing in connection with treaties concerning environmental damage,[645] the competence of the International Labour Organisation,[646] and the construction and regulation of railroads between Belgium and the Netherlands.[647] In engaging in such a discussion, the Neutral Expert pronounced not just on the meaning to be given to Annexure D, but also to other provisions of the Treaty that were plainly not within Part 1 of Annexure F—including its Preamble, Article III, Article XI, and Article XII.[648] In the course of his analysis, the *Baglihar* Neutral Expert made two major errors:

(a) **First**, the Neutral Expert took a superficial view of the object and purpose of the Treaty, reducing it to the Parties acting "in a spirit of goodwill and friendship".[649] While he acknowledged that "the Treaty was negotiated and

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[640] *Baglihar* Determination, **PLA-0002**, § 5.1.
[641] *See*, e.g., H. Lauterpacht, *The Development of International Law by the Permanent Court of International Justice* (Longmans 1934).
[642] *Territorial Dispute (Libyan Arab Jamahiriya/Chad), Judgment, I.C.J. Reports 1994*, p. 6, **PLA-0059**.
[643] *Kasikili/Sedudu Island (Botswana/Namibia), Judgment, I.C.J. Reports 1999*, p. 1045, available at: https://www.icj-cij.org/sites/default/files/case-related/98/098-19991213-JUD-01-00-EN.pdf (last accessed 18 March 2024); *Sovereignty over Pulau Ligitan and Pulau Sipadan (Indonesia/Malaysia)*, Judgment [2002] ICJ Rep 625, **PLA-0029**.
[644] *Nuclear Tests (New Zealand v. France), Judgment, I.C.J. Reports 1974*, p. 457.
[645] *Auditing of Accounts between the Netherlands and France pursuant to the Additional Protocol of 25 September 1991 to the Convention on the Protection of the Rhine against Pollution by Chlorides of 3 December 1976 (Netherlands/France)*, Award (2014) 144 ILR 259, **PLA-0016**.
[646] *Competence of the International Labour Organisation in regard to International Regulation of the Conditions of the Labour of Persons Employed in Agriculture* (Advisory Opinion) P.C.I.J. Series B No. 2.
[647] *Iron Rhine Arbitration (Belgium/Netherlands)*, Award (2005) XXVII RIAA 35.
[648] *Baglihar* Determination, **PLA-0002**, ¶¶ 5.12–5.13 and 5.20.
[649] *Id.*, ¶ 19.

concluded during a period of tension between India and Pakistan", he concluded that the circumstances of its conclusion were "of no help to confirm the meaning of the rights and obligations under the Treaty".[650] As discussed above and in **Chapters 7** and **9**, the object and purpose is much more than pursuing goodwill and friendship, and includes the Peace, Treaty and Hydro Bargains. The object and purpose of seeking peace and stability through the allocation and utilisation of the waters of the Indus system includes duties of cooperation, but it is not limited to that aspect.

(b) **Second**, the Neutral Expert stated that rights and obligations in Annexure D "must be interpreted […] taking into account the best and latest practices in the field of construction and operation of hydro-electric plants."[651] He then used this focus on "best" or "state-of-the-art" practices, derived from a legal and Treaty-systemic exercise that strayed well beyond his mandate, to make a number of determinations in India's favour, including on the need for a deep orifice spillway for the Baglihar HEP,[652] the permissibility of drawdown flushing,[653] and the calculation of Pondage.[654]

8.52. India has sought to make every possible use of that surprising "best practices" / "state-of-the-art" theory of Treaty interpretation. See, for example:

(a) The Indian Commissioner's statement in the 110th meeting of the Commission in 2014 that "an unambiguous neutral view is available in the Baglihar determination which can always serve as guideline [and i]f the same is followed, the issue can be resolved in all run of the river [HEPs] on [the] Western Rivers".[655]

(b) The Indian Commissioner's letter of 16 July 2015, which stated that the Pakistani Commissioner's position on the calculation of pondage "had already been rejected by Neutral Expert appointed under the provisions of the Treaty in

[650] *Id.*, ¶¶ 6 and 18.
[651] *Id.*, ¶ 5.21 (emphasis added).
[652] *Id.*, Determination D.2.
[653] *Id.*, Determination D.3.
[654] *Id.*, Determination D.5.
[655] Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 8.

respect of Baglihar HEP", and "the Commission may deliberate pondage provided for the above projects as per the guidelines/views of Neutral Expert in [*Baglihar*]".[656]

(c) The Indian Commissioner's letter of 21 August 2015, stating that the *Kishenganga* Court's finding that the *Baglihar* Determination had no precedential value was not applicable to pondage.[657]

(d) India's position is that *Baglihar* should be followed on the calculation of Pondage, on drawdown flushing and depletion of Dead Storage, and that terms in Paragraph 8 of Annexure D such as "sound and economical design", "satisfactory operation of the works", "satisfactory construction […] of the works", "satisfactory and economical construction and operation of the Plant as a Run-of-River Plant", and "customary and accepted practice of design for the designated range of the Plant's operation"[658] should be interpreted in an evolutionary manner incorporating engineering "best practices" and the "state-of-the-art".[659]

8.53. Pakistan has consistently pointed out the problem with the Neutral Expert's approach to interpretation and, more generally, in treating the *Baglihar* Determination as having precedential effect. For example, in his 25 February 2016 letter, Pakistan's Commissioner stated:

> "You continue to insist, for instance, that the pondage calculation for the [KHEP] and [RHEP] should be resolved by reference to the Neutral Expert's pondage determination in the Baglihar case, notwithstanding the fact that the Partial Award issued by the Court of Arbitration in the Kishenganga case (i) rejected the 'best practices' interpretation of the Treaty that led to the Neutral Expert's final determination on pondage and other issues in the Baglihar case and (ii) declared that a Neutral Expert's determinations do not have general precedential value beyond the specific hydro-electric plant before him.
>
> Similarly, although the Court of Arbitration in the Kishenganga case ruled that drawdown flushing is not permitted under the Treaty, India insists on maintaining a design with deep orifice spillways for sediment control in both the [KHEP] and [RHEP]

[656] Letter No. Y-20014/1/2015-16/2152 from the ICIW to the PCIW dated 16 July 2015, **Exhibit P-0012**, p. 2.
[657] Letter No. Y-11017/2/2015-IT/2155 from the ICIW to the PCIW dated 21 August 2015, **Exhibit P-0016**, ¶ 9.
[658] Indus Waters Treaty 1960, **PLA-0001**, Annexure D, Paragraph 8(f).
[659] *See*, e.g., India's Rejoinder (*Kishenganga* arbitration), 21 May 2012, **Exhibit P-0227**, ¶¶ 104–105. *See* also Record of the 103rd Meeting of the Permanent Indus Commission, 31 May-5 June 2009, dated 5 June 2009, **Exhibit P-0066**, pp. 3, 11 and 17; Record of the 104th Meeting of the Permanent Indus Commission, 27-31 March 2010, dated 31 May 2010, **Exhibit P-0330**, pp. 8-9; Record of the 105th Meeting of the Permanent Indus Commission, 29 May-2 June 2010, dated 2 June 2010, **Exhibit P-00541**, p. 5.

configurations that would not be effective unless water can be drawn down to or near the streambed.

Your positions on these and related issues, which Pakistan rejects, present legal questions of Treaty interpretation which will inevitably recur as India proceeds with other HEP projects on the Western Rivers."[660]

8B.2 The *Kishenganga* Court's rejection of the *Baglihar* interpretative approach

8.54. As Pakistan's Commissioner noted, when India tried to urge the *Kishenganga* Court of Arbitration to follow *Baglihar*'s reasoning on Treaty interpretation with respect to drawdown flushing,[661] the Court of Arbitration—which included six eminent international lawyers alongside an eminent engineer—declined, strongly implying that *Baglihar* was wrong, and that the restrictions on HEP design in Annexure D simply did *not* permit unthinking recourse to the "state-of-the-art" in determining what India was permitted to build:

> "In carrying out this evaluation, the Court emphasizes that it is not considering whether the development of hydro-electric power without recourse to drawdown flushing is preferable for India. It is not for the Court to apply 'best practices' in resolving this dispute. India has quite understandably argued in these proceedings for a right to the optimal design and operation of its hydro-electric installations on the upstream stretches of the Western Rivers. However, any exercise of design involves consideration of a variety of factors—not all of them technical. Hydrologic, geologic, social, economic, environmental and regulatory considerations are all directly relevant, and the Court considers the Treaty restraints on the construction and operation by India of reservoirs to be such a regulatory factor. For the Court, the optimal design and operation of a hydro-electric plant is that which can practically be achieved within the constraints imposed by the Treaty".[662]

8B.3 The *Kishenganga* Court's approach is clearly the correct one

8.55. For the avoidance of doubt, Pakistan's case is not that the Treaty forbids India from making use of new technology in the design and construction of its HEPs under Annexure D. Pakistan's case is that India is required to use "best practices" but that it must do so within the framework of and consistently with the terms of the Treaty. "Best practices" in engineering do not allow India to ignore the constraints of Annexure D, which constitute carefully limited exceptions to the superior rules that govern India's conduct on the Western Rivers in Article

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[660] Letter No. WT(132)/(7531-A)/PCIW (with enclosure) from the PCIW to the ICIW dated 25 February 2016, **Exhibit P-0023**, ¶¶ 5–7.

[661] *See* e.g., *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 297–302.

[662] *Id*., ¶ 522 (emphasis added).

III of the Treaty proper.[663] As in the *Kishenganga* arbitration, the effect of those rules may be such that India is required to find somewhere else to build a HEP, rather than adopting a technical advancement that would allow India the site of its choosing at the expense of the Treaty's fundamental bargain. That position is explained in significantly more detail in the Chapters which follow. In any event, as will now be explained, the point does not have to be reargued: the ruling of the *Kishenganga* Court is binding on the Parties, and the flawed ruling of the *Baglihar* Neutral Expert is not.

8C PAKISTAN'S ANSWER TO THE COURT'S QUESTION (A) IN PARAGRAPH 35 OF PO6

8.56. In paragraph 35(a) of PO6, the Court asked the following question:

> "To what extent and on what basis are the decisions of past dispute resolution bodies established pursuant to Article IX of the Treaty concerning (i) competence, (ii) matters of fact, (iii) the interpretation of the Treaty, or (iv) the application of the Treaty in particular factual circumstances, binding or otherwise controlling with respect to (a) the Parties, (b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert? Insofar as such decisions are binding or otherwise controlling, what—if any—exceptions or limitations may limit their binding/controlling effect?"

8.57. As already indicated in this Chapter, that question is an important one in the context of this dispute. This section of the Memorial provides Pakistan's answer to it.

8.58. The Court's question primarily concerns the meaning to be given to Paragraph 23 of Annexure G (regarding the effect of Awards of a Court of Arbitration) and Paragraph 11 of Annexure F (setting out the effect of decisions of the Neutral Expert), although, as further explained below, it also touches on other Paragraphs of Annexures F and G, which empower the Treaty's "dispute resolution bodies" to take other "decisions"[664].

8.59. Paragraph 23 of Annexure G (the effect of Awards of a Court of Arbitration) provides as follows:

[663] Specifically, that the Western Rivers are in the first instance reserved for Pakistan's "unrestricted use", that India is under an obligation to "let flow' their waters, and is otherwise prohibited from storing them: Indus Waters Treaty 1960, **PLA-0001**, Arts III(1), (2), (4).

[664] In particular, Paragraphs 6 and 7 of Annexure F empower the Neutral Expert to take "decisions" relating to procedure and as to whether "any particular difference falls within Part 1 of […] Annexure [F]", and Paragraph 9 of Annexure F requires the Neutral Expert, "as soon as possible", to "render a decision on the question or questions referred to him, giving his reasons"; while Paragraphs 16 and 28 empower the Court to render "decisions" regarding, respectively, "its competence" and "interim measures".

> "The Court shall render its Award, in writing, on the issues in dispute and on such relief, including financial compensation, as may have been claimed. The Award shall be accompanied by a statement of reasons. An Award signed by four or more members of the Court shall constitute the Award of the Court. A signed counterpart of the Award shall be delivered by the Court to each Party. *Any such Award rendered in accordance with the provisions of this Annexure in regard to a particular dispute shall be final and binding upon the Parties with respect to that dispute.*"[665]

8.60. Paragraph 11 of Annexure F (the effect of decisions of the Neutral Expert) provides as follows:

> "The decision of the Neutral Expert on all matters within his competence shall be final and binding, in respect of the particular matter on which the decision is made, upon the Parties and upon any Court of Arbitration established under the provisions of Article IX (5)."[666]

8.61. Each of the elements of the Court's question (a) of paragraph 35 of PO6 are addressed in the following subsections.

8C.1 Decisions of a past Court of Arbitration

8.62. The Court is empowered under Article IX and Annexure G of the Treaty to make various "decisions":

(a) It may decide "all questions relating to its competence" (Paragraph 16 of Annexure G).

(b) It may also decide to "lay down" interim measures that are "necessary to safeguard [a Party's] interests under the Treaty with respect to the matter in dispute, or to avoid prejudice to the final solution or aggravation or extension of the dispute" (Paragraph 28 of Annexure G).

(c) Decisions may be issued as an Award on the "issues in dispute and on such relief, including financial compensation, as may have been claimed" (Paragraph 23 of Annexure G).[667]

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665 Indus Waters Treaty 1960, **PLA-0001**, Annexure G, Paragraph 23 (emphasis added).

666 Paragraph 12 of Annexure F also empowers the Neutral Expert, "at the request of the Commission, [to] suggest for the consideration of the Parties such measures as are, in his opinion, appropriate to compose a difference or to implement his decision." Such "suggestions" are not in the nature of a "decision" of the Neutral Expert and are clearly not intended to be binding. This provision is not addressed further in this **Chapter 8C**.

667 The Court is also empowered to "lay down […] such interim measures as, in the opinion of [a] Party, are necessary to safeguard [that Party's] interests under the Treaty with respect to the matter in dispute, or to avoid

8.63. Paragraph 23 provides that an Award, which is "rendered in accordance with" the provisions of Annexure G "in regard to a particular dispute shall be final and binding upon the Parties with respect to that dispute." For a decision of the Court to qualify as an "Award", Paragraph 23 requires that the following requirements be satisfied: it must be (1) in writing, on the issues in dispute and on such relief, including financial compensation, as may have been claimed; (2) accompanied by a statement of reasons; (3) signed by four or more members of the Court. Finally, (4) a signed counterpart of the Award shall be delivered by the Court to each Party.

8.64. These requirements are general and basic, and reflect a deliberate choice by the Parties not to exclude interim "decisions" from Paragraph 23. "Awards" of a Court of Arbitration under the Treaty therefore encompass not only substantive decisions on disputes under the Treaty, but also decisions as to the Court's competence pursuant to Paragraph 16 of Annexure G. To that end, the Competence Award of this Court satisfies all the applicable requirements. It constitutes an "Award" under Paragraph 23.

8.65. "Awards", as defined in the Treaty, may also address each of the issues enumerated in parts (i) to (iv) of the Court's question (a). In the course of determining competence, for example, the Court has engaged in the interpretation and application of the Treaty. Accordingly, the question of whether "decisions" of a Court of Arbitration on such matters are "binding or otherwise controlling" must be determined by reference to Paragraph 23 of Annexure G.

8.66. The plain words of Paragraph 23 state that decisions of the Court that satisfy the requirements of an "Award" are "final and binding upon the Parties with respect to that dispute". Accordingly, the Award is binding, in all respects (the scope of competence, the facts, the interpretation and application of the Treaty), on (a) the Parties. This has been confirmed both by the *Kishenganga* Court and this Court. In its Partial Award, the *Kishenganga* Court stated that:

> "*Baglihar* is binding for the Parties in relation to the Baglihar project; the present decision, by contrast, is *binding in respect of the general question presented in these proceedings*."[668]

prejudice to the final solution or aggravation or extension of the dispute" (Indus Waters Treaty 1960, **PLA-0001**, Paragraph 28, Annexure G).

[668] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 470 (emphasis added).

8.67. This Court also addressed the effect of "Awards" in its Competence Award. It affirmed the effect of Paragraph 23 of Annexure G was that "an interpretation or application of the Treaty by the *Kishenganga* Court is final and binding upon both India and Pakistan."[669] In particular, it confirmed that the *Kishenganga* Court's interpretation of Article IX was "final and binding upon India".[670] For completeness, and as explained further below, whilst the Court addressed India's Second Objection on its merits, its finding that the *Kishenganga* Court's interpretation of Article IX was "final and binding upon India" would also have been sufficient to dispose of the Second Objection without doing so.

8.68. As to the wider "binding" or "controlling" effects of Awards of a Court of Arbitration, as regards the Court's reference in its question to "(b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert", both Paragraph 23 of Annexure G and the doctrine of "*res judicata*" are relevant.

8.69. Under Paragraph 23, an Award is "final and binding" on the Parties "with respect to that dispute". The plain meaning of this provision is that an Award is binding on all aspects of that dispute, including binding on other mechanisms with which the Parties may be engaged, namely the Neutral Expert. It is also difficult to see how either a Court of Arbitration or a Neutral Expert could, consistent with the fundamental principle of good faith, disregard the "decisions" contained in such an "Award" to the extent that a new dispute or difference concerned the "dispute" already addressed in that Award. For *res judicata* purposes, the "Award" here means both its operative part—*dispositif*—and the reasoning informing the operative part, which necessarily forms part of the decision.[671]

8.70. This conclusion does not depend upon, but is reinforced by, the doctrine of *res judicata*.[672] The doctrine of *res judicata* precludes re-litigation of the same subject matter between the same parties in later proceedings. In the words of the ICJ, it "establishes the

[669] Competence Award, ¶ 123.
[670] *Id.*, ¶ 189; *see* also ¶¶ 200-201, referring to *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 478–479.
[671] *Question of the Delimitation of the Continental Shelf between Nicaragua and Colombia beyond 200 Nautical Miles from the Nicaraguan Coast (Nicaragua v. Colombia), Preliminary Objections, Judgment, I.C.J. Reports 2016,* p. 100, **PLA-108**, ¶ 61: "The decision of the Court is contained in the operative clause of the judgment. However, in order to ascertain what is covered by *res judicata*, it may be necessary to determine the meaning of the operative clause by reference to the reasoning set out in the judgment in question."
[672] *See* generally, B. Cheng, *General principles of law as applied by international courts and tribunals*, (reissue: Cambridge University Press 2006), **PLA-0095**, pp. 336–338.

finality of the decision adopted in a particular case."[673] *Res judicata* is an inherent part of the judicial function, as the Arbitral Tribunal in *Trail Smelter* recognised in its Final Award of 1941:

> "That the sanctity of *res judicata* attaches to a final decision of an international tribunal is an essential and settled rule of international law.
>
> If it is true that international relations based on law and justice require arbitral or judicial adjudication of international disputes, it is equally true that such adjudication must, in principle, remain unchallenged, if it is to be effective to that end."[674]

8.71. As the ICJ has also found, the principle of *res judicata* is necessary both to ensure (a) the "stability of legal relations" and (b) a litigant the benefit of a judgment it has already obtained, preserving the sanctity of the principles concerning the legal settlement of disputes.[675] The principle has also been applied by numerous other international courts and tribunals.[676] The principle of *res judicata* and a Court of Arbitration's general competence to address any question concerning the interpretation and application of the Treaty endow a Court's legal conclusions and factual findings with a dispositive quality, subject to new developments, as explained below.

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[673] *Arbitral Award of 3 October 1899 (Guyana v. Venezuela)*, *Jurisdiction of the Court, Judgment, I.C.J. Reports 2020*, p. 455, **PLA-0056**, ¶ 65; *Question of the Delimitation of the Continental Shelf between Nicaragua and Colombia beyond 200 Nautical Miles from the Nicaraguan Coast (Nicaragua v. Colombia), Preliminary Objections, Judgment, I.C.J. Reports 2016*, p. 100, **PLA-0108**, ¶ 58; *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro), Judgment, I.C.J. Reports 2007*, p. 43, **PLA-0109**, ¶¶ 115–116; *Corfu Channel case, Judgment of December 15th, 1949: I.C.J. Reports 1949*, p. 244, **PLA-0072**, p. 248.

[674] *Trail Smelter Arbitration (USA/Canada)*, III RIAA 1905, **PLA-0110**, pp. 1950–1951.

[675] *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro), Judgment, I.C.J. Reports 2007,* p. 43, **PLA-0109**, ¶ 116.

[676] *See Question of the Delimitation of the Continental Shelf between Nicaragua and Colombia beyond 200 Nautical Miles from the Nicaraguan Coast (Nicaragua v. Colombia), Preliminary Objections, Judgment, I.C.J. Reports 2016*, p. 100, **PLA-108**, ¶ 58; *Request for Interpretation of the Judgment of 11 June 1998 in the Case concerning the Land and Maritime Boundary between Cameroon and Nigeria (Cameroon v. Nigeria), Preliminary Objections (Nigeria v. Cameroon)*, *Judgment, I.C.J. Reports 1999*, p. 31, **PLA-0111**, ¶ 12. *See* also *Waste Management v. United Mexican States (II)*, ICSID Case No. ARB(AF)/00/3, Decision of the Tribunal on Mexico's Preliminary Objection concerning the Previous Proceedings, 26 June 2002, **PLA-0112**, ¶ 39; *Landesbank Baden-Württemberg, HSH Nordbank AG, Landesbank Hessen-Thüringen Girozentrale and Norddeutsche Landesbank-Girozentrale v. Kingdom of Spain*, ICSID Case No. ARB/15/45, Decision on the Respondent's Application for Reconsideration of the Tribunal's Decision of 25 February 2019 Regarding the "Intra-EU" Jurisdictional Objection, 11 November 2021, **PLA-0113**, ¶¶ 26–37; *Jan de Nul N.V. and Dredging International N.V. v. Arab Republic of Egypt*, ICSID Case No. ARB/04/13, Award, 6 November 2008, **PLA-0103**, ¶¶ 129–130; *Sistem Mühendislik Inşaat Sanayi ve Ticaret A.Ş. v. Kyrgyz Republic*, ICSID Case No. ARB(AF)/06/1, Decision on Jurisdiction, 13 September 2007, **PLA-0107**, ¶ 132; *RREEF Infrastructure (G.P.) Limited and RREEF Pan-European Infrastructure Two Lux S.à r.l. v. Kingdom of Spain*, ICSID Case No. ARB/13/30, Decision on Responsibility and on the Principles of Quantum, 30 November 2018, **PLA-0106**, ¶ 209.

8.72. As a general principle inherent to the adjudicative function, the principle of *res judicata* necessarily applies to the decisions of a Court of Arbitration established or appointed under the Indus Waters Treaty. Indeed, in its Final Award, the *Kishenganga* Court recognised unquestioningly the "*res judicata*" effect of the Final Award.[677] In that context, the Court observed that, while "stability and predictability in the availability of the waters of the Kishenganga/Neelum for each Party's use are vitally important for the effective utilization of rights accorded to each Party by the Treaty", it was nonetheless "important not to permit the doctrine of *res judicata* to extend the life of [the Final] Award into circumstances in which its reasoning no longer accords with reality along the Kishenganga/Neelum."[678] It was for that reason that the Court put in place a mechanism for future "reconsideration" of the "minimum flow" laid down in its Award.[679] In other words, the Court had to make express provision in its Final Award for deviation from the otherwise applicable and controlling doctrine of *res judicata*.

8.73. The doctrine of *res judicata* does not necessarily preclude a party from attempting to re-litigate a matter of Treaty interpretation in its application to a specific (new) difference before a Neutral Expert regarding a specific (different) HEP—for example, where that matter falls strictly outside "the dispute" addressed in an earlier Court of Arbitration Award. There is no rule of binding precedent in international adjudication, and none under the Treaty, which would render such a Court decision binding on a later Court or Neutral Expert. In those instances, the subsequent decision-maker should have regard to the overriding and general duty on any international dispute resolution body "to exercise its competence in such a manner as to facilitate the actual resolution of the Parties' dispute and to avoid the risks of duplicative proceedings or conflicting decisions"—a duty recognised by this Court in its PO6.[680]

8.74. In summary, the response to question (a) as regards the decision of a past Court of Arbitration in a particular dispute, is that such a decision is:

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677 *Kishenganga* arbitration, Final Award, **PLA-0004**, ¶ 118.

678 *Id.*.

679 *Id.*, § III.C.

680 PO6, ¶ 30. *See* also *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Croatia v. Serbia)*, *Judgment, I.C.J. Reports 2015,* p. 3, **PLA-0105**, ¶¶ 386–389, in which the ICJ held that it would not depart from the "approach" to the interpretation of Article II of the Genocide Convention that it had set out in its earlier judgment in *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro), Judgment, I.C.J. Reports 2007,* p. 43, **PLA-0109** at ¶ 344, because there was no "compelling reason" to do so.

(a) Binding (provided it constitutes an "Award") upon (a) the Parties as to (i) competence, (ii) matters of fact, (iii) the interpretation of the Treaty, and (iv) the application of the Treaty in particular factual circumstances;

(b) Binding, in relation to those aspects of the Award(s) that are *res judicata*, in "(b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert" in all respects (i) to (iv); and

(c) Binding in all other respects, pursuant to Paragraph 23 of Annexure G, the principle of good faith, and the overriding and general duty of comity and mutual respect, in (b) the present proceedings before the Court, and (c) the present proceedings before the Neutral Expert, and controlling in (d) future proceedings (relating to a different dispute or difference) before a court of arbitration or a neutral expert, in all respects (i) to (iv).

8.75. In addition to the concept of a decision being "binding", a Court of Arbitration's legal conclusions and factual findings are dispositive in the present proceedings before the Court, the present proceedings before the Neutral Expert, and future proceedings before a court of arbitration or a neutral expert, subject to new developments.

8C.2 Decisions of a past Neutral Expert

8.76. This subsection considers to what extent and on what basis the decisions of a past Neutral Expert appointed under Article IX of the Treaty concerning (i) competence, (ii) matters of fact, (iii) the interpretation of the Treaty, or (iv) the application of the Treaty in particular factual circumstances, are binding or otherwise controlling with respect to (a) the Parties, (b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert. It also addresses the Court's further question as to what—if any—exceptions or limitations may limit the binding/controlling effect of such decisions, insofar as they are binding or otherwise controlling.

8.77. The first question that arises from the Court's question is what constitutes a "decision" of a Neutral Expert. Pursuant to Article IX and Annexure F, the Neutral Expert is empowered to make three types of "decision": (i) decisions under Paragraph 6 of Annexure F (i.e., procedural decisions); (ii) decisions under Paragraph 7 of Annexure F as to whether "any particular difference falls within Part 1 of […] Annexure [F]" (i.e., competence decisions); and (iii) decisions "on the question or questions referred to him" (i.e., substantive decisions). At the point of filing of this Memorial, the *Baglihar* Determination provides the only example of a substantive "decision" of a "past" Neutral Expert.[681]

8.78. This Court has already held in its Competence Award that, consistent with Paragraph 11 of Annexure F, "all matters within the neutral expert's competence are final and binding in respect of the particular matter on which the decision is made" (while "any difference that is not within his or her competence can give rise to a dispute subject to the procedures that may lead to the establishment of a court of arbitration").[682] The *Kishenganga* Court also reached the view that "*Baglihar* is binding for the Parties in relation to the Baglihar project".[683]

8.79. Decisions of the first category (i.e., procedural decisions of the Neutral Expert under Paragraph 6 of Annexure F) are "final and binding" upon the Parties and upon any Court of Arbitration as regards that proceeding, provided that, and only to the extent that, such decisions are in fact "within [the Neutral Expert's] competence" (in the words of Paragraph 11 of Annexure F).[684]

8.80. This follows not only from the wording of Paragraph 11 of Annexure F, but also from Paragraph 13 of Annexure F. Paragraph 13 provides that:

> "Without prejudice to the finality of the Neutral Expert's decision, if any question (including a claim to financial compensation) which is not within the competence of a Neutral Expert should arise out of his decision, that question shall, if it cannot be resolved by agreement, be settled in accordance with the provisions of Article IX (3), (4) and (5)."

8.81. Accordingly, as Pakistan explained in its Response, a Court of Arbitration has a "dispositive settlement competence", which applies not only to "final decisions but also to both interlocutory decisions and procedural decisions, as any such decision may raise question[s] of *ultra vires* decision-making on the part of the Neutral Expert."[685]

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[681] *Baglihar* Determination, **PLA-0002**.
[682] Competence Award, ¶ 316.
[683] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 470.
[684] *See*, more generally, Pakistan's Response, ¶¶ 142–143.
[685] Pakistan's Response, ¶ 143.

8.82. However, even when such procedural decisions fall squarely "within the competence of a Neutral Expert", they are "controlling" only with regard to the proceeding in which they are made. They concern, pursuant to Paragraph 6, "[t]he procedure with respect to [a particular] reference to a Neutral Expert". Accordingly, they are not "otherwise controlling", outside the context of the proceeding to which they relate, with respect to any of (a) the Parties, (b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, or (d) future proceedings before a court of arbitration or a neutral expert.

8.83. Decisions of the second category, i.e., decisions pursuant to Paragraph 7 of Annexure F regarding a Neutral Expert's competence, are also "final and binding" upon the Parties and upon any Court of Arbitration as regards the particular matter (or HEP) on which the decision is made, provided that, and only to the extent that, such decisions are in fact "within [the Neutral Expert's] competence" (in the words of Paragraph 11 of Annexure F). As with procedural decisions of the first category addressed above, this follows directly from both Paragraphs 11 and 13 of Annexure F. On the other hand, as Pakistan explained in its Response, a decision of a Neutral Expert made pursuant to Paragraph 7 of Annexure F which in fact exceeded his competence would raise a question of ultra vires decision-making and thus fall within the remit of a Court of Arbitration.[686] In those circumstances, were a Court to determine that the Neutral Expert had in fact exceeded his competence in rendering a certain decision pursuant to Paragraph 7, neither the Parties, nor the Court, would be bound by that decision.

8.84. Since there is no decision of a "past" Neutral Expert rendered pursuant to Paragraph 7 of Annexure F, there is no question of whether such a decision is binding or controlling with respect to (b) the present proceedings before the Court, or (c) the present proceedings before the Neutral Expert.

8.85. As regards any future decision of a neutral expert—or indeed of the current Neutral Expert—pursuant to Paragraph 7 of Annexure F, which is not challenged by the Parties and therefore not subject to any contrary decision of a Court of Arbitration, such an interlocutory decision would be "final and binding" on the Parties and any Court of Arbitration, pursuant to Paragraph 11. It would therefore be "binding or otherwise controlling", in the sense of the Court's question at paragraph 35(a) of PO6, with respect to: (a) the Parties, and (d) future

[686] Pakistan's Response, ¶ 143.

proceedings before a court of arbitration, as regards the particular matter (or HEP) on which the decision is made.

8.86. As regards the second part of (d) above—that is, future proceedings before a neutral expert—the same conclusion must follow, i.e., that a past decision of a neutral expert pursuant to Paragraph 7 of Annexure F that has not been subject to a contrary decision of a Court of Arbitration is "binding or otherwise controlling". While that conclusion is not expressly dictated by Paragraph 11 (or, for that matter, by Paragraph 13) of Annexure F, it follows from a "good faith" interpretation of Article IX and Annexure F. A good faith interpretation of these provisions of the Treaty, in turn, supports the application of the doctrine of *res judicata* (as set out in detail in **Chapter 8C.1** above). For present purposes, that means that, absent a contrary finding of a Court of Arbitration, the Parties would be precluded from relitigating before a new neutral expert the disagreement addressed in a past Paragraph 7 decision, and a future neutral expert would be precluded from revisiting such a "decision" with respect to the particular matter on which the decision is made.

8.87. Decisions of the third category, i.e., substantive decisions "on the question or questions referred to him" under Paragraph 9 of Annexure F, are also "final and binding" upon the Parties and upon any Court of Arbitration, in respect of the particular matter or HEP on which the decision is made, provided that, and only to the extent that, such decisions are in fact "within [the Neutral Expert's] competence" (in the words of Paragraph 11 of Annexure F). Just as for procedural and interlocutory decisions of the first and second categories, addressed in the immediately preceding paragraphs, the "final and binding" nature of such substantive decisions follows directly from both Paragraphs 11 and 13 of Annexure F.

8.88. Pursuant to Article IX(2)(a) of the Treaty, the "competence" of the Neutral Expert extends only to any "difference" falling within the provisions of Part 1 of Annexure F. It is to this extent—and to this extent only—that a past (substantive) "decision" of a Neutral Expert is "final and binding". The *Kishenganga* Court addressed the effect of a neutral expert's past determination in its Partial Award as follows:

> "The effect of a neutral expert's determination is restricted to the elements of the design and operation of the specific hydro-electric plant considered by that Expert. Although India has urged the Court to consider the Second Dispute to have been effectively resolved by *Baglihar*, the Court does not see in Annexure F any indication that the Parties intended a neutral expert's determination to have a general precedential value beyond the scope of the particular matter before him. *Baglihar* is binding for the Parties

in relation to the Baglihar project; the present decision, by contrast, is binding in respect of the general question presented in these proceedings."[687]

8.89. The Court thus emphasised that while it was its "duty to decide, as a matter of law, upon the permissibility of drawdown flushing generally under the Treaty", its decision had "no effect on the Parties' rights and obligations in respect of the Baglihar hydro-electric project, as determined by the Neutral Expert in *Baglihar*."[688]

8.90. Accordingly, the third category of "decisions" of a past Neutral Expert (substantive decisions under Paragraph 9 of Annexure F) are "binding", pursuant to Paragraph 11 of Annexure F, and also therefore "controlling", with respect to (a) the Parties, (b) the present proceedings before the Court, (c) the present proceedings before the Neutral Expert, and (d) future proceedings before a court of arbitration or a neutral expert, if and to the extent that those decisions were "within his competence". Such decisions may concern, to use the words of the Court in its question (a), either or both "(ii) matters of fact" (for example, as regards Paragraph 1(6) of Annexure F) and/or "(iv) the application of the Treaty in particular factual circumstances" (under Paragraph 1 of Annexure F more generally). However, the categories of decision listed at (ii) and (iv) in the Court's question are neither "binding" nor "controlling" in any respect to the extent they go beyond a neutral expert's competence. The category of decision listed at (iii)—the interpretation of the Treaty—is not "within the competence" of the Neutral Expert[689,] and thus, by definition, in no respect "binding" or "controlling".

* * *

[687] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 470 (citations omitted).
[688] *Id.*, ¶ 469.
[689] *See* Pakistan's Response, ¶ 271 ("[t]he Court is the mechanism with general interpretative competence under the Treaty as indicated, *inter alia*, by […] its competence to engage in Treaty interpretation writ large (pursuant to Paragraph 29 of Annexure G) […]"). As Pakistan highlighted in its Response, there is no equivalent in Annexure F, of the applicable law clause set out in Paragraph 29 of Annexure G. This "makes clear that a Neutral Expert's interpretative competence is confined to technical matters that do not engage questions of the law of the Treaty or of its systemic application." (*Id.*, ¶ 130). *See* also Competence Award, ¶ 190, confirming that the competence of a neutral expert "is limited to a prescribed list of technical questions, set out in Part 1 of Annexure F, that are appropriate for determination by a person with expertise in hydrology, dam operation, and dam design."

CHAPTER 9: THE SCHEME OF THE WESTERN RIVERS RUN-OF-RIVER HYDRO BARGAIN AND ARTICLE III OF THE TREATY

9.1. As noted in **Chapter 7**, the third bargain reflected in the Treaty is the Western Rivers Run-of-River Hydro Bargain. This bargain constitutes the detailed agreement between the Parties as set out in Article III of the Treaty:

(a) The rule that India must "let flow" the waters of the Western Rivers, that Pakistan "shall receive for unrestricted use all those waters", and that India "shall not permit any interference with these waters"; and

(b) The tightly constrained exceptions to that rule. Most notably, for present purposes, the exception that the waters of the Western Rivers can be used for the generation of hydroelectric power in accordance with the terms of Annexure D.

9.2. The *quid pro quo* for the Hydro Bargain is found in the wider Treaty Bargain, which balanced India's unrestricted right to the use of the waters of the Eastern Rivers, pursuant to Article II, with Pakistan's unrestricted right to the use of the waters of the Western Rivers, pursuant to Article III.

9.3. That the relevant exceptions to the rule are limited and tightly constrained is evident not simply from the fact that they are expressly cast as exceptions, triggering the interpretative rule of narrow construction set out in **Chapter 8**, but also from four other, closely related considerations.

9.4. The **first** is that the exceptions are exceptions not simply to India's "let flow" obligation but also to the injunction that India "shall not permit any interference with the waters" of the Western Rivers. As has been addressed above, "interference with the waters" is a term of art that is given a special meaning in Article I(15) of the Treaty, addressing any act of withdrawal of water and any man-made obstruction to the flow of the waters which causes a change in the volume of the daily flow of those waters. While the "let flow" obligation paints with a broad brush, the non-interference obligation is cast in clear and precise terms that preclude any obstruction by India of the volume of the daily flow of the waters of the Western Rivers. An exception to an injunction in these terms must necessarily be construed narrowly to ensure that the headline obligation is not fundamentally undermined by the exception.

9.5. The soundness of this appreciation is reinforced by the **second**, and closely related consideration, namely, that the hydroelectric power generation exception in Article III(2)(d) is itself expressly contingent on compliance with the terms of Annexure D. Article III(2)(d) does not say simply, as it might have done, that India can use the waters of the Western Rivers for purposes of hydroelectric power generation. It says, rather, that India can use the waters for this purpose "as set out in Annexure D". The terms and conditions of Annexure D are thus an intrinsic and inseparable part of the hydroelectric power generation exception to the "let flow" and non-interference obligations. The terms and conditions of Annexure D are controlling of this exception. Annexure D requires that if India does not bring itself within the terms and conditions of the Annexure, it cannot bring itself within the hydroelectric power exception in Article III(2)(d), with the result that any obstruction that causes a change in the volume of the daily flow of the waters of the rivers will amount to a breach of Article III.

9.6. From an interpretative perspective, the requirements and constraints of Annexure D constitute a further narrowing of the exception—hydroelectric power generation is an exception to India's "let flow" and non-interference obligations and the constraints of Annexure D constitute a narrowing of the exception.

9.7. The **third** consideration is that this construction of the Treaty finds further support in the terms of Article III(4), which provides that "[e]xcept as provided in Annexures D and E, India shall not store any water of, or construct and storage works on, the Western Rivers." This injunction, significantly, is not located in paragraph (2) of Article III, as part of the formulation of the headline rule and its exceptions. It is, rather, set out in a self-standing clause that is subject to its own exception, namely, "except as provided in Annexures D and E". This provision thus completes the circle insofar as it conditions any storage of water by India on the Western Rivers on compliance with, for present purposes, Annexure D.

9.8. The **fourth** brick in the wall is the terms of Annexure D, which address the generation of Run-of-River hydroelectric power by India on the Western Rivers. As will be explained further below, these terms heavily constrain India's right to use the waters of the Western Rivers for hydroelectric power generation. Paragraph 8 of Annexure D, which is at the heart of the Parties' dispute, sets down criteria to which the design of "any new Run-of-River Plant […] *shall conform*" (emphasis added). Pursuant to Paragraph 2(g) of Annexure D, a "Run-of-River Plant" is a HEP "that develops power without Live Storage […] except for Pondage…." The effect of this, before one even comes to the design criteria in Paragraph 8 of Annexure D, is to reinforce still further the exceptional and tightly constrained character of India's right to use the waters of the Western Rivers for hydroelectric power generation.

9.9. Against this background, the remaining parts of this Chapter unpack and address the detail of the Run-of-River Hydro Bargain that is at the heart of this case under the following headings:

(a) **Section A** addresses the rule of "let flow"/non-interference/no storage.

(b) **Section B** explains the relationship between Article III and the other provisions of the Treaty.

(c) **Section C** sets out the Treaty's detailed cooperation and reporting requirements in respect of the design, construction and operation of Run-of-River HEPs on the Western Rivers.

(d) **Section D** answers the Court's question (b) in paragraph 35 of PO6.[690]

9A THE "LET FLOW"/NON-INTERFERENCE/NO STORAGE OBLIGATION

9.10. Article III guarantees Pakistan's exclusive use of the waters of the Western Rivers subject to tightly limited exceptions. As explained in **Chapter 7** and elsewhere in this Memorial, this provision was intended to ensure that the April 1948 crisis, when India cut off irrigation and drinking water to large parts of Pakistan, and put millions in danger from crop failure, could not be repeated.

9.11. Article III is formed of four provisions:

> "(1) Pakistan shall receive for unrestricted use all those waters of the Western Rivers which India is under obligation to let flow under the provisions of Paragraph (2).
>
> (2) India shall be under an obligation to let flow all the waters of the Western Rivers, and shall not permit any interference with these waters, except for the following uses, restricted (except as provided in item (c)(ii) of Paragraph 5 of Annexure C) in the case of each of the rivers, The Indus, The Jhelum and The Chenab, to the drainage basin thereof:

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[690] In PO6, paragraph 35(b), the Court asked the following question: "To what extent can non-Treaty-based design and operational practices be taken into account for purposes of interpreting the technical requirements set out in Annexure D, paragraph 8?"

(a) Domestic Use;

(b) Non-Consumptive Use;

(c) Agricultural Use, as set out in Annexure C; and

(d) Generation of hydro-electric power, as set out in Annexure D.

(3) Pakistan shall have the unrestricted use of all waters originating from sources other than the Eastern Rivers which are delivered by Pakistan into The Ravi or The Sutlej, and India shall not make use of these waters. Each Party agrees to establish such discharge observation stations and make such observations as may be considered necessary by the Commission for the determination of the component of water available for the use of Pakistan on account of the aforesaid deliveries by Pakistan.

(4) Except as provided in Annexures D and E, India shall not store any water of, or construct any storage works on, the Western Rivers."

9.12. Article III(1) expresses the "let flow" obligation, which mandates that Pakistan receive the waters of the Western Rivers "for unrestricted use".

9.13. As a form of words in treaty drafting, "let flow" is unusual. Insofar as Pakistan has been able to establish, the term is not replicated in other international water conventions. A survey of 600 such conventions[691] reveals that there is no direct comparator for the Indus Waters Treaty's "let flow"/"non-interference" obligation.[692] It is *sui generis* to the Treaty and the Hydro Bargain underpinning it. To that end, the following points are relevant.

(a) **First**, "let flow" is not framed in terms of an obligation of *non-appropriation*, such that India has the capacity to use the waters of the Western Rivers so long as they are replaced in equivalent amount.

[691] The Food, Agriculture and Renewable Natural Resources Legislation Database ("**FAOLEX**"), which contains a collection of over 540 water treaties, including their full text, available at: https://www.fao.org/faolex/en (last accessed 18 March 2024); and the Oregon State University Program in Water Conflict Management and Transformation International Freshwater Treaties Database, which contains "summaries and/or the full text of more than 600 international, freshwater-related agreements, covering the years 1820 to 2007", available at: https://transboundarywaters.science.oregonstate.edu/content/international-freshwater-treaties-database (last accessed 18 March 2024).

[692] The concept of "flow" is included in a handful of agreements, but with a different emphasis and scope: *see* e.g., Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, 5 April 1995, 34 ILM 864, Chapter II (defining "[a]cceptable minimum monthly natural flow"), **PLA-0093**; Treaty relating to Cooperative Development of the Water Resources of the Columbia River Basin (with Annexes), 17 January 1961, 59 AJIL Supp 989, Art II(1), **PLA-0100** (referring to Canada providing certain storage "usable for improving the flow of the Columbia River"). *See* also the Treaty on the Lesotho Highlands Water Project Between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa, 24 October 1986, Article 6, **PLA-0104** (prohibiting parties from "unilateral interference with the delivery of water to the Designated Outlet Point" and requiring Lesotho to ensure the "minimum rates of flow" downstream of each Project dam).

(b) **Second**, the concept is also not framed as a prohibition. Rather, India is under a *positive obligation* to "let flow" the relevant waters and permit no interference with them. The "let flow" obligation is the starting point for analysing compliance, not an afterthought.

(c) **Third**, the obligation is not limited in terms of volume, and therefore applies to *all* the relevant waters. It would be no defence for India to say that it only *partially* impeded the flow of the Western Rivers. The language of "let flow" and "all the waters" is unequivocal. India having been allocated the waters of the Eastern Rivers for its exclusive use under the Treaty, it is to those rivers that India must look to satisfy any needs it may have. To the extent those waters are not sufficient to meet India's needs, it will have to modify its expectations or seek other solutions: the waters of the Western Rivers are allocated to Pakistan, and to Pakistan alone, subject only to the tightly limited exceptions.

9.14. Article III(2) elaborates on the "let flow" obligation by introducing the principle of "non-interference" with all the waters of the Western Rivers except for tightly restricted uses. The *travaux préparatoires* recount how the principle of non-interference was crucial to Pakistan.[693] The Parties understood that this meant that India should not alter the flow, in quantity or timeliness, of the Western Rivers as they pass into Pakistan and that India may only construct obstructions with Pakistan's consent. Pakistan strongly objected to any form of standing consent for the construction by India of works for the generation of hydro-electric power that would interfere with, or be capable of interfering with, the natural flow of the river (including but not limited to storage works). To take one example, a letter from Pakistan's Minister of Industries dated 10 September 1957 expressed Pakistan's concerns:

> "Being the lower riparian, Pakistan alone is vulnerable to interference by India. By introducing for the first time at this stage new uses on Western Rivers, e.g. […] unrestricted right to develop hydro-electric power from those rivers, India has, while trying effectively to secure to herself the exclusive use and development of the Eastern Rivers, sought to deny the reciprocal independence to Pakistan which the Bank Proposal and the Aide Memoire promised to afford to each country."[694]

[693] **Appendix A**, **Section 4.A.3**.
[694] Letter from Mr Mueenuddin to Mr Iliff (with enclosure), 10 September 1957, **Exhibit P-0420**.

9.15. The Appendix to the letter noted that interference by hydroelectric work "is repugnant to the provisions of the Adjusted Bank Proposal and Pakistan cannot agree to any such works in areas under the control of India".[695]

9.16. Pakistan, under pressure from the World Bank, eventually accepted a narrow exception to India's "let flow" obligation for hydroelectric power generation.[696] That carve-out from the "let flow" obligation appears in Article III(2)(d).

9.17. Article I(15) defines "interference with the waters". As addressed in **Appendix A**, in the Indus Waters Treaty 1960 draft of 9 December 1959 ("**December 1959 draft**"), the definition of "interference" was "any act of withdrawal therefrom or any man-made obstruction to their flow which causes a change in the volume of the daily flow of the waters".[697] In the final Treaty, this evolved to become the following:

> "The term 'interference with the waters' means:
>
> (a) Any act of withdrawal therefrom; or
>
> (b) Any man-made obstruction to their flow which causes a change in the volume (within the practical range of measurement) of the daily flow of the waters: *Provided however that an obstruction which involves only an insignificant and incidental change in the volume of the daily flow, for example, fluctuations due to afflux caused by bridge piers or a temporary by-pass, etc., shall not be deemed to be an interference with the waters.*"[698]

9.18. The emphasised language was likely inserted in response to discussions concerning what a "change in the volume of the daily flow of the waters", within the meaning of Article I(12) of the December 1959 draft, would look like. Article I(15) gives a firm answer to this question: literally *any* practically measurable change in flow caused by India that exceeds the kind of "insignificant or incidental" change caused by (for example) sinking a bridge pier or allowing for flood bypass will be considered an "interference with the waters" of the Western Rivers and a breach of the "let flow" obligation of Article III(2), unless India is able to establish an exception. This affirms the centrality of Article III in the architecture of the Treaty, and the paramount character of the rule of unrestricted use it grants to Pakistan.

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695 *Id.*, ¶ (3).

696 **Appendix A**, **Sections 4.B** and **5.C.1–2**.

697 Indus Waters Treaty 1960 draft of 9 December 1959 [without Annexures] ("**December 1959 draft**"), **Exhibit P-0139**, p. 3; *see* also, **Appendix A**, **Section 4.B**.

698 Indus Waters Treaty 1960, **PLA-0001**, Article I(15) (emphasis added).

9.19. The practical implementation of the "let flow" and non-interference obligations is set out in Article III(3), which reiterates Pakistan's right to "unrestricted use of all waters" other than the Eastern Rivers, contrasted with the prohibition (also in Article III(3)) on India "mak[ing] use of these waters". The establishment of discharge observation stations emphasises that constant monitoring and cooperation is envisaged by the Parties. This is discussed further in **Chapter 9C** below.

9.20. Finally, Article III(4) deals with the equally important principle of "no storage" by India. As the *Kishenganga* Court held, "one of the primary objectives of the Treaty is to limit the storage of water by India on the Western Rivers".[699] In keeping with this, Article III(4) imposes a clear prohibition on India retaining, in any way, the waters of the Western Rivers except as provided in Annexures D and E.

9.21. According to the *travaux préparatoires*, as set out in more detail in **Appendix A**, the issue of storage arose relatively late in the negotiations. In August 1959, both Parties' draft Heads of Agreement envisaged that India's hydroelectric uses of the Western Rivers would be a type of "non-consumptive use". However, India's draft also proposed that it be given a limited storage capacity for HEPs (among other uses) of 0.1 MAF per "single storage" (as opposed to per tributary). The President of Pakistan was prompted to write a letter on 21 August 1959 emphasising Pakistan's consistent position that it must be guaranteed the "total flow of Western Rivers, excepting for insignificant uses in Jammu and Kashmir only". A new request by India for "no limit to uses from Indus, Jhelum above lake, and Chenab about RL 2000 covering Jammu and Kashmir, as well as Indian territory [… and] storages" was in stark contrast to Pakistan's consistent and fundamental position.[700] As **Appendix A** recounts, the Parties engaged in fierce negotiations on these issues into Spring 1960, which prevented progress on the draft Annexures C (Agricultural Use), D (HEPs) and E (Storage). Pakistan was under significant pressure from the Bank to yield to India's demands. In the Indus Waters Treaty, draft of 8th June 1960 ("**June 1960 draft**"),[701] the reference to Annexure D was included in Article III(4), extending its terms to the production of hydroelectric power by India on the Western Rivers. In this way, the Treaty drafters confirmed that the live and dead storage of a Run-of-River HEP constitute forms of storage covered by the prohibition, as opposed to larger reservoirs alone. Although there is a lack of clarity on the evolution of the negotiations

[699] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 504.
[700] Message from President Ayub of Pakistan to Mr Black, 21 August 1959, **Exhibit P-0468**.
[701] June 1960 draft, **Exhibit P-0151**.

in the period between April and June 1960, it is evident that the strict limits on storage in Annexures D and E are the outcome of these intense exchanges, and any derogation from the "no storage" rule is to be strictly construed.[702]

9B THE RELATIONSHIP BETWEEN ARTICLE III AND OTHER PROVISIONS OF THE TREATY

9.22. The relationship between Article III and other provisions of the Treaty in the light of the Hydro Bargain operates on two levels:

(a) The "let flow"/non-interference obligation in the *chapeau* of Article III(2) constitutes the rule. The provisions in Article III(2)(a)–(d) and Paragraphs 8-17 of Annexure D constitute tightly limited exceptions to that rule (subsection 1).

(b) The prohibition on storage and storage works in Article III(4) is the rule, which is subject only to the provisions in Annexures D and E (subsection 2).

9.23. The canon of treaty interpretation that exceptions to a rule are to be interpreted restrictively operates to ensure that the central edifice of the Hydro Bargain is not undone, a Bargain that protects Pakistan's exclusive right to the waters of the Western Rivers. The object and purpose of the Treaty also requires a restrictive interpretation of the exceptions given that the rule is of central importance to the entire scheme of the Parties' agreement.[703] In the light of its extensive programme of HEP development (addressed in **Chapter 5**), the burden is on India to demonstrate that its conduct comes within the scope of the exceptions.

9B.1 The relationship between Article III and the provisions on hydroelectric power

9.24. The *chapeau* of Article III(2) expressly restricts the use of waters, save for a limited exception given in Annexure C concerning irrigation,[704] "in the case of each of the [Western] rivers […] to the drainage basin thereof". It follows that even if the exception in Article III(2)(d) for the "[g]eneration of hydro-electric power" is applicable, its use can only be justified in so far as it remains within the drainage basin of the river concerned.

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[702] **Appendix A**, **Section 5.C.4**.

[703] *See* e.g., *Whaling in the Antarctic (Australia v Japan; New Zealand intervening)*, Judgment [2014] ICJ Rep 226, **PLA-0091**, ¶¶ 56–58; *Enron Creditors Recovery Corporation (formerly Enron Corporation) & Ponderosa Assets LP v Argentine Republic*, ICSID Case No ARB/01/3, Award, 22 May 2007, **PLA-0091**, ¶ 331.

[704] Indus Waters Treaty 1960, **PLA-0001**, Annexure C, Paragraph 5(c)(ii).

9.25. Under the Hydro Bargain, India is entitled to generate hydroelectric power insofar as it does so within the constraints of the exception in Article III(2)(d). This in turn conditions that generation of hydroelectric power on compliance with the provisions of Annexure D of the Treaty, which further narrows the exception.

9.26. Annexure D elaborates detailed terms and conditions that define, cabin and constrain the hydroelectric power exception in Article III(2)(d). Following Paragraph 1, addressed below, the Annexure is divided into five Parts, two of which are principally relevant for present purposes: Part 1, which defines key terms, according to a number of them a bespoke, special meaning for purposes of the Treaty, and Part 3, which addresses new Run-of-River Plants. Amongst the key provisions in Part 3 is Paragraph 8, which mandates detailed criteria to which the design of any new Run-of-River Plant "shall conform." It is these mandatory design criteria that are at the heart of the dispute between the Parties in these proceedings.

9.27. Paragraph 1 of Annexure D states:

> "The provisions of this Annexure shall apply with respect to the use by India of the waters of the Western Rivers for the generation of hydro-electric power under the provisions of Article III(2)(d) and, *subject to the provisions of this Annexure*, such use shall be unrestricted : *Provided that* the design, construction and operation of new hydro-electric plants which are incorporated in a Storage Work (as defined in Annexure E) shall be governed by the relevant provisions of Annexure E." (Emphasis added)

9.28. As the emphasised phrases of the Paragraph make clear, any suggestion that Paragraph 1 of Annexure D gives India an unrestricted right to construct and operate HEPs on the Western Rivers would be incorrect. The detailed provisions of the Annexure make it clear that India's right to use the waters of the Western Rivers for hydroelectric power generation is subject to tightly limiting constraints. And the proviso ("Provided that...") ensures that new HEPs that incorporate Storage Works fall to be addressed under Annexure E. It follows that new Run-of-River HEPs cannot be Plants that incorporate Storage Works. While Run-of-River HEPs are permitted to store a limited volume of water by way of Pondage, Pondage is a restricted volume of Live Storage, i.e., water for operational purposes, the volume of water so stored being subject to tight control. Further, the Annexure D design and operational criteria are to be construed narrowly, as an exception to the "let flow" principle in Article III.

9.29. The design and operational requirements and restrictions for new Run-of-River HEPs are laid down in Part 3 of Annexure D (termed, in this Memorial, "Annexure D.3 HEPs").

(a) Design requirements and restrictions

9.30. The overarching restriction in Annexure D is that it permits only the construction of "Run-of-River Plants", being (pursuant to Paragraph 2(g)) a HEP "that develops power without Live Storage as an integral part of the plant, except for Pondage and Surcharge Storage".

9.31. As was addressed in **Chapter 4**, Run-of-River HEPs use the natural flow of the watercourse to drive turbines that generate electricity. Given their reliance on natural flow, they are susceptible to the effects of a fluctuating flow of water. In the context of the Western Rivers, which rely on snow and/or glacial melt to provide water, this will result in a considerably higher flow in the "wet" summer months than in the "dry" winter months. There may also be shorter-term fluctuations, as well as longer-term fluctuations due to climate change. To address this, run-of-river HEPs typically include a small amount of controllable live storage (Pondage) to enable fluctuations in the flow of water to be addressed via timed release of water into the turbines.

9.32. What is significant about Annexure D is that it prescribes, in close and unusual detail, particular design requirements of Run-of-River HEPs with which India must comply. Storage, in the form of Pondage, is severely limited. Other mandatory design criteria address elements that are intended to constrain, heavily, the use of both Pondage (the small volume of water stored for operational purposes) and "Dead Storage" (stored water that cannot be used for operational purposes). Other design criteria address construction-feature constraints aimed at controlling the downstream effects of the release of water for purposes of sediment management. These design criteria reflect and underpin Pakistan's rights of exclusive use of the waters of the Western Rivers under Article III.

9.33. The design restrictions are contained in Paragraph 8 of Annexure D. They are informed by various definitions set out in Paragraph 2 of Annexure D.

9.34. Annexure D is built around the concept of "Dead Storage" (Annexure D, Paragraph 2(a)), being the water stored in the HEP's reservoir for non-operational purposes, and which—pursuant to Paragraph 19 of Annexure E, extended to Annexure D through Paragraph 14 of Annexure D—cannot be discharged for anything other than an unforeseen emergency.

9.35. In Annexure D, the "Dead Storage Level" sits below the "Operating Pool" (addressed below) and accounts for all remaining water in the reservoir. This is a term with a special meaning, in accordance with Article 31(4) of the VCLT. For any other (non-Treaty) HEP, the Dead Storage Level would refer to the point of the reservoir below the invert of the lowest outlet, such that if the reservoir were emptied, water would nevertheless remain in the reservoir below this point. The water between the bottom of the Operating Pool and the Dead Storage Level would be referred to as "controllable storage"—a concept that does not exist in Annexure D. There is only Dead Storage and Live Storage, and the latter cannot be touched by the HEP operator absent an emergency (pursuant to Annexure E, Paragraph 19, incorporated into Annexure D by reference by Paragraph 14 thereof).

9.36. "Live Storage", pursuant to Paragraph 2(b) of Annexure D, is the water in the HEP's reservoir above the Dead Storage Level, which is used operationally. "Pondage", in turn, is defined (but not calculated) with the special meaning of "Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant" (Annexure D, Paragraph 2(c)). This, in turn, fixes the "Full Pondage Level", being the normal upper level of the reservoir, at "the level corresponding to the maximum Pondage provided in the design in accordance with Paragraph 8 (c)" (Annexure D, Paragraph 2(d)). And it also fixes the volume of the HEP's "Operating Pool", being the storage capacity between Dead Storage Level and Full Pondage Level where the Pondage is to be accumulated until discharged (Annexure D, Paragraph 8(f)). Above the Operating Pool in the reservoir is "Surcharge Storage", another form of Live Storage, which is "uncontrollable storage occupying space above the Full Pondage Level" (Annexure D, Paragraph 2(e)). This form of storage ordinarily results from emergency flood conditions and cannot be retained for later use.

9.37. All of these various definitions in Paragraphs 2(a)–(e) of Annexure D can be depicted by a cross-section diagram of a HEP's reservoir as follows:

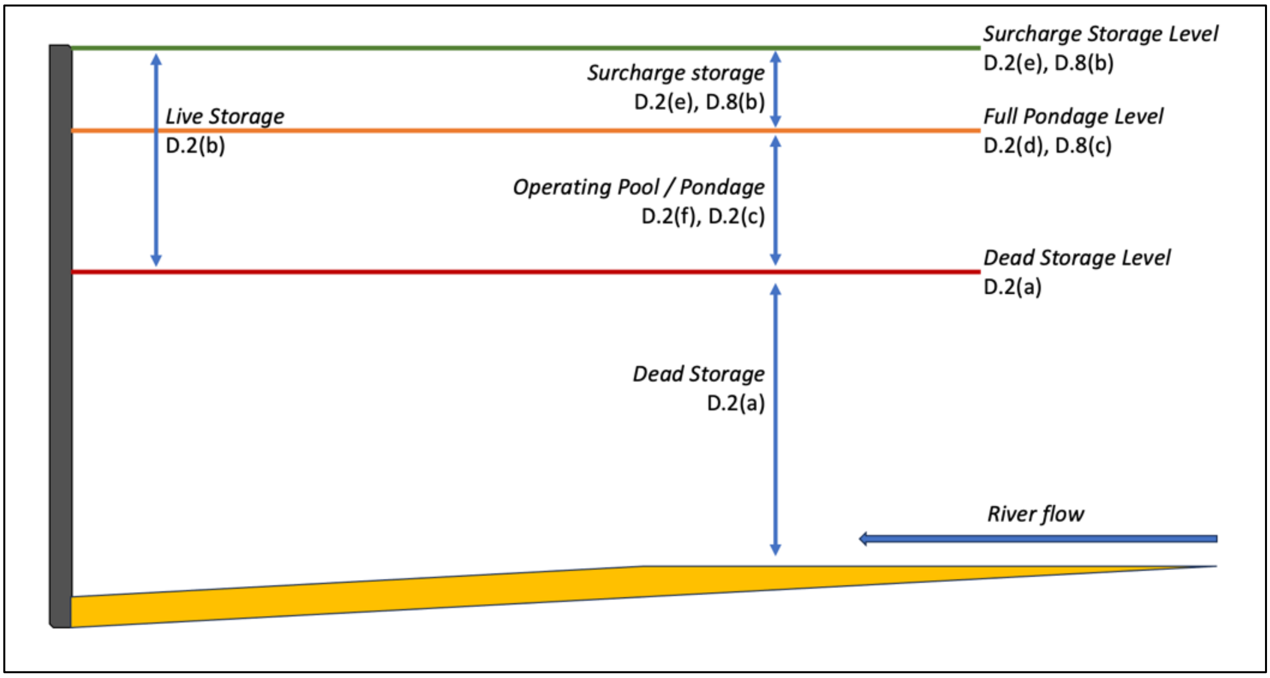

Figure 9.1 – Cross-section of HEP Annexure D reservoir

(The references are to the relevant Annexure D, Paragraphs 2 and 8 sub-paragraphs)

9.38. A further and important defined term is "Firm Power" in Paragraph 2(i) of Annexure D. This refers to the hydroelectric power "corresponding to the minimum mean discharge at the site of a plant".

9.39. As explained in **Chapters 5** and **6** above, Part 2 of Annexure D grandfathers HEPs that India had either already constructed or was in the process of constructing on 1 April 1960. Pursuant to this Part, such HEPs could be operated without restriction. A list of these HEPs is provided in Paragraphs 3 and 4 of Annexure D. Each of the HEPs concerned is relatively small, with the largest being Ganderbal, at 15MW. By comparison, the KHEP has an installed capacity of 330MW, and the planned RHEP will have an installed capacity of 880MW.

9.40. When dealing with a new Run-of-River HEP, India is required to comply with the design criteria set out in Paragraph 8 of Annexure D—unless the HEP falls into the category of a "Small Plant" under Paragraph 18.[705] These mandatory design criteria, with which any new Run-of-River Plant must comply ("shall conform to …") are as follows:

[705] A Small Plant is truly small: the aggregate maximum discharge through the turbines cannot exceed 300 cusecs and the dam cannot be higher than 20 feet above the river bed. It cannot be located on the main stem of any of the Western Rivers but only on a tributary: Annexure D, Paragraph 18.

"(a) The works themselves shall not be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design.

(b) The design of the works shall take due account of the requirements of Surcharge Storage and Secondary Power.

(c) The maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power.

(d) There shall be no outlets below the Dead Storage Level, unless necessary for sediment control or any other technical purpose; any such outlet shall be of the minimum size, and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works.

(e) If the conditions at the site of the Plant make a gated spillway necessary, the bottom level of the gates in the normal closed position shall be located at the highest level consistent with sound and economical design and satisfactory construction and operation of the works.

(f) The intakes for the turbines shall be located at the highest level consistent with satisfactory and economical construction and operation of the Plant as a Run-of-River Plant with customary and accepted practice of design for the designated range of the Plant's operations.

(g) If any Plant is constructed on the Chenab Main at a site below Kotru (Longitude 74° – 59' East and Latitude 33° – 09' North), a Regulating Basin shall be incorporated."

9.41. These criteria, so far as they are relevant to the present case, are examined in detail in **Part IV** of this Memorial. In the context of the Hydro Bargain, the following key points are noted at this stage:

(a) Consistent with the object and purpose of the Treaty, and reflecting the Hydro Bargain, the Paragraph 8 criteria can only be interpreted as a deliberate effort by its drafters of the Treaty to limit India's ability to store water on the Western Rivers and to control the use of the water that it is permitted to store. The criteria thus narrow significantly the exception to the "let flow"/non-interference/no storage obligation on India pursuant to Article III.

(b) As such, the Paragraph 8 criteria are not value-neutral, and cannot be dismissed by India on the basis that they prevent India from designing, constructing and operating whatever kind of HEP it wishes to design, construct or operate. That was a central finding of the *Kishenganga* Court.[706]

(c) Except for Paragraph 8(g), addressing regulating basins, which stands apart from the other provisions of Paragraph 8, the point of each criterion is to limit India's storage of water within HEP reservoirs on the Western Rivers and/or constrain the control that India can exercise over that limited volume of water that it is permitted to store. As already noted, this aspect was a 'red line' in Pakistan's negotiating position on Paragraph 8.[707]

(d) By Paragraph 8(c), the calculation of the maximum allowable Pondage, a term defined in Paragraph 2(c), is tied to river flow through the medium of "Firm Power" (defined with a special meaning in Paragraph 2(i)), which is calculated by reference to the discharge of the watercourse at the proposed HEP site. This approach is highly unusual as the concept of firm power is ordinarily calculated by reference to demand, plotted on a load curve, rather than by reference to the flow of the river.[708] A maximum allowable Pondage calculation based on river flow, as Paragraph 8(c) requires, rather than by reference to demand for electricity, will therefore ordinarily lead to a lower amount of storage. While this approach is unusual, it is entirely consistent with the wider objectives of the Treaty and the Run-of-River Hydro Bargains to limit India's right and ability to store water on the Western Rivers.

9.42. As a result, Annexure D does not limit the number of HEPs that India can build on the Western Rivers, but it does severely constrain the storage available to India in the form of Pondage.

9.43. Other provisions of Paragraph 8 of Annexure D impose further design constraints on India. Paragraph 8(d) provides that low level outlets cannot be placed below the Dead Storage Level of the HEP unless necessary for sediment control or some other technical purpose, and, in such cases, imposes restrictions that require that such outlets must be of the minimum size,

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[706] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 522.
[707] Cable No. 82 from Mr W. A. Sheikh (Foreign Office Rawalpindi) to Mr Mueenuddin (Pakistan Representative Washington), 26 January 1960, **Exhibit P-0541**, p. 2.
[708] The Neutral Expert in the *Baglihar* proceedings adopted such a definition, against the provisions of the Treaty, and was entirely wrong to do so: *Baglihar* Determination, **PLA-0002**, § 5.9.3.

and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works. Both of these limitations are unusual and would not be found in a typical run-of-river commercial contract for the construction of a run-of-river HEP in, for example, Nepal. While the language in Paragraph 8(d) allows a measure of design flexibility, it does not enable India to ignore the restrictions of the Paragraph on the basis that complying with them will not produce an HEP that is in line with "best practice".

9.44. Similar (though not identical) language appears in other sub-paragraphs of Paragraph 8, notably Paragraph 8(e), addressing gated spillways, and Paragraph 8(f), addressing intakes for turbines.

9.45. Paragraph 8(e) provides that ungated spillways (i.e., uncontrollable spillways at the top of the dam wall) are the presumptive design approach, with the use of gated spillways only being permissible if necessitated by "the conditions at the site of the Plant". Such conditions would include, for example, if the valley in its natural configuration is so narrow as to make an ungated spillway necessary for design flood purposes. If this bar is met, Paragraph 8(e) further restricts the designer's options by requiring that "the bottom level of the gates in the normal closed position shall be located gated at the highest level consistent with sound and economical design and satisfactory construction and operation of the works."

9.46. Paragraph 8(f) adopts a similar approach in respect of intakes for the turbines—power intakes—which are another means by which water can be released from a HEP; not through the dam wall but through the intake itself. By requiring the power intakes to be placed as high as possible within the reservoir, Paragraph 8(f) limits the extent to which India can use power intakes to manipulate controllable storage. While surface level intakes may be the preferred design choice for a run-of-river HEP (as they minimise the amount of sediment that enters the turbine, increasing the longevity of the turbine blades) there are valid engineering reasons why an HEP designer might prefer to situate the power intakes lower in the reservoir. As with other Annexure D HEP design criteria, however, Paragraph 8(f) heavily constrains design flexibility, requiring the designer to adopt the highest power intake configuration consistent with "satisfactory an economical construction and operation of the Plant […] and with customary and accepted practice of design for the designated range of the Plant's operation."

9.47. The interpretation and application of the above provisions are addressed more fully in **Chapter 10**.

9.48. A vivid illustration of the design restrictions imposed on India under the Hydro Bargain is the change in the KHEP from Storage Work to a Run-of-River Plant. As the *Kishenganga* Court observed, the KHEP was "first conceived as a Storage Work" under Annexure E of the Treaty in 1971.[709] Under its original design, the KHEP was to store water during the high flow season in a 220.00 MCM reservoir behind a 77-metre high dam.[710] The stored water was to be used for enhanced power generation during the winter.[711] Following Pakistan's objections,[712] India redesigned the KHEP in 2006 with a 35.48 metre high dam and a reservoir of 18.35 MCM.[713] In India's own words, "the revised Run-of-River design is largely the same as the earlier design".[714] For the avoidance of doubt, Pakistan considers the design and operation of KHEP to be *inconsistent* with the Treaty and "better characterized as an Annexure E Storage Work".[715] As stated in Pakistan's Arbitration Request and explained in **Chapter 2**, Pakistan has disputes with India with respect to Pondage, intakes, sediment outlets, and spillways of the KHEP.[716]

(b) Operational restrictions

9.49. The HEP design restrictions in Paragraph 8 of Annexure D are matched by operational restrictions in Paragraph 15 of the Annexure. This sets out a general rule for HEP operation that is intended to maintain consistency in downstream flow:

> "[T]he works connected with a Plant shall be operated so that (a) the volume of water received in the river upstream of the Plant, during any period of seven consecutive days, shall be delivered into the river below the Plant during the same seven-day period, and (b) in any one period of 24 hours within that seven-day period, the volume delivered into the river below the Plant shall not be less than 30% and not more than 130% of the volume received in the river above the Plant during the same period of 24 hours".

9.50. Paragraphs 15(i)–(iii) then provide a series of river-specific limitations in addition to the above conditions. On the main stem of the Chenab above Ramban, for example, India must allow for no interruption in flow over a 24-hour period: all water received upstream from the HEP in that time must be delivered downstream within 24 hours. And with respect to the Jhelum, India is only able to undertake an inter-tributary transfer to the extent it does not

[709] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 154 and 438.
[710] *Id.*, ¶ 154.
[711] *Id.*, ¶ 154.
[712] *Id.*, ¶ 440.
[713] *Id.*, ¶ 155.
[714] *Id.*, ¶ 236.
[715] *Id.*, ¶ 315.
[716] Pakistan's Arbitration Request, ¶ 7(k).

adversely affect Pakistan's then-existing irrigation and hydroelectric activity downstream—a point that was the focus of the first dispute in *Kishenganga*.[717] While principally operational, Paragraph 15 also has design implications, the possibility of an inter-tributary transfer must be incorporated into the HEP whilst still on the drawing board.[718]

9.51. Paragraph 15 plainly imposes additional storage limitations on India. India cannot, for example, use a HEP reservoir to store 100% of the waters of the river for a fortnight and then release it back into the river in a flood, creating downstream hazards for Pakistan. By Paragraph 15, India is required to deliver downstream the same volume of water that was received upstream "during any period of seven consecutive days", with added constraints on the approach that is permissible within any period of 24 hours. These restrictions, which are operationally significant, reinforce the rule of "let flow"/non-interference/no storage under Article III and the limited and tightly regulated nature of the carve-outs. They affirm the exceptional nature of the operational flexibility afforded to India under Annexure D.

(c) Other exceptions in Article III(2)(a)-(c)

9.52. The other exceptions to the "let flow"/non-interference/no storage rule are contained in Article III(2)(a)–(c). They provide useful context to the Hydro Bargain. Article III(2)(a) permits "Domestic Use", which is defined in Article I(10):

> "[T]he use of water for:
>
> (a) drinking, washing, bathing, recreation, sanitation (including the conveyance and dilution of sewage and of industrial and other wastes), stock and poultry, and other like purposes;
>
> (b) household and municipal purposes (including use for household gardens and public recreational gardens); and
>
> (c) industrial purposes (including mining, milling and other like purposes) […]"

9.53. The first two permitted domestic uses are relatively non-invasive. Although the use of water for "industrial purposes" could require significant offtake in some industries such as mining and smelting, that offtake is limited in turn by Article IV(12). This provides that the use of water for industrial purposes by India on the Western Rivers under Article III(2) shall not exceed: in the case of an industrial process known before 1 April 1960, the quantum of use

[717] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 378–436.
[718] *Id.*, ¶ 407.

for that process as was customary as of 1 April 1960; and in the case of an industrial process not known before 1 April 1960, (a) the quantum of use in similar or comparable industrial processes as was customary on 1 April 1960, or (b) where there was no such similar or comparable process, a quantum of use that does not have a substantially adverse effect on Pakistan.

9.54. The purpose of such a limitation is self-evidently to protect Pakistan from increasing industrial demands by India in the years following the Treaty's conclusion. The allowable consumption of water for a known or comparable industrial process is limited to the quantum of use in 1960, ensuring that India cannot take advantage of developments that require more water (although it can take up advancements that require less). In the case of an unforeseen but later developed industrial process, moreover, India can only utilise it to extract water from the Western Rivers to the extent such a process does not have a substantially adverse effect on Pakistan. In addition, pursuant to the second clause of Article IV(13), which entitles India to extract water from the Western Rivers for use in an industrial process, it is obliged to use best endeavours to return it.

9.55. Article III(2)(b) permits "Non-Consumptive Use", defined in Article I(11) as:

> "…[A]ny control or use of water for navigation, floating of timber or other property, flood protection or flood control, fishing or fish culture, wild life or other like beneficial purposes, provided that, exclusive of seepage and evaporation of water incidental to the control or use, the water (undiminished in volume within the practical range of measurement) remains in, or is returned to, the same river or its Tributaries; […] ."

9.56. India can only rely on this exception to the extent that the use in question is for a relevant purpose and it ensures that any water removed from the watercourse beyond a d*e minimis* amount is returned to it, consistent with the "let flow" obligation.

9.57. Non-Consumptive Use also includes use of the Western Rivers by India for the purpose of "flood protection or flood control". India's capacity to do so is again limited, this time by the provisions of Article IV(2), the second sentence of which provides:

> "In executing any scheme of flood protection or flood control each Party will avoid, as far as is practicable, any material damage to the other Party, and any such scheme carried out by India on the Western Rivers shall not involve any use of water or any storage in addition to that provided under Article III."

9.58. Therefore, even in circumstances of flood protection or control, India cannot store any water on the Western Rivers save as permitted by Annexures D and E, in keeping with Article III(4). The same limitations also apply under Article IV(3), which addresses the Parties' right to undertake maintenance of the watercourses.

9.59. Article III(2)(c) and Annexure C deal with "Agricultural Use", defined in Article I(9) as simply meaning "the use of water for irrigation, except for irrigation of household gardens and public recreational gardens." So far as India is concerned, the real limitations are contained in Annexure C, which consists of 10 paragraphs placing onerous limits on Indian irrigation from the Western Rivers in terms of the amount of water that can be removed, and the land area that can be irrigated.

9B.2 The relationship between Article III and the provisions on storage of the waters of the Western Rivers

9.60. Article III(4) is a self-standing clause that prohibits India's storage of any water, or the construction of any storage works, on the Western Rivers, subject to Annexures D and E.

9.61. As a preliminary remark, it is noteworthy that pursuant to Article II Pakistan does not have the possibility to store or use for hydroelectric power the waters of the Eastern Rivers before they flow finally into Pakistan. This balance between the Parties, struck as part of the Treaty Bargain, is also crucial to the Hydro Bargain. It is an additional reason to construe restrictively India's right to use the waters of the Western Rivers for hydroelectric power under Article III. Interpreted expansively, such rights would give India the capacity to control the Western Rivers, threatening the definitive division of the Indus Basin that is the Treaty Bargain itself.

9.62. Turning to storage, the capacity of India to construct any Storage Work on the Western Rivers is severely limited by Annexure E—consistent with the structure of the Treaty whereby Annexure E is an exception to the primary rule of Article III(4). A "storage work" is defined as "a work constructed for the purpose of impounding the waters of a stream" (Paragraph 2(a) of Annexure E). This may be done by damming an existing watercourse or a natural lake, or through the construction of a man-made reservoir into which the Western Rivers can be diverted.

9.63. Storage of water *generally* is not a defined term in Annexure E, but it is clear that it concerns the intervention by a riparian in the natural flow of a watercourse with a view to retaining a portion of that water for a specific use.

9.64. To that end, Paragraph 2 of Annexure E defines several different types of storage, by reference to reservoir capacity and the corresponding volume of water. They each reflect a different aspect of water stored behind the dam of a Storage Work.[719] Taken together, they comprise the "Reservoir Capacity", meaning the gross volume of water that can be stored in a reservoir per Paragraph 2(b) of Annexure E.

9.65. While India is allowed to continue to operate those Storage Works that existed prior to 1 April 1960, its ability to construct new Storage Works is capped by the provisions of Paragraph 7 of Annexure E:

> "The aggregate storage capacity of all […] [reservoirs] which may be constructed by India after […] [1 April 1960] on each of the River Systems specified […] [below] shall not exceed, for each of the categories [of storage] […] the quantities specified therein."

9.66. Paragraph 7 then sets out limits to the amount of storage capacity that India is allowed to build on the Western Rivers.[720] These are not generous. Moreover, any storage work constructed on a Tributary of the Jhelum on which Pakistan has any agricultural or hydro-electric power use has to be designed and operated so "as not to adversely affect the then existing Agricultural use or hydro-electric use on that Tributary" (Paragraph 10).

9.67. Other forms of storage are regulated by the detailed design criteria for Storage Works in Paragraph 11 of Annexure E. Where the Storage Work contains a HEP, it must be operated in accordance with the provisions of Paragraph 21 of Annexure E, which limits storage further. In particular, Paragraph 21(b) provides that, save for the period each year in which India is filling the Conservation Storage of a Storage Work under the strict parameters of Paragraph 18 of Annexure E (by default during the wet season, when water is plentiful[721]), "the volume of

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[719] Not every Storage Work will require every type of storage—Power Storage, for example, will only be required if the Storage Work incorporates a HEP, as anticipated by Paragraph 21 of Annexure E.

[720] Exclusive, *inter alia*, of Pondage for HEPs constructed under Annexure D and Paragraph 21(a) of Annexure E, and Surcharge Storage and Dead Storage allowed for under both Annexures: Annexure E, Paragraphs 8(d), (e), (f).

[721] India is entitled to fill its Conservation Storage annually, and its Dead Storage once only, at such time and in accordance with such rules as agreed between the Commissioners. In the absence of any agreement, India is entitled to fill its Conservation Storage and Dead Storage: (a) for the Indus, between 1 July and 20 August; (b) for the Jhelum, between 21 June and 20 August; and (c) for the Chenab, between 21 June and 31 August, but only at such a rate as not to reduce the flow of the main stem above Merala to less than 55,000 cusecs: Annexure E, Paragraph 18.

water delivered into the river below the work [Storage Work] during any period of seven consecutive days shall not be less than the volume of water received in the river upstream of the work in that seven-day period". This ensures a constant flow of water to Pakistan for the vast majority of the year, including during the entirety of the dry season.

9.68. As a result, the only form of storage capacity that is *not* regulated under Annexure E (nor by Annexure D) is Dead Storage Capacity, which once filled initially in accordance with Paragraph 18 cannot be depleted "except in an unforeseen emergency" per Paragraph 19. As the *Kishenganga* Court of Arbitration noted:

> "Dead Storage is the only category of storage, under either Annexure D or E, that is unrestricted in volume. India may include Dead Storage in the design of any Run-of-River Plant or Storage Work and may provide for Dead Storage of any capacity. This fact is consistent with the other restrictions on storage on the Western Rivers only if Dead Storage is somehow qualitatively different and was understood to be truly 'dead'—an area to be filled once, and not thereafter subject to manipulation. The absence of limits on the volume of Dead Storage cannot, of course, itself impose a restriction on how such storage may used. But it is suggestive of the mindset of the Parties in providing for storage of this type."[722]

9.69. Annexure E must therefore be read as providing a carefully limited exception to the primary rule of Article III(4). Moreover, through its focus on storage *capacity* rather than water actually *stored*, it not only prevents India from storing water, but from building works which would *allow* it to store water, even if the capacity is never used. Again, this is consistent with the finding of the *Kishenganga* Court that "in many instances, the Treaty does not simply restrict the Parties from taking certain actions, but also constrains their entitlement to construct works that would enable such action to be taken".[723]

9C THE TREATY'S COOPERATION AND REPORTING REQUIREMENTS IN RESPECT OF THE DESIGN, CONSTRUCTION AND OPERATION OF RUN-OF-RIVER HEPS ON THE WESTERN RIVERS

9.70. The Hydro Bargain is underpinned by detailed requirements for cooperation and reporting in respect of the design, construction and operation of Run-of-River HEPs on the Western Rivers, as previously elaborated on in **Chapter 6** above. These are reflective of the "cooperative spirit" underlying the Treaty's object and purpose (see **Chapter 8**).

[722] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 505.
[723] *Id.*, ¶ 506.

"Cooperation" is an ongoing obligation, encompassing regular reporting of information, cooperation in river development and site access on demand.

9.71. As noted above, Article III(3) contains the Parties' agreement to establish "discharge observation stations" and to make such observations "for the determination of the component of water available for the use of Pakistan on account of" the deliveries by Pakistan into The Ravi or The Sutlej—waters that "India shall not make use of".

9.72. The modalities for exchanging data are set out in Article VI. Article VI(1) requires the Parties (in reality, India) to engage in daily monitoring of several variables—including daily gauge and discharge date relating to river flow, daily extractions or releases from reservoirs, daily withdrawals from government-operated headworks, daily escapages from all canals, and daily deliveries from link canals. India is to deliver the data to Pakistan on a monthly basis. Moreover, if the other Party, in its judgment, considers the data to be necessary for "operational purposes", it can request that the data be provided on a daily basis.

9.73. Article VI(2) expands the universe of potential data by providing that either Party may request the "supply of any data relating to the hydrology of the Rivers", relating to connected canal or reservoir operation or, expansively, "relating to […] any provision of this Treaty".

9.74. Article VII is entitled "Future co-operation". Article VII(1) imposes a positive obligation on both Parties "to cooperate, by mutual agreement, to the fullest possible extent" in achieving optimum development of the rivers. Examples of cooperation include setting up or installing hydrologic observation stations or meteorological observation stations within the drainage basins of the rivers; carrying out new drainage works as may be required in connection with new works of the other Party; undertaking engineering works on the Rivers by mutual agreement.

9.75. Under Article VII(2), if either Party planned to construct any engineering work that would "cause interference with the waters of any of the Rivers" and would affect the other Party "materially", it is obliged to notify the other Party of its plans "as may be available and as would enable the other Party to inform itself of the nature, magnitude and effect of the work". The Party planning the work shall, if requested, supply the other with that data if the work would cause interference with the waters, even if it did not consider that the other Party will be materially affected. This provision reflects the paramount importance of the obligation of non-interference, even if a material effect is not anticipated.

9.76. As set out in **Chapter 7**, consistent with the Peace Bargain, the most important site for cooperation under the Treaty is the Permanent Indus Commission, which is provided for in Article VIII. According to Article VIII(4), the Commission's purpose and functions is to "establish and maintain co-operative arrangements for the implementation of the Treaty" and "to promote co-operation between the Parties in the development of the waters of the Rivers". To this end, the Commission is, among other things, to undertake a general tour of inspection of the Rivers every five years and, upon the request of either Commissioner, "to undertake promptly […] a tour of inspection of such works or sites on the Rivers as may be considered necessary by him [the Commissioner] for ascertaining the facts connected with those works or sites" (Article VIII(4)(c) and (d)).

9.77. Under Annexure D, there are specific cooperation obligations in relation to new Run-of-River HEPs. As discussed above, Paragraph 8 sets out the design criteria for HEPs on the Western Rivers, reflecting the "let flow"/non-interference/no storage obligations. Paragraph 9 provides that for Pakistan to "satisfy itself that the design of a Plant conforms" to that criteria, India shall communicate in writing at least six months in advance of the beginning of the construction the following information set out in Appendix II to Annexure D:

(a) Location of the Plant.

(b) Hydrologic data, including "[o]bserved or estimated daily river discharge data on which the design is based".[724]

(c) Flood data.

(d) Gauge-discharge curve(s) for the site.

(e) Hydraulic data, including the Full Pondage Level, Dead Storage Level and Operating Pool together with the calculations for the Operating Pool.

(f) Particulars of design, covering ten aspects including type of spillway and intake and outlet works.

[724] Indus Waters Treaty 1960, **PLA-0001**, Annexure D, Appendix II, ¶ 2(b).

(g) General data including the "[e]stimated effect of proposed development on the *flow pattern* below the last plant downstream"[725] and the construction and operation timetable.

9.78. Pakistan notes that the data required on the effect on the "flow pattern" below the last downstream HEP is relevant to the effect of cascading works. The effect of such works is not a dispute that is currently before the Court of Arbitration, but Pakistan notes that cascading works may manipulate the flow of the Western Rivers in a manner inconsistent with the "let flow"/non-interference/no storage rule. Cascading works that exploit the hydroelectric power generation exception in order to circumvent the general rule would undermine the three Bargains and the object and purpose of the Treaty.

9.79. The implications of the data required under Paragraph 9 are set out in Paragraph 10 of Annexure D, which provides that within three months of the receipt of the data, Pakistan shall communicate in writing any objection to the proposed design based on non-conformity with the Paragraph 8 criteria.

9.80. Paragraph 11 of Annexure D states that if a question arises as to whether the design of a Plant conforms with the Paragraph 8 criteria, then either Pakistan or India "may proceed to have the question resolved in accordance with the provisions of Article IX(1) and (2)".

9.81. Paragraph 12 of Annexure D confirms the ongoing nature of the obligation of cooperation on HEP design, construction and operation. Under Paragraph 12(a), if any proposed alteration in the design of a Plant *before* it comes into operation "would result in a material change in the information furnished to Pakistan" under Paragraph 9, India "shall immediately communicate particulars of the change to Pakistan in writing" and the process under Paragraphs 10 and 11 is triggered, except that Pakistan will only have two months for any objection under Paragraph 10.[726]

9.82. Paragraph 12(b) of Annexure D sets out a similar process for when an alteration relates to a Plant *after* it comes into operation. An equivalent provision is in Paragraph 15 of Annexure

[725] *Id.*, Annexure D, Appendix II, ¶ 5 (emphasis added).
[726] Paragraphs 10 and 11 also apply when India undertakes emergency repairs or alterations that result in a change to the information furnished to Pakistan under Paragraph 9 (Paragraph 13 of Annexure D).

E. By covering works after they come into operation, each provision therefore enables a process for monitoring the cumulative effects of works on the Western Rivers.

9.83. In short, as part of the Hydro Bargain, India's design, construction and operation of HEPs is subject to constant monitoring for compliance with the Treaty and its rule of "let flow"/non-interference/no storage. India must measure a variety of inputs daily, and provide the data to Pakistan monthly (or even daily if requested). India must inform Pakistan of any planned works likely to affect Pakistan's rights and interests and provide it with information on them. India is under a positive obligation to cooperate with Pakistan on river development, and to interact with it through the Commission. India must also give Pakistan's Commissioner timely access to any facility it builds on Western Rivers on demand, such that its compliance with the Treaty may be assessed.

9.84. As set out in **Chapter 6**, and in the introduction to **Part IV**, below, for the provisions of Annexure D to work as intended—given their inter-operability—cooperation between the Parties on information-sharing is required from the outset of the design process, at each stage of the design and construction, and continues during the HEP's operation.

9.85. In practice, as the Court has previously been informed[727] and as addressed in **Chapter 6** and the Statement of Pakistan's Commissioner in **Appendix B**, India has not fulfilled its side of the Hydro Bargain. Among other things, India has repeatedly denied Pakistan's Treaty-mandated rights to undertake tours of inspection of the KHEP and the RHEP notwithstanding numerous requests from Pakistan's Commissioner. Pakistan has not visited the KHEP since the site visit undertaken by the *Kishenganga* Court in 2011 and has had no access to the site of the KHEP since then, despite nearly a decade of requests. Pakistan has also drawn to India's attention to key data omissions underlying, for example, its modelling related to KHEP and RHEP.

9.86. The final element of the Hydro Bargain in Annexure D is the reporting requirements placed on India.

[727] "Explanatory Note on site visit correspondence for the Kishenganga and Ratle Hydroelectric Plants", 2014-2023, sent to the Court on 9 May 2023.

9.87. Beyond its reporting requirements in respect of pre-1 April 1960 HEPs (Annexure D, Paragraphs 5–7), India must also report to Pakistan on its proposed designs for any new Run-of-River HEPs as follows:

(a) By Article VII(2) of the Treaty, both Parties are under an obligation to notify the other Party if it "plans to construct any engineering work which would cause interference with the waters of any of the Rivers and which, in its opinion, would affect the other Party materially" whereupon "it shall notify the other Party of its plans and shall supply such data relating to the work as may be available and as would enable the other Party to inform itself of the nature, magnitude and effect of the work. […]"

(b) Under Paragraph 9 of Annexure D, the Treaty provides:

> "To enable Pakistan to satisfy itself that the design of a Plant conforms to the criteria mentioned in Paragraph 8, India shall, at least six months in advance of the beginning of construction of river works connected to the Plant, communicate to Pakistan, in writing, the information specified in Appendix II to this Annexure. If such information is not available or is not pertinent to the design of the Plant or to the conditions at the site, it will be so stated."

(c) Appendix II to Annexure D, in turn, requires India to provide considerable information to Pakistan on any proposed Annexure D.3 HEP on the Western Rivers, including as regards the location and site, hydrologic data, hydraulic data (including precise details of proposed storage), the particulars of design (including a dimensioned plan) and other general information.[728]

(d) Pakistan is then authorised to take issue with India's proposed design within three months (Annexure D, Paragraph 10), at which point the matter may be taken up in the Commission and resolved in accordance with the provisions of Article IX (Annexure D, Paragraph 11). India is, moreover, also required to report any material alterations in the proposed design and give Pakistan the opportunity to comment on these as well (Annexure D, Paragraph 12).

9.88. The upshot of these provisions it that they enable Pakistan—itself and through the person of its Commissioner—to supervise Indian HEP construction and operation on the

[728] In the case of a Small Plant, India is required to provide Pakistan with a more limited suite of information: Annexure D, Paragraphs 19–23, and Appendix III.

Western Rivers, such that any issues can be identified early and resolved in accordance with the processes set out in Article IX. In considering the Annexure D provisions, the *Kishenganga* Court held that it was strongly advisable that the process set out in these Paragraphs be adhered to and exhausted before construction of the proposed HEP commences.[729]

9.89. As such, Indian compliance with the "let flow"/non-interference/no storage rule is not presumed by Annexure D. The position is actively one of "trust but verify", and Pakistan is charged with the responsibility of ensuring that India upholds its end of the bargain, a responsibility that can only be meaningfully discharged through the regular receipt of information from India. The reporting requirements are essential to enable Pakistan to ensure that India does not stray from the path.

9D THE COURT'S QUESTION (B)

9.90. In paragraph 35(b) of PO6, the Court asked the following question:

> "To what extent can non-Treaty-based design and operational practices be taken into account for purposes of interpreting the technical requirements set out in Annexure D, paragraph 8?"

9.91. Pakistan's response is that non-Treaty-based design and operational practices can only be taken into account to the extent that such practices are consistent with the framework and object and purpose of the Treaty.

9.92. The correct approach is not one that is hostile to technological advancements or "best practices". This is illustrated by the nuanced analysis of two issues by the *Kishenganga* Court in its Partial Award:

(a) The **first** was the role and scope of the environmental impact assessment ("**EIA**") that India had to conduct to evaluate downstream effects. Pakistan contended that India's EIA was inadequate because the most important area—namely "the area below the dam site"—was not part of the assessment.[730] India defended its EIA by invoking "international best practices", meaning that it "be in writing, be conducted sufficiently early to be taken account in decision-making, include an opportunity for public comment, and be comprehensive".[731]

[729] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 443–444.
[730] *Id.*, ¶ 223 and fn. 215.
[731] *Id.*, ¶ 261 and fn. 322.

In other words, India used "best practices" to try to avoid defining the scope of its EIA. The Court concluded that the evidence presented by the Parties did "not provide an adequate basis" for a determination of the "maintenance of minimum flow downstream of the KHEP".[732] It requested India to provide "further data concerning the impacts of a range of minimum flows to be discharged at the KHEP" including "environmental concerns from the dam site at Gurez to the Line of Control" and to "incorporate a sufficient range of minimum flows so as to give the Court a full picture of the sensitivity of the river system".[733] Underlying the Court's approach was its legal appreciation of the Treaty's requirement that India operate the KHEP to preserve downstream flows.[734] That appreciation was informed by customary international law, including the requirement that States "take environmental protection into consideration when planning and developing projects that may cause injury to a bordering State".[735] The *Kishenganga* Court drew upon the ICJ's analysis in the 2010 *Pulp Mills* Judgment[736] that an EIA must be undertaken "where there is a risk that the proposed industrial activity may have a significant adverse impact in a transboundary context, in particular, on a shared resource."[737] The *Kishenganga* Court also referred to the 2007 *Iron Rhine* Arbitration[738] in respect of the duty to prevent and mitigate significant environmental harm "when pursuing large-scale construction activities".[739] While the *Kishenganga* Court did not refer to "best practices" as such, it relied on practice and decisions regarding EIAs that informed what the Parties were required to do under the Indus Waters Treaty. It did not accept India's invocation of "best practices" to minimise its obligations under the Treaty.

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[732] *Id.*, ¶ 455.
[733] *Id.*, ¶¶ 458–9.
[734] *Id.*, ¶ 445.
[735] *Id.*, ¶ 449.
[736] *Pulp Mills on the River Uruguay (Argentina* v. *Uruguay), Judgment, I.C.J. Reports 2010*, p. 14, available at: https://www.icj-cij.org/sites/default/files/case-related/135/135-20100420-JUD-01-00-EN.pdf (last accessed 18 March 2024).
[737] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 450, referring to *Pulp Mills* (*id.*), p. 83.
[738] *Arbitration Regarding the Iron Rhine (*"Ijzeren Rijn"*) Railway between the Kingdom of Belgium and the Kingdom of the Netherlands*, Award, 24 May 2005, *PCA Award Series* (2007), available at: https://legal.un.org/riaa/cases/vol_XXVII/35-125.pdf (last accessed 18 March 2024), ¶ 59.
[739] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 451.

(b) The **second** issue was drawdown flushing below Dead Storage Level. India argued that drawdown flushing was "one of the most effective techniques" for maintaining the sustainability of reservoirs, citing practices in India, Switzerland, Austria, China, New Zealand, and Venezuela.[740] Pakistan submitted that sediment sluicing offered a "feasible alternative" that respected the Treaty's framework.[741] The Court accepted Pakistan's argument, noting that "it is not for the Court to apply 'best practices' in resolving this dispute" and that "the Treaty restraints on the construction and operation by India of reservoirs" are "a regulatory factor" in Plant design, such that the Treaty prohibited drawdown flushing.[742] The Court did not accept India's mere invocation of "best practices" to circumvent the Treaty's requirements.

9.93. Pakistan has consistently relied on the approach of the *Kishenganga* Court of Arbitration. As stated in the PCIW's letter of 25 February 2016:

> "[T]he Partial Award issued by the Court of Arbitration in the Kishenganga case (i) rejected the 'best practices' interpretation of the Treaty that led to the Neutral Expert's final determination on pondage and other issues in the Baglihar case and (ii) declared that a Neutral Expert's determinations do not have general precedential value beyond the specific hydro-electric plant before him."[743]

9.94. By contrast, India turns Article III on its head by taking a narrow approach to the rule of "let flow"/non-interference/no storage and an expansive approach to the exceptions, including the technical requirements set out in Annexure D, Paragraph 8. As set out above and elaborated upon in **Part IV** of this Memorial, while the Treaty permits India to construct new Run-of-River Plants on the Western Rivers, it requires such Plants to meet carefully calibrated and tightly constrained design and operational requirements in order to give content to India's "let flow"/non-interference/no storage obligations in Article III.

9.95. India has used its interpretive approach to undermine the object and purpose of the Treaty in two ways:

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[740] *Id.*, ¶ 517, fn. 724 (citing India's Counter-Memorial (*Kishenganga* arbitration), 23 November 2011, **P-0123**, ¶ 7.81), and ¶ 334, fn. 509.
[741] *Id.*, ¶ 518.
[742] *Id.*, ¶ 522.
[743] Letter No WT(132)/(7531-A)/PCIW (with enclosure) from the PCIW to the ICIW dated 25 February 2016, **Exhibit P-0023**, ¶ 5.

(a) **First**, India's position is that the Treaty permits it to build Run-of-River HEPs without restriction on the number of projects. It has spoken of "harnessing the significant hydro-electric potential available on the Western Rivers"[744]—in stark contrast to its Treaty obligation to "let flow". To this end it has been undertaking an extensive Run-of-River HEP construction agenda on the Western Rivers (see **Chapter 5** above).

(b) **Second**, as will be developed in **Part IV**, India has interpreted each requirement in Annexure D so as to maximise its ability to control and manipulate the waters through the design and operation of Annexure D.3 HEPs. To this end, it purports to adopt an evolutive, "state-of-the-art" approach in order to circumvent the design and operational restrictions in Annexure D. The KHEP and RHEP are merely examples of the standard Indian HEP design with common features that are being replicated in dozens of plants. Taken as a whole, India's strategy has been to deploy seemingly minor enhancements with respect to individual HEPs into a regulatory regime that has moved far beyond the terms of Article III and Annexure D of the Treaty, as they were drafted and agreed in 1960.

9.96. India's approach to interpretation of Article III also informed its submissions on Pondage before the *Kishenganga* Court. India's formulation turned on the requirements of load demand for the Plant in order to obtain a greatly increased allocation of water and apparently circumvent the prohibitions on interference with waters and their storage. India also relied heavily on the finding by the Neutral Expert in the *Baglihar* Determination,[745] a determination that took a seriously flawed approach to interpretation, as explained in **Chapters 7**, **10** and **11**.

9.97. As Pakistan addressed in its Statement on Coordination and Competence, the different approaches taken in the *Baglihar* and *Kishenganga* cases would produce materially divergent outcomes in practice on the Western Rivers.[746] The Neutral Expert in *Baglihar*, citing "the current level of scientific and technical knowledge", held that the sediment management technique known as reservoir or drawdown flushing was permitted under the Treaty.[747] By

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[744] India's Rejoinder (*Kishenganga* arbitration), 21 May 2012, **Exhibit P-0227**, ¶ 4.97.
[745] *See* **Chapter 11** below.
[746] Pakistan's Statement on Coordination and Competence, 24 February 2023, ¶ 21.
[747] *Baglihar* Determination, **PLA-0002**, § 5.5.3.

contrast, the *Kishenganga* Court, while holding that the *Baglihar* Determination remained in place with respect to the Baglihar Plant,[748] disagreed with the *Baglihar* analysis. Noting that "it is not for the Court to apply 'best practices' in resolving this dispute", the Court found that "the Treaty restraints on the construction and operation by India of reservoirs" are "a regulatory factor" in Plant design, such that the Treaty prohibited drawdown flushing.[749]

9.98. The correct interpretive approach, applying the well-established principles of treaty interpretation and the correct object and purpose of the Treaty, is to treat Article III as the "rule" and to restrictively interpret, according to their ordinary meaning, the exceptions in Article III(2). The same restrictive interpretation is called for in Annexure D so that the design and operational constraints on Annexure D.3 HEPs reflect the Bargains at the heart of the Treaty. To be clear, and to underline what is stated above, this approach does **not** preclude or exclude consideration and the adoption of "best practice" technological developments since the Treaty was concluded in 1960. What it does require is that such practices are adopted within the framework of the Treaty, and to achieve its ends, not as a stalking horse to circumvent the terms of the Treaty that the Parties agreed upon in 1960.

9.99. Against this background, Pakistan's response to the Court's question (b) in paragraph 35 of PO6 is that design and operational practices, including innovative best practice approaches, must be taken into account by India when it comes to designing, constructing and operating Treaty-compliant Annexure D.3 HEPs on the Western Rivers. The Treaty does not, for example, prescribe the materials with which spillway gates, turbines or other components of a HEP must be constructed. The Treaty does not require, by way of further example, that a HEP must use desanders. Nor does the Treaty fix, for example, the minimum size of outlets by reference to the technological capabilities of 1960 or calibrate the appreciation of what is necessary, with respect to sediment control or the conditions at the site of the Plant, by reference to technological appreciation at the time that the Treaty was concluded. Technological innovation and best practice **must** be taken into account, and indeed is required by the similar (though not identical) language found in Paragraphs 8(d), (e) and (f) of Annexure D that mandates reference to "sound and economical design" and similar formulae. What cannot be done, however, is for India to use an appeal to what it terms "best practice", a claim that is invariably specious, to enable it to escape its obligations under the Treaty.

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[748] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 470.
[749] *Id*., ¶ 522.

9.100. There is a vein of opinion that the interpretation and application of treaties must account for developments since a treaty was concluded, that treaties are evolutionary in character, living instruments, malleable and adaptable to changing circumstances. That may be the case with some treaties, that have that purpose intrinsically located with their DNA. It is not the case with regard to treaties that are akin to contracts, that are transactional in nature. And it is not the case with regard to foundational, cornerstone treaties that define the terms of a settlement between States. The Indus Waters Treaty was the solution to, the means of settlement of, a rupture between Pakistan and India, from their earliest days, of the most dire and potentially catastrophic form—the denial by one State of the life-giving flow of water to another. The Bargain that was struck in 1960—the three comingled Peace, Treaty and Hydro Bargains that were struck—after years of negotiation, with the assistance of a third-party interlocutor, was not a Bargain for a fixed term. It was not a Bargain to be undone by one party only, at its unilateral whim. It was not a Bargain that provided for the possibility of unilateral revision because one State, subject to an obligation, considered that the passage of time should enable it to escape its obligations.

9.101. It must be emphasised, as well, that Pakistan does not consider India's resort to some notion of "best practices" to be an honest endeavour to find innovative solutions in the interests of both States. On the contrary, Pakistan considers that India's claim to use, or to wish to use, "best practices" in design and operation is neither well-founded in substance nor advanced within the scheme of the Treaty, with its multiple avenues for technical discussion between the Parties. India is in fact failing to use "best practices" in the design of its new Annexure D.3 HEPs. It is failing to consult adequately and in a timely manner with Pakistan on those designs. It pays lip service to the notion of "best practices" to evade its obligations and responsibilities under the Treaty. Innovative design and operational practices should, and must, be adopted for purposes of interpreting and applying the technical requirements set out in Annexure D, Paragraph 8 of the Treaty. They must, though, be in the service of the Treaty, not to achieve its ouster.

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PART IV: THE INTERPRETATION AND APPLICATION OF PARAGRAPH 8 OF ANNEXURE D

IV.1. **Part IV** has two purposes. **First**, against the backdrop of **Parts I** and **II** and applying the treaty interpretation principles set out in **Part III**, Part IV constitutes the gravamen of Pakistan's response to the questions posed by the Court in paragraph 35 of PO6. For each of the disputes in Pakistan's Arbitration Request, Part IV addresses what is to be taken into account, and what is to be excluded, in interpreting and applying the legal criteria and technical requirements of the relevant subparagraphs of Paragraph 8 of Annexure D. The features and concepts introduced in **Chapter 4** are now placed in the Treaty framework. **Second**, Part IV builds on the insights of Pakistan's Commissioner set out in **Chapter 6** and **Appendix B** and the three bargains explained in **Chapters 7** and **9** to show how the Treaty fits together with its various moving parts, the balance of which is crucial to its functioning. The origin and purposes of the Treaty, including the Peace, Treaty and Hydro Bargains are reflected in the relationship between the "let flow"/non-interference/no storage rule and the exceptions in Annexure D. The Parties' obligations as to co-operation, transparency and information-sharing create a "trust and verify" system and are inextricably linked to the design criteria for HEPs as well as the ongoing monitoring of construction and operation of such Plants.

IV.2. **Chapter 10** considers outlets, spillways and power intakes, which are addressed in Paragraphs 8(d), (e) and (f) of Annexure D. It considers these three components together because they reflect three means by which water may be passed over, through or around a HEP's dam to escape the reservoir. Gated spillways and power intakes are particular forms of "outlets". These components reflect the means by which a HEP's operator may *control* water that has been stored, which directly engages the Treaty's "let flow"/non-interference/no storage rule. Reflecting the three bargains at the heart of the Treaty, including Pakistan's deep concern following the April 1948 crisis, that India would be able to use the storage capacity in a HEP's reservoir to inflict harm upon it, Paragraphs 8(d), (e) and (f) impose stringent constraints in respect of the location and placement of outlets, gated spillways and power intakes, as well as a size constraint in respect of outlets situated below Dead Storage Level of an Annexure D.3 HEP.

IV.3. **Chapter 10** demonstrates how the design criteria in Paragraphs 8(d), (e) and (f) are all directed to India identifying a design and operational profile for the HEP that enables it to have the best plant possible within the constraints of the Treaty on the basis of site-specific evidence and expert opinion. This has implications, in particular, for the selection of sediment management and flood control techniques.

IV.4. The Chapter's analysis draws support from the *Kishenganga* Court awards and the internal logic of the Treaty. By contrast, India's approaches to outlets, spillways and intakes rely on the Neutral Expert's approach in *Baglihar*, which contained multiple flaws including the consideration of non-Treaty based design and operational practices. Such errors render the *Baglihar* Determination unreliable, quite apart from the fact that a neutral expert can only make Plant-specific, technical determinations (as addressed in **Chapter 8**).

IV.5. **Chapter 11** addresses the interpretation of Paragraph 8(c), concerning the calculation of the maximum allowable Pondage—and, by extension, the size of a HEP's Operating Pool. This is the most technically complex of the disputes before the Court. "Pondage" is a HEP's controllable "Live Storage", which is stored between the "Full Pondage Level" and the "Dead Storage Level" of an Annexure D.3 HEP reservoir. Its calculation is complex largely because of the steps and the calculations required, which turn on the calculation of "Firm Power", defined in Paragraph 2(i) of Annexure D, which is derived from the calculation of the "Minimum Mean Discharge" at the site of any given HEP. As explained in **Chapter 8**, these terms have a special meaning, bespoke to the Treaty and reflect the three bargains that underlie it. The Treaty also does not expressly state the period of time to be used for calculating the Pondage required for Firm Power, but as the Chapter shows, the period in question—24 hours—is readily deducible from the Treaty.

IV.6. Ultimately the calculation of Pondage, as with the design of outlets, spillways and intakes, has given rise to a dispute between Pakistan and India in which India attempts to maximise its control of the water of the Western Rivers, and Pakistan seeks to enforce the Peace, Treaty and Hydro Bargains. In the context of Pondage, this means that India seeks a deeper Dead Storage Level to give it greater controllable storage and greater freedom to situate certain HEP components (including outlets, spillways and power intakes) lower in its reservoirs. This prototype, reflected in the Baglihar HEP and based on serious shortcomings in the *Baglihar* Determination, gives India greater control over waters that the Treaty otherwise allocates, pursuant to Article III, for the exclusive use of Pakistan. For its part, Pakistan is constantly aware of India exploiting the Paragraph 8 criteria to undermine the "let flow"/non-interference/no storage rule, leaving Pakistan vulnerable. Pakistan's vulnerability is intensified by the large number of HEPs with significant Live Storage that India has planned for the Western Rivers (see **Chapter 5**).

IV.7. **Chapter 11** is supplemented by **Appendix E**, a technical annex that underpins the legal argument with verifying mathematical formulae.

IV.8. **Chapter 12** addresses the final item of dispute between the Parties: the means by which the acceptable freeboard of an Annexure D.3 HEP is to be calculated. Consistent with the principle of systemic treaty interpretation, this Chapter considers Paragraph 8(a) in its wider Treaty context, including, in particular, with regard to Paragraph 8(b) of Annexure D. Together, these two provisions define the permissible height of an Annexure D.3 HEP's freeboard. The height of the freeboard is determined to provide assurance against overtopping by waves generated by wind, landslide and seismic motion, settlement (in the case of embankment dams), malfunction of spillway gates, or other uncertainties. However, in the context of the Treaty and the tightly constrained design limitations that underpin the Hydro Bargain, even a small increase in the height of the freeboard increases India's ability to artificially raise the water level and control the waters, a concern that is amplified by the very large number of HEPs planned for the Western Rivers.

IV.9. **Chapter 13** completes the Memorial with some concluding observations and final submissions.

CHAPTER 10: OUTLETS, SPILLWAYS AND POWER INTAKES—ANNEXURE D, PARAGRAPHS 8(D), (E) AND (F)

10.1. In this Chapter, Pakistan continues with its discussion of the various elements of Paragraph 8 of Annexure D that are at issue in this case—and, in so doing, answers the questions on outlets for sediment management, spillways and intakes posed by the Court in PO6. Here, Pakistan considers Paragraphs 8(d), (e) and (f), which address three key components of any Annexure D.3 HEP: outlets, spillways and power intakes.

10.2. There are good engineering and legal reasons for considering these components together.

10.3. **First**, in engineering terms, they reflect three means—or, rather, three **outlets**—by which water may be **passed over, through or around** a HEP's dam to escape the reservoir. As a result, they also reflect the means by which a HEP's operator may **control the water** contained within the reservoir by opening or closing these means of discharge as required. The extent to which the operator possesses such control will depend on the position of each component within the reservoir. The deeper the component, the greater the control, as the operator is ordinarily reliant on gravity to remove water from the reservoir. Thus, like a plug at the bottom of a bathtub, an outlet near the bottom of the dam wall will enable the operator to control all water in the reservoir above the outlet. Conversely, like the lip of a bath itself, an uncontrolled spillway will give the operator almost no control at all over the water beneath it, as it will only discharge by overflow during flood conditions.

10.4. **Second**, India's ability to use any or all these components to control the contents of an Annexure D.3 HEP reservoir justifies dealing with them compendiously as a legal matter. As is clear from the both the summary of the history of the negotiation of the Treaty discussed in **Chapter 2** above and from documents surrounding the conclusion of the Treaty, addressed in **Appendix A**, such concepts of control were of the greatest concern to Pakistan during that negotiation. It readily apprehended the possibility that India would be able to use the storage capacity in a HEP's reservoir to inflict harm upon it. When considering early iterations of Paragraph 8, for example, Pakistan's opening position was "no low-level sluices should be permitted in Dams built for hydroelectric power as they will increase the potential [for India] to harm [Pakistan]".[750]

10.5. This concern is writ large in the provisions of Annexure D that deal with these components. Self-evidently, it could not prohibit them entirely, as each is potentially essential to a Run-of-River HEP's operation. But it could subject them to **common and limiting standards** (which, consistently with the Hydro Bargain, must be interpreted restrictively[751]) that would allow India to construct a functional Annexure D.3 HEP whilst at the same time preserving the letter and spirit of Article III of the Treaty which in turn reflect the key objectives of the Treaty so far as the Western Rivers are concerned.[752] Thus, Paragraphs 8(d), (e) and (f) themselves do not speak in terms of India being able to construct dams with a view to producing "maximum efficiency" or "maximum power output", but rather in terms of (*inter alia*) "sound and economical design" and "satisfactory operation" or "satisfactory […] construction" of the Plant.

10.6. Read properly and with an eye to Article III, therefore, Annexure D guarantees India a HEP that works subject to the limitations of the Treaty. It does not allow India to construct the HEP without consideration of its wider and supervening obligation to "let flow", without unnecessary interference, the waters of the Western Rivers. What India is permitted to do—indeed, what India **must** do—is build the best HEP possible **within the limitations of the Treaty itself**.

10.7. As Pakistan has addressed in the opening Chapter of this Memorial, and again in **Chapter 9**, this is now not—or should not be—controversial: it was recognised expressly by the Court of Arbitration in its binding decision in *Kishenganga*. There, it dismissed a contrary interpretation by the *Baglihar* Neutral Expert—in the following terms:

> "It is not for the Court to apply 'best practices' in resolving this dispute. India has quite understandably argued in these proceedings for a right to the optimal design and operation of its hydro-electric installations on the upstream stretches of the Western Rivers. However, any exercise of design involves consideration of a variety of factors—not all of them technical. Hydrologic, geologic, social, economic, environmental and regulatory considerations are all directly relevant, and *the Court considers the Treaty restraints on the construction and operation by India of reservoirs to be such a regulatory factor*. *For the Court, the optimal design and operation of a*

[750] Cable No. 82 from Mr W. A. Sheikh (Foreign Office Rawalpindi) to Mr Mueenuddin (Pakistan Representative Washington), 26 January 1960, **Exhibit P-0541**, p. 2.
[751] *See* **Chapter 7E** and **Chapter 8B.3(d)** above.
[752] *See* **Chapter 9** above.

hydro-electric plant is that which can practically be achieved within the constraints imposed by the Treaty."[753]

10.8. With this in mind, this Chapter proceeds as follows:

(a) **Section A** considers the relationship between Paragraphs 8(d), (e) and (f) through the prism of the controlling concepts of Dead Storage and the Dead Storage Level, as defined in Paragraph 2(a).

(b) **Section B** considers Paragraph 8(d) on outlets and interprets the individual components of that provision.

(c) **Section C** considers Paragraph 8(e) on spillways and interprets the individual components of that provision.

(d) **Section D** considers Paragraph 8(f) on intakes and interprets the individual components of that provision.

(e) **Section E** addresses the Court's questions on outlets for sediment management, spillways and intakes, as set out in PO6.

(f) **Section F** considers the position on the interpretation of Paragraphs 8(d), (e) and (f) taken by the Neutral Expert in *Baglihar* and by India in this dispute and assesses each against the proper interpretation of these provisions as set out in earlier sections.

10A DEAD STORAGE AND PARAGRAPHS 8(D), 8(E) AND (F)

10.9. As already set out above, and as canvassed in **Chapter 4**, within the realm of hydropower engineering, spillways and intakes are specific species of a wider category of structure, namely outlets.[754] Annexure D addresses these—outlets, spillways and intakes—in three separate paragraphs, applying distinct criteria to each. At the same time, however, there are common features between them, not only in terms of their function (passing water over, through or around a dam) but in terms of their legal constraints. Thus:

10.10. Paragraph 8(d) on outlets provides that (emphasis added):

[753] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 522 (emphasis added) (citation omitted).
[754] *See* paragraph 4.74 above.

> "There shall be no outlets below Dead Storage level, unless necessary for sediment control or any other technical purpose; any such outlet will be of the minimum size, and located at the highest level, consistent with *sound and economical design* and with *satisfactory operation of the works*."

10.11. Paragraph 8(e) on spillways provides that (emphasis added):

> "If the conditions at the site of a Plant make a gated spillway necessary, the bottom level of the gates in normal closed position shall be located at the highest level consistent with *sound and economical design* and *satisfactory construction and operation of the works*."

10.12. Paragraph 8(f) on intakes provides that (emphasis added):

> "The intakes for the turbines shall be located at the highest level consistent with *satisfactory and economical construction and operation of the Plant* as a Run-of-River Plant and with *customary and accepted practice of design* for the designated range of the Plant's operation."

10.13. The differences in language between these three provisions must, on any objective construction, be taken to be deliberate. The key to why those differences arise lies (at least in part) not in Paragraph 8 itself, but in Paragraph 2(a) and the definitions of Dead Storage and Dead Storage Level contained therein. As made abundantly clear by that provision, Dead Storage is water that is "*not* [to be] used for operational purposes",[755] and the Dead Storage Level is the level of a HEP's reservoir corresponding to Dead Storage. This is entirely consistent with the provisions of Article III of the Treaty, which not only places on India an obligation to "let flow" the waters of the Western Rivers but also contains limitations on interference with and storage of those same waters.[756] And it is also entirely consistent with the findings of the *Kishenganga* Court, which stated that Dead Storage for the purposes of the Treaty is "truly 'dead'—an area to be filled once and not thereafter subject to manipulation".[757]

10.14. Viewed through this prism it is clear—and reflected in the terms of Paragraph 2(b) – that the only water in an Annexure D.3 HEP that can be used for operational purposes is Live Storage, which is stored above the Dead Storage Level. When this is understood, it becomes equally clear that Paragraph 8(b) places a strict prohibition—subject to very limited exceptions—on **any** outlets placed below the Dead Storage Level in an Annexure D.3 HEP.

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[755] Emphasis added.
[756] *See* **Chapter 9** above.
[757] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 505.

10.15. Paragraphs 8(f) and (e), conversely, regulate two specific types of outlets, namely spillways and intakes, even where those outlets are placed above the Dead Storage Level. With regards to spillways, Paragraph 8(e) first of all establishes that gated spillways are not a default choice but must be justified as "necessary" by conditions at the site of the HEP in question (to be addressed below). Where so justified, moreover, Paragraph 8(e) addresses the additional requirement concerning the bottom level of the gates, which must be located "at the highest level consistent with sound and economical design and satisfactory construction and operation of the works". The use of the term "construction" in this context indicates that difficulties in actually building the spillway (on account of geological or technical challenges) may be taken into account by India in justifying the level of the bottom of the gate within the reservoir.

10.16. Paragraph 8(f) deals with the specifics of power intakes for turbines. Again, it subjects these to an additional constraint, requiring (*inter alia*) that they be located at the highest level "consistent with satisfactory and economical construction and operation of the Plant as a Run-of-River Plant".

10.17. By necessary and unavoidable implication, spillways and power intakes under Paragraphs 8(e) and (f) cannot be placed entirely below the Dead Storage Level of an Annexure D.3 HEP. Where India considers such placement to be preferable, it is drawn immediately back into the precisely controlled limitations of Paragraph 8(d), under which placement of such outlets (1) must not only be necessary "for sediment control or any other technical purpose", but also, even then (2) the outlets themselves must be of the minimum size and located at the highest level "consistent with sound and economical design and with satisfactory operation of the works". The absence of any reference to "construction" in Paragraph 8(d)—unlike in Paragraphs 8(e) and (f)—moreover, carries with it the unavoidable implication that the size and placement of such outlets cannot be justified by reference to the cost or difficulty of actually building them.

10.18. If the message of Paragraphs 8(d), (e) and (f) is to be summarised into a single concept, it is this: the deeper India wishes to place outlets (including spillways and intakes) in the reservoir of an Annexure D.3 HEP, the more factors it has to demonstrate before the Treaty allows that placement. This observation, moreover, is *a fortiori* in circumstances where the outlet is to be placed below the Dead Storage Level.

10B OUTLETS AND PARAGRAPH 8(D)

10.19. The first component to be addressed is outlets, contained in Paragraph 8(d) of Annexure D. This provides that:

> "There shall be no outlets below Dead Storage level, unless necessary for sediment control or any other technical purpose; any such outlet will be of the minimum size, and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works."

10.20. In the paragraphs that follow, Pakistan will provide an interpretation of the engineering and legal aspects of this provision.

10B.1 The role of outlets in Run-of-River HEP sediment management

10.21. Pakistan's first objective in this part is to return to the engineering concept of an outlet, first introduced as a general matter in **Chapter 4**. Here, Pakistan builds on that discussion by addressing outlets in the very particular context of a Run-of-River HEP, before moving on to interpret the wording of Paragraph 8(d) itself.

10.22. As already noted in **Chapter 4**, hydropower engineering defines an outlet as any opening that will allow water to be discharged through or around a dam.[758] As also noted above, this includes concepts dealt with elsewhere in Paragraph 8, namely spillways and power intakes. These are, in technical terms, outlets as well—albeit highly specialised ones.

10.23. Beyond these *sui generis* concepts, however, a number of other HEP structures can also be classed as outlets. Some of these—notably diversion outlets—are used only in the construction of the dam and are blocked immediately afterwards. Others are intended to be used throughout the HEP's life—most notably those designed to help the HEP manage **sediment loads**. In this connection, it is not uncommon for certain outlets to serve multiple functions: a crest gated spillway, for example, may also have a role to play in a HEP's sediment management in addition to helping the HEP deal with and disperse a flood.[759]

[758] *See* paragraph 4.34 above. *See* further Bureau of Reclamation, *Design Standards No 14: Appurtenant Structures for Dams (Spillway and Outlet Works) Design Standards*, (US Department of the Interior), October 2011, **Exhibit P-0490**, § 1.5.2.

[759] And, for the avoidance of doubt, Pakistan has no objection to such a dual-function spillway, provided that all relevant requirements of Paragraph 8 of Annexure D are complied with: Record of the 111th Meeting of the Permanent Indus Commission, 31 January-4 February 2015, dated 31 May 2015, **Exhibit P-0025**, ¶¶ 29–30.

10.24. The problem of sediment arises when the sediment transported by a fast-moving river enters the deeper and slower-moving volume of water created by a HEP's reservoir. As already noted in **Chapter 4**, HEP sediment management has two aspects: (1) preventing sediment **accumulation in the reservoir** to preserve the HEP's live storage; and (2) minimising the sediment **entering a HEP's turbines** and abrading the turbine blades.[760]

10.25. So far as the **first** purpose of sediment management is concerned, the flexibility of a HEP's capacity to dispatch the available power generation potential at will to supply power system demands is limited by its live storage. A Run-of-River HEP will still have power generation potential in the absence of live storage, but the flexibility in the timing of its use is constrained. Where the HEP in question is a Run-of-River HEP with pondage, the objective of sediment management is to keep the operating pool clear so that the storage capacity is available to assist the HEP in meeting the load placed upon it by the operator. Although the HEP can still function without pondage, it renders the operator entirely reliant on the flow of the river at a particular time, in the same way as a 'pure' Run-of-River HEP.

10.26. When a new reservoir begins operation, sediment does not pose a threat to the HEP's live storage. As time wears on, however, the trapping of sediment in the reservoir will result in the accumulation of rapidly settling coarse sediment (e.g., sand and gravel) at the upstream end of the reservoir, so forming a delta, whereas slower-settling fine sediment (e.g., silt and clay) can travel deeper into reservoir and may reach the dam.[761]

10.27. Reservoirs with a large storage capacity act as efficient sediment traps. HEPs attached to such reservoirs may not have to deal with serious sediment issues for decades, as there is little danger of coarse sediment reaching the intake and entering the turbines. Run-of-River HEPs, conversely, have relatively limited storage capacity, such that sediment may—left to its own devices—reach the dam in a matter of a few years or even sooner.

[760] *See* paragraph 4.125 above.
[761] G. L. Morris and J. Fan, *Reservoir Sedimentation Handbook* (McGraw-Hill 1998), **Exhibit P-0492**, p. 2.14.

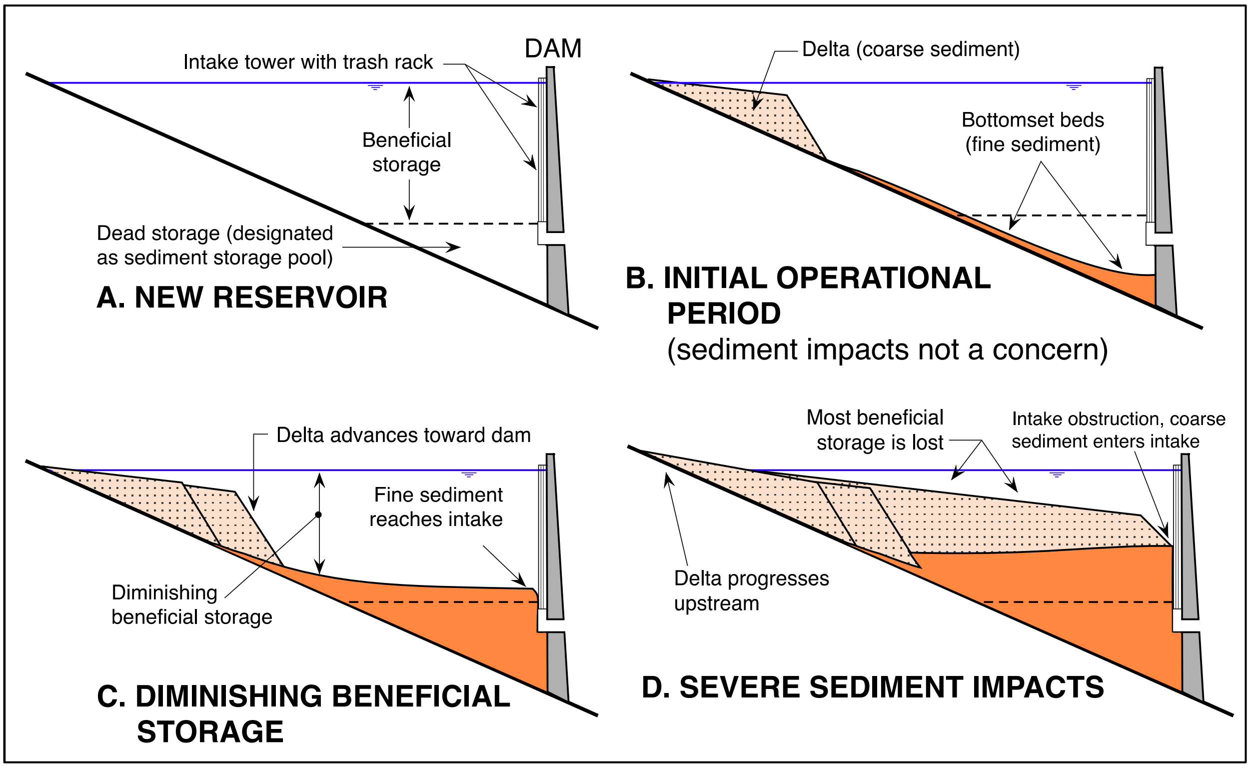

Figure 10.1 - Sedimentation sequence in a reservoir, ultimately resulting in a delta containing course sediments reaching the dam

10.28. Unless sediment is managed, therefore, the accumulation of coarse and fine sediments will fill the reservoir of a Run-of-River HEP completely and create a new river bed, eliminating the HEP's live storage, as shown in **Figure 10.1** above.

10.29. So far as the **second** purpose of sediment management is concerned, the entry of sediment into the HEP's turbines—particularly coarse sediment such as sand—will erode the turbine blades. In the short term, this will damage a turbine and cause the HEP to lose power generation efficiency. In the longer term, it will render a turbine inoperable and require it to be taken offline while its runner is replaced.[762]

10.30. Sediment management in this context is to be accomplished by minimising the amount of sediment entering the HEP's intakes and travelling onwards to the turbines. In the case of a reservoir having a large storage capacity, most sediment will settle out before it reaches the area of the dam and intakes, and sediment management may not be a problem until decades have passed and the reservoir has lost a substantial fraction of its capacity. However, in Run-

[762] D. Felix and others, "Hydro-abrasive erosion of hydraulic turbines caused by sediment - a century of research and development" (2016) (49(12)) *IOP Conference Series: Earth and Environmental Science*, **Exhibit P-0523**, § 2.

of-River plants the storage capacity is typically quite small compared to river inflow, and sediments will quickly reach the intake area. When coarse sediments can reach the power intake, the sediment load on the turbines can be minimised, for example, by using a settling basin or desander, a structure constructed between the intake and the turbine, and designed to remove heavier particles from the water.

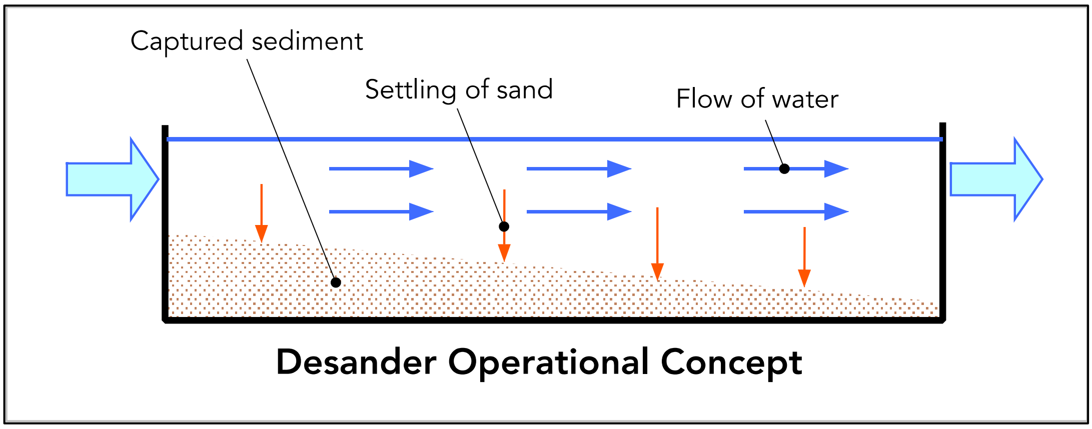

Figure 10.2 - Basic operational concept of the capture of sand by a desander

10.31. Another option in this respect is the use of abrasion-resistant coatings on turbine blades, or changes in the design of turbine hydraulic geometry.[763] Both strategies can increase the resistance of turbine blades to sediment abrasion, thereby increasing the number of operating hours between repair overhauls, as compared to the overhaul cycle without these measures. Effective sediment management begins at the design phase of the HEP and extends throughout the project's operational lifetime.[764] Active sediment management is therefore a day-to-day preoccupation of any HEP operator.

[763] *Id.*, § 4.
[764] *See* generally G. L. Morris, "Classification of Management Alternatives to Combat Reservoir Sedimentation" (2020) (12(3)) *Water*, **Exhibit P-0319**.

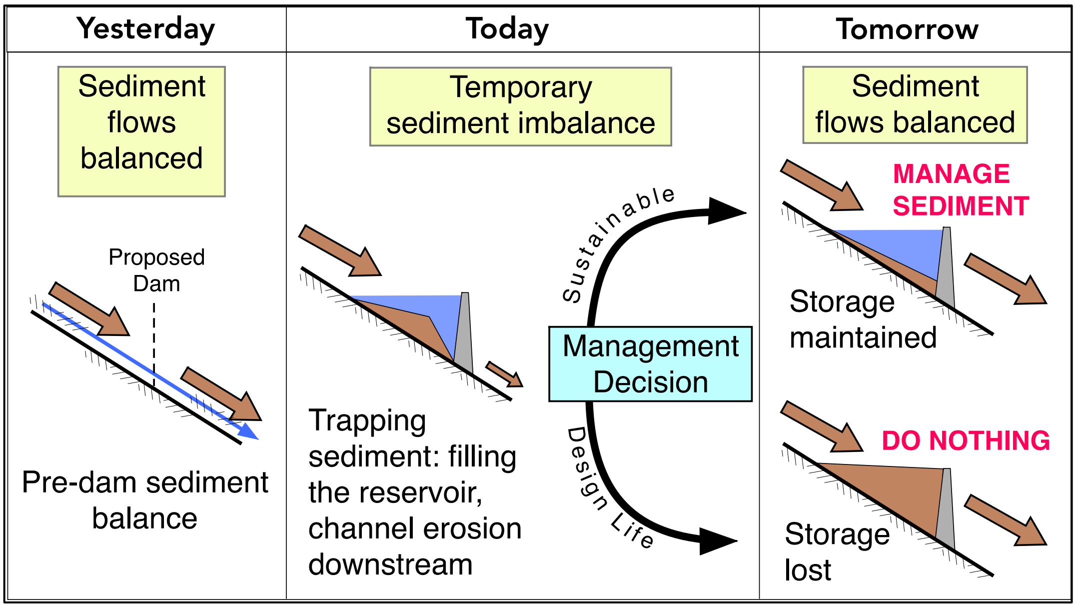

Figure 10.3 - Achievement of the long-term sustainability of sediment in reservoirs

10.32. Effective sediment management often involves the use of multiple techniques in conjunction with one another. Some of these require the construction of outlets below the HEP's minimum operating level ("**low-level outlets**"), defined in Paragraph 2(a) of Annexure D as the Dead Storage Level. Strategies for managing sediments using low-level outlets include:

10.33. **Pressure flushing**, whereby a low-low level outlet is opened to create a 'scour cone' in sediment deposits on the upstream side of the outlet, without lowering the reservoir level. The scour cone is highly localised and will not address sediment accumulation along the length of a reservoir but can be used to remove sediment from the immediate area of the intakes.[765]

[765] G. L. Morris, "Sediment Management Techniques", in G. W. Annandale and others (*eds*.), *Extending the Life of Reservoirs: Sustainable Sediment Management for Dams and Run-of-River Hydropower* (World Bank 2016), **Exhibit P-0524**, pp. 114–115.

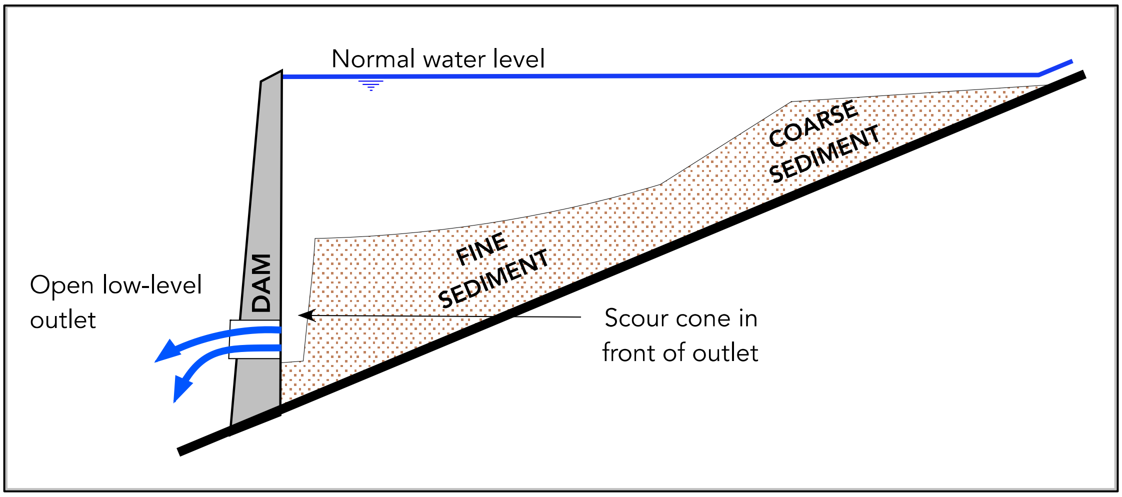

Figure 10.4 - Diagrammatic representation of pressure flushing

10.34. **Reservoir empty flushing** (also called "drawdown flushing" or simply "flushing") whereby low-level outlets are used to empty the reservoir such that the river's flow scours the exposed sediment bed and carries the eroded sediment through the outlet and downstream of the dam. For this to work, the low-level outlet would normally be located at the bottom of the reservoir, near the original streambed, and sized appropriately.[766]

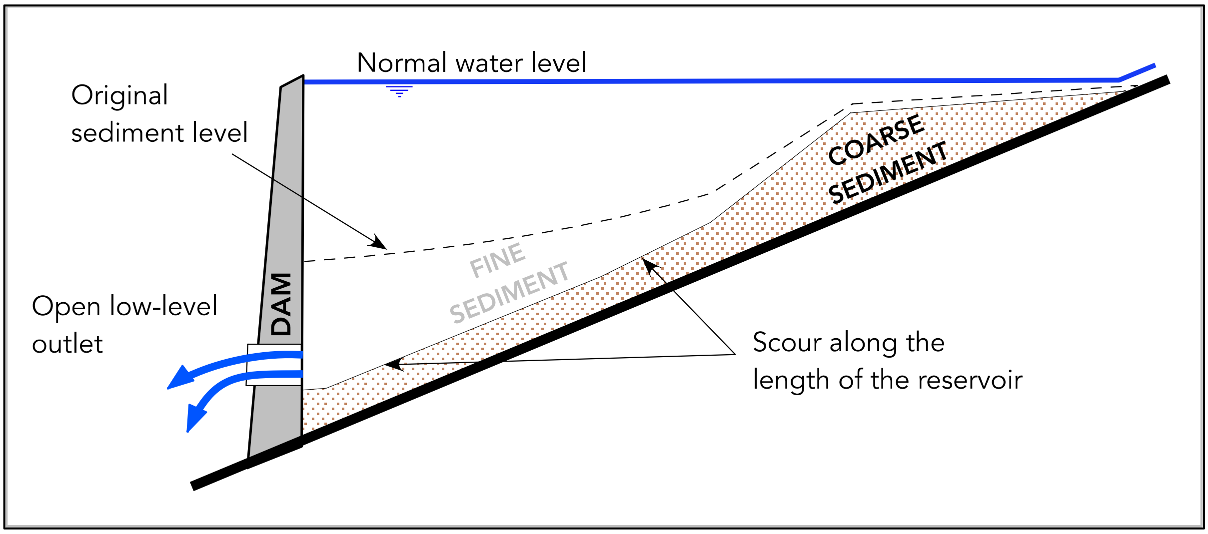

Figure 10.5 - Diagrammatic representation of reservoir or drawdown flushing (prohibited under the Treaty)

10.35. Many—perhaps most—sediment management techniques, however, do **not** require low-level outlets to be built into the dam or its reservoir. These include:

[766] *Id.*, pp. 116–118.

10.36. **Sluicing**, whereby large capacity outlets (e.g., spillways) located at or just below the minimum operating level, are fully opened during flood conditions to pass sediment-laden floods through the reservoir at the highest velocity possible. In such circumstances, the reservoir is essentially converted into a fast-flowing river, the high velocity of which can be used to minimise deposition of flood-borne sediments and to also scour existing sediment beds in a manner similar to reservoir flushing but without emptying the reservoir below the minimum operating level.[767]

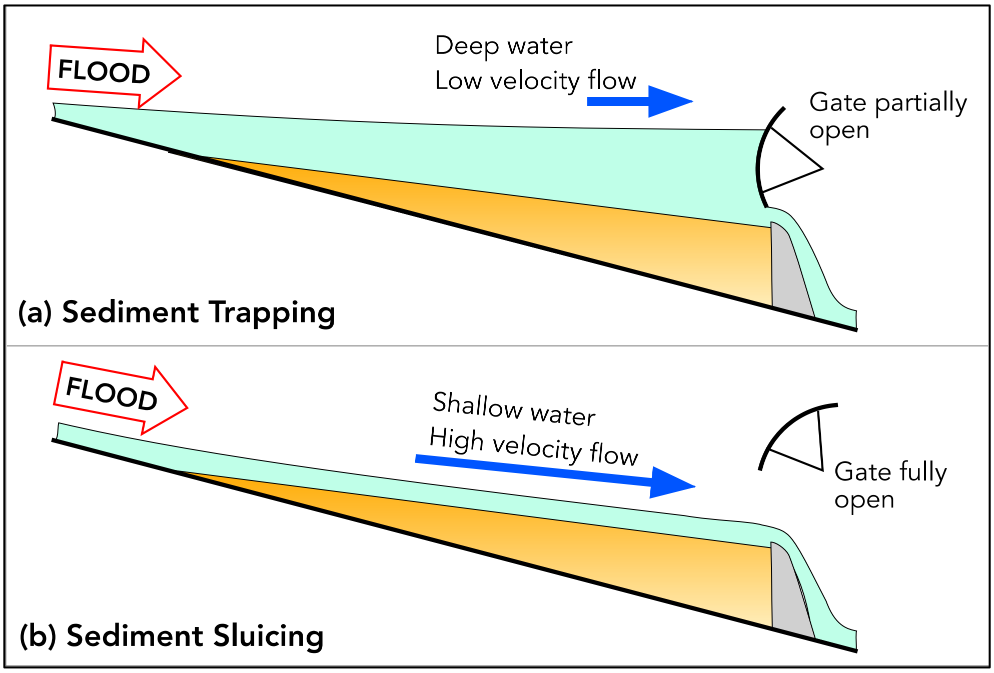

Figure 10.6 - Diagrammatic representation of sluicing

10.37. **Seasonal drawdown**, whereby the reservoir is lowered to the minimum operating level during the monsoon (i.e., by emptying the operating pool) and maintained there for the entire wet season to prevent sediment deposition in the empty operating pool during the period of the year that pondage is not needed for power peaking (as the river's natural flow is sufficient to continuously run the HEP at full power). It is during the monsoon that most sediment is deposited in the reservoir via snowmelt and rainfall runoff. Operating the HEP at the minimum operating level during this period will therefore prevent further accumulation of sediment in the (empty) operating pool, with sediment egress into the turbines being minimised by

[767] *Id.*, pp. 108–110.

incorporation of a settling basin (as defined above). The operating pool is refilled at the end of the monsoon, after the period of greatest sediment load has passed.[768]

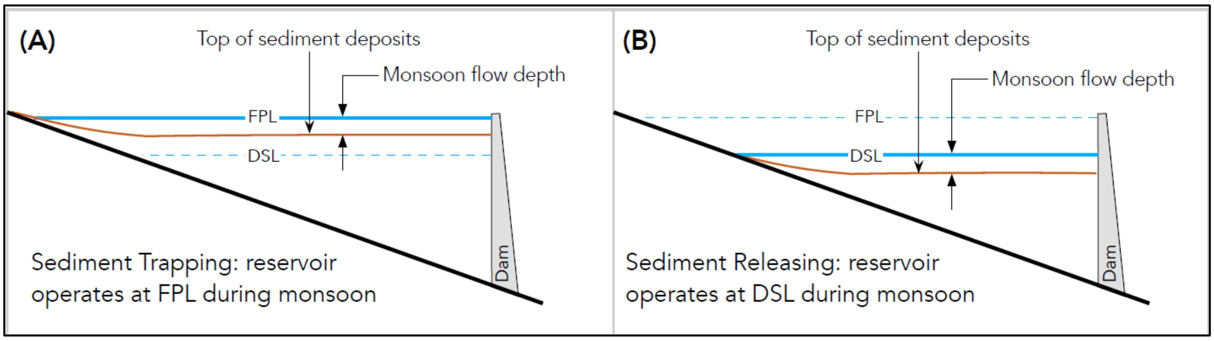

Figure 10.7 - (A) Operating of the reservoir at Full Pondage Level during the monsoon enables the operating (pondage) pool to act as a sediment trap; (B) Holding the reservoir at Dead Storage Level during the monsoon maintains the operating pool empty and therefore it does not trap sediment

10.38. **Bypass tunnels**, whereby a tunnel is installed in the reservoir upstream of the dam with a view to diverting sediment-laden floods around the dam, to reduce the rate of sediment accumulation in the HEP's operating pool. This also increases the operating pool's sedimentation efficiency, protecting the turbines. This strategy is particularly useful in the Himalayas, as the monsoon floods are usually much greater than the HEP's installed capacity, enabling the diversion of sediment-laden flows to take place without a drop in power production.[769]

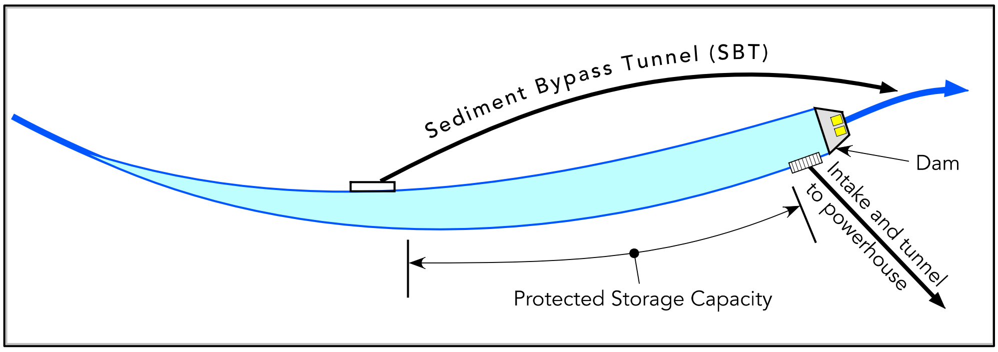

Figure 10.8 - Diagrammatic representation of sediment bypass tunnel

[768] G. L. Morris and others, "Reservoir Sedimentation", in M. H. García (*ed.*), *Sedimentation Engineering: Processes, Measurements, Modeling, and Practice* (ASCE 2007), **Exhibit P-0525**, § 12.8.4.4.
[769] G. L. Morris, "Sediment Management Techniques", in G. W. Annandale and others (*eds.*), *Extending the Life of Reservoirs: Sustainable Sediment Management for Dams and Run-of-River Hydropower* (World Bank 2016), **Exhibit P-0524**, pp. 106–108.

10.39. The optimal sediment management strategy for a HEP can only be determined on a case-by-case basis. This will depend on several factors linked to the HEP site, including: its hydrology; sediment load and its variation over time;[770] and river and reservoir geometry. In addition to features at the HEP itself, moreover, sediment management strategies can also include various techniques for reducing upstream sediment yield, e.g., by controlling soil erosion and, where appropriate, upstream sediment trapping.[771] And in other cases, they may include the mechanical removal of sediment from the reservoir, e.g., through dredging or dry excavation.[772]

10B.2 Interpreting Paragraph 8(d)

10.40. It is against that background of what an outlet is and its potential role in sediment management that one turns to the wording of Paragraph 8(d) itself. As with the other sub-paragraphs of Paragraph 8, this introduces a design criterion within which India must work if an Annexure D.3 HEP is to be Treaty-compliant.

(a) "There shall be no outlets below the Dead Storage Level…"

10.41. The starting point of Paragraph 8(d) is a stark prohibition: "[t]here shall be no outlets below the Dead Storage Level". India is therefore forbidden from placing outlets below the bottom of the Operating Pool of its Annexure D.3 HEPs. Put another way, and consistent with the findings of the *Kishenganga* Court,[773] the opening words of Paragraph 8(d) reflect the clear expectation of the Treaty's drafters that India would have no capacity to control the Dead Storage in its reservoirs via use of low-level outlets. This reflects the bargains at the heart of the Treaty, in particular the Hydro Bargain.

10.42. By the same token, however, Paragraph 8(d) does not purport to regulate outlets that are located above the Dead Storage Level. This is consistent with the idea that Live Storage is for operational use. That is not to say, however, that outlets above Dead Storage Level are, in all respects, unregulated by Paragraph 8 of Annexure D. As set out further below, both spillways and intakes—as distinct species of outlet—are regulated by Paragraphs 8(e) and (f)

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[770] This itself includes a number of additional factors, including: sediment characteristics and load; sediment catchment characteristics (including the source of sediment); nature and size of any extreme design events; the presence of turbid density currents; and riverbed sediment particle size. *See* more generally *id*.
[771] *Id*., pp. 99–105.
[772] *Id*., pp. 112–114.
[773] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 505.

respectively, even where those outlets are placed wholly or partially above Dead Storage Level.[774]

(b) "…unless necessary for sediment control or any other technical purpose…"

10.43. The default prohibition on low-level outlets under Paragraph 8(d) also carries with it an **exception**. India will be entitled to include an outlet below the Dead Storage Level in its HEP design where—and only where—"necessary for sediment control or any other technical purpose".

10.44. The meaning of "sediment control" in this context is self-evident and spelled out above and in **Chapter 4**: it refers to sediment management for the purpose both of preserving a HEP's Live Storage and minimising sediment entry into the turbines.

10.45. So far as a "technical" purpose is concerned, it must be given its natural and ordinary meaning of "having special and usually practical knowledge especially of a mechanical or scientific subject".[775] Read in the context of HEP design, and alongside the reference to sediment control, the term "technical" is plainly referencing the operation of the HEP and its appurtenances. Put another way, the outlet must be required for the operation of the HEP **as such**, and not connected to some other purpose, e.g., irrigation of adjacent fields or the provision of water for domestic use. This would include passage of the design flood in the case of spillways and the diversion of water to the turbines in the case of intakes. It follows that a spillway or intake below the Dead Storage Level can be justified under the strict terms of Paragraph 8(d).

10.46. The legal implications of this language are clear:

(a) In the first place, India carries the burden of proving it is entitled to a low-level outlet:[776] it must justify departure from the rule that the prohibition reflects. In

[774] That being said, other outlets (beyond spillways and intakes) are not regulated by Paragraph 8 of Annexure D: if India wanted to build a maintenance outlet above the Dead Storage Level, it is constrained only by wider considerations of good faith (e.g., *pacta sunt servanda*) in determining the need for such an outlet, as well as its size and height.

[775] "Technical", *Merriam-Webster* available at: https://www.merriam-webster.com/dictionary/technical (last accessed 18 March 2024), **Exhibit P-0526**. Another definition of the term is: "[p]ertaining to, involving, or characteristic of a particular art, science, or other subject" ("Technical", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2003), Volume 2, **Exhibit P-0418**, p. 3197).

[776] *See* e.g., *Certain Iranian Assets (Islamic Republic of Iran v. United States of America)*, ICJ General List No 164 (Judgment, 30 March 2023), **PLA-0041**, ¶ 108, concerning the application of the exception contained in the

this, the relationship between the two concepts in the first clause of Paragraph 8(d) is a microcosm of the relationship between Article III of the Treaty proper (the rule) and Annexure D itself (the exception).[777]

(b) In the second place, the standard of proof that India must meet if it is to be allowed a low-level outlet under Paragraph 8(d) is a high one. It is not entitled to such an outlet only on the basis that it is objectively "necessary". This word was the subject of interpretation by the *Kishenganga* Court of Arbitration in the context of Paragraph 15(iii) of Annexure D, which understandably strove to give it a consistent meaning throughout the Treaty.[778] Although refusing to hold that the term held connotations of indispensability, the *Kishenganga* Court nevertheless set the bar of necessity at a high level:

> "Turning to the threshold for necessity, the Court sees no need to associate this term with indispensability or emergency action, as argued by Pakistan. The concept of necessity appears elsewhere in the Treaty without such connotations, including the provisions of Annexure G interpreted by the Court in its Order on Interim Measures. *The Court sees no reason, for purposes of the Treaty, to ascribe to it any special meaning beyond the normal use of the term to describe action that is 'required, needed or essential for a particular purpose'*."[779]

However, the Court continued:

> "*This interpretation does not, however, reduce necessity to a mere test of what is desirable, nor does it become a self-judging matter for India alone to evaluate.* The Court can imagine situations in which the benefits of including the diversion of water within the scheme of a Run-of-River Plant would be so marginal that such a diversion could not fairly be termed 'necessary.' In the present case, however, the Court concludes, on the basis of its understanding of the KHEP and its appreciation of the Gurez site, that diversion from that site is, in fact, 'necessary' for India to generate significant power."[780]

10.47. In the context of Paragraph 8(d), therefore, the term "necessary" requires India, if it is to justify the inclusion of a low-level outlet in an Annexure D.3 HEP, to establish that the outlet is "required, needed or essential" for sediment management or another technical purpose for

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Treaty of Amity, Economic Relations, and Consular Rights between the United States of America and Iran, 15 August 1955, 284 UNTS 93, Article XX(1)(d). *See also* paragraph 8.32 above.

[777] *See* **Chapter 9** above.

[778] As required by the usual rules on treaty interpretation: *Auditing of Accounts between the Netherlands and France pursuant to the Additional Protocol of 25 September 1991 to the Convention on the Protection of the Rhine against Pollution by Chlorides of 3 December 1976 (Netherlands/France)*, Award (2014) 144 ILR 259, **PLA-0016**, **¶** 91. *See*, generally, **Chapter 8** above.

[779] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 397 (emphasis added, citation omitted).

[780] *Id.*, ¶ 398 (emphasis added).

the specific HEP in question. It is **not** sufficient for India to demonstrate, by reference to a cost-benefit analysis, or similar exercise, that a low-level outlet, all things considered, would be **preferable**.

10.48. The word "necessary" in Paragraph 8(d) entails a further limitation, namely that in justifying a low-level outlet under Paragraph 8(d), India cannot breach other provisions of the Treaty. This is of particular importance in the context of sediment, as India cannot utilise any sediment management technique that would deplete the reservoir below the Dead Storage Level, which is prohibited by Annexure D, Paragraph 14 and Annexure E, Paragraph 19.

10.49. As the *Kishenganga* Court held, where India is confronted with a situation in which a HEP cannot be sustainably operated without such depletion, the solution is not to breach the clear prohibition on such depletion—it is to find somewhere else to build the HEP.[781]

10.50. As a practical matter, therefore, the first clause of Paragraph 8(d) limits the circumstances in which India is permitted to include low-level outlets in its Annexure D.3 HEPs to an even greater extent than first appears. India is barred by other provisions of the Treaty from adopting the key sediment management technique in which a low-level outlet is required, namely reservoir drawdown below Dead Storage Level for flushing. Pressure flushing,[782] using a low-level outlet without depleting the reservoir below the Dead Storage Level, has the technical limitation of not constituting a complete answer to sedimentation. Pressure flushing, for example, is utilised only to keep the immediate vicinity of an intake free of sediment, but cannot solve the larger problem of wider sediment accumulation, and was largely dismissed by the *Kishenganga* Court[783] in preference to sluicing.[784] And while the preferred sediment management technique of sluicing may, site depending, require the use of an outlet with the invert (bottom of the outlet) set below the Dead Storage Level,[785] although the water level is not lowered below Dead Storage Level during sluicing operations, it is again for India to demonstrate that outlet height is necessary for sluicing to be effective.

10.51. Pakistan's interim conclusion on the meaning of Paragraph 8(d), supported by the *Kishenganga* Court and the internal logic of the Treaty, is therefore this: as an initial matter,

[781] *Kishenganga* arbitration, Decision on India's Request for Clarification or Interpretation, **PLA-0021**, ¶ 33.
[782] *See* paragraph 10.33 above.
[783] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 502.
[784] *Id.*, ¶ 518. Other techniques include building desanders into the intake approach or simply raising the intakes higher in the reservoir.
[785] *Id.*, ¶ 507.

the circumstances in which India will be permitted to design an Annexure D.3 HEP that uses a low-level outlet for sediment management—or any other technical purpose—are subject to significant constraint.

(c) "…any such outlet shall be of the minimum size, and located at the highest level, consistent with sound and economical design…"

10.52. If India succeeds in establishing the necessity of a low-level outlet, Paragraph 8(d) limits the design possibilities of such outlets further still, by providing that they must be as small as possible, and as high as possible in the HEP's reservoir. The reason for this is clear. By limiting the **size** of the outlet, the Treaty minimises the amount of water that India can discharge from it on a second-by-second basis (the instantaneous flow rate). By limiting its **depth**, the Treaty removes India's ability to control water volume in the reservoir below the Dead Storage Level. Again, this is entirely consistent with the *modus vivendi* of Annexure D as not just limiting the amount of Live Storage that India is permitted,[786] but also reducing its ability to control its Dead Storage, being the only form of storage that is unlimited under the Treaty.[787]

10.53. But by what standard is the size and height of the outlet to be assessed? Paragraph 8(d) provides the answer to this as well—in the first place by the words "consistent with sound and economical design". The noun "design" in this context is found throughout Paragraph 8, not only in the sub-paragraphs of the provision but also in the *chapeau*: "the design of any new Run-of-River Plant […] shall conform to the following criteria", of which Paragraph 8(d) is one. From this, it can be inferred that "design" goes beyond "a plan or scheme conceived in the mind", being one accepted definition, but rather extends to "[t]he action or art of planning and creating in accordance with appropriate functional or aesthetic criteria; the selection and arrangement of artistic or functional elements making up a work of art, machine, or other object".[788] In other words, "design" in the context of Paragraph 8 refers not just to the rendering of particular HEP features on paper but also in practice.

10.54. Paragraph 8(d) also requires that the design of the outlets be "sound and economical". In this context, "sound" must be taken as referring, in its natural and ordinary sense, to "free

[786] Via Paragraph 8(c) of Annexure D and its approach to the calculation of Pondage (*see* **Chapter 11**).
[787] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 505–508.
[788] "Design", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2002), Volume 1, **Exhibit P-0527**, p. 653.

from any decay or defect; undamaged, unbroken; in good condition"[789]—in other words, fit for the purpose for which it has been designed. And "economical", by similar token, means "[c]haracterized by or tending to economy; careful of resources, not wasteful; sparing, thrifty"[790]—in other words, not disproportionately expensive given the purpose for which it has been designed.

10.55. Pakistan makes two observations about this language:

(a) **First**, it means that India is capable of designing the size and height of a low-level outlet in an Annexure D.3 HEP by reference to what works in the circumstances and is affordable. India is **not** entitled to claim that "best practices" in HEP design entitles it to a design and placement of an outlet that would maximise its utility for India but in disregard of actual or potentially damaging downstream consequences for Pakistan. The Treaty limits and constrains what India can do. It is entitled to a workable and functioning HEP within the constraints of the Treaty.

(b) **Second**, at the same time, the language used allows, and indeed requires, India to take advantage of advances in HEP technology to improve its designs on the Western Rivers, provided that the use of such advances is within the boundaries of the Treaty.[791] The effect of Paragraph 8(d) is to treat advances in HEP technology as a ratchet. Best practices can and must be used to improve India's compliance with its "let flow" and non-interference obligations in Article III. They cannot be relied upon as a basis for undermining the Treaty and the Parties' fundamental bargains.

10.56. The result of this is that—as the *Kishenganga* Court of Arbitration found—India is able (indeed, is compelled) to build the best HEP it can in light of the strictures placed upon it by the Treaty,

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[789] "Sound", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2003), Volume 2, **Exhibit P-0418**, p. 2930.
[790] "Economical", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2002), Volume 1, **Exhibit P-0527**, p. 789.
[791] *See* **Chapter 9D** above.

10.57. On the basis of this analysis, HEP design under the Treaty, as regards outlets, becomes a three-step process.

(a) **First**, India must show that a low-level outlet is necessary (in the relevant sense) for sediment management or some other technical purpose.

(b) **Second**, India must identify appropriate options with respect to the necessary outlet that allow for sound and economical design, including anything on the cutting edge, taking into account advancements in HEP construction at the time the HEP is notified under Paragraph 9 of Annexure D.

(c) **Third**, once the options are identified, India is obliged to pick the design option that best protects Pakistan's interests on the Western Rivers, i.e., the one that allows for the smallest and highest low-level outlet. As such, even a marginal decrease in the size and depth of a low-level outlet will be enough for one design to be preferred over another for the purposes of Annexure D.

(d) "…and with satisfactory operation of the works"

10.58. The same analysis applies to the coda of Paragraph 8(d), which speaks of a low-level outlet's size and placement allowing for "satisfactory operation" of the HEP. As with "sound and economical design", there is no need to go beyond the natural and ordinary meaning of these terms. "Operation" refers to an "[e]xertion of force or influence; working, activity" or "[t]he condition of functioning or being active".[792] In other words, it is relevant to the way in which an Annexure D.3 HEP functions once construction has concluded and it has come online. And "satisfactory", in similar vein, merely means "sufficient" or "adequate".[793]

10.59. From this, it is apparent that Paragraph 8(d) applies the same standards to the operation of a low-level outlet in an Annexure D.3 HEP as to its design. Where necessary, India is entitled to a low-level outlet that performs its designed function in an acceptable manner. It is not entitled to a low-level outlet that may allow the HEP to operate on the cutting edge of hydropower engineering but would do so at the cost of Pakistan's rights under the Treaty.

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[792] "Operation", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2003), Volume 2, **Exhibit P-0418**, p. 2005.
[793] "Satisfactory", *id*., p. 2674.

10.60. This last passage of Paragraph 8(d) is also important for what it does not say. Unlike Paragraphs 8(e) and (f), which regulate spillways and outlets above Dead Storage Level, Paragraph 8(d) does not allow a low-level outlet to be justified by reference to the "satisfactory operation *and construction*" of the HEP. This is important, as the omission of the words "and construction" from Paragraph 8(d) make clear that India cannot rely on construction considerations (for example, associated with cost or dictated by a more complex design) to justify a lower or larger outlet. The relevant benchmark is "satisfactory operation" of the works. Again, this clear choice of words indicates that outlets below Dead Storage Level are harder to justify than outlets above Dead Storage Level.

10C SPILLWAYS AND PARAGRAPH 8(E)

10.61. With Paragraph 8(d) properly understood, Pakistan turns to Paragraph 8(e) concerning spillways. As will be appreciated, spillways only fall, in the first instance, to be regulated by Paragraph 8(e), which by its terms applies to spillways wherever located in an Annexure D.3 HEP's reservoir. Where, however, the spillway is placed below Dead Storage Level, it will also fall to be regulated as an outlet by Paragraph 8(d).

10C.1 The role of spillways in a Run-of-River HEP

10.62. The concept of a spillway has already been introduced in **Chapter 4**.[794] In short, a spillway is a large outlet principally designed to pass floodwater downstream to prevent unsafe overtopping of the dam that results in unacceptable damage to its structure. All HEPs, including Run-of-River HEPs, have spillways for this purpose.

10.63. A spillway's capacity will depend on the magnitude of the design flood. That is established by dam safety guidelines—but will usually require the spillway to be able to discharge an inflow design flood selected depending on the consequences of dam overtopping. Design may allow for some damage during the extreme floods provided that the dam does not fail. Smaller floods are expected to be discharged with no damage. The inflow design flood may be as large as the Probable Maximum Flood.[795]

[794] *See* **Chapter 4D.4** above.
[795] *See* paragraph 4.110 above. *See* also ICOLD, "Bulletin 167", *Regulation of Dam Safety: An Overview of Current Practice Worldwide*, Preprint 2023, **Exhibit P-0318**, § 5.5.

10.64. Spillways come in two broad varieties:[796]

(a) **Uncontrolled spillways**, which are invariably located at the top of the operating pool. Owing to the lack of gates to control flood discharge, they are also referred to as ungated spillways. They may be located in the wall of the dam or in an adjacent abutment and are used when the reservoir overflows the spillway crest in flood conditions, like overflow across the lip of a bathtub. The discharge rate from such spillways is a function of the height of the reservoir level over the spillway crest. Flood discharge requires that the reservoir surcharge above the full pondage level (i.e., flood surcharge storage) is used.

(b) **Controlled spillways**, which use large mechanical gates to control the discharge of water through the dam structure, can be located at any level within or adjacent to the dam. Where they are at the top of the dam wall or an adjacent abutment, they are referred to as crest gated spillways; where, however they are located within the dam or an adjacent abutment so as to be fully submerged they are known as orifice spillways.

10.65. The below diagram shows the broad categories of spillways (ungated, orifice and crest gated) within a HEP's reservoir.

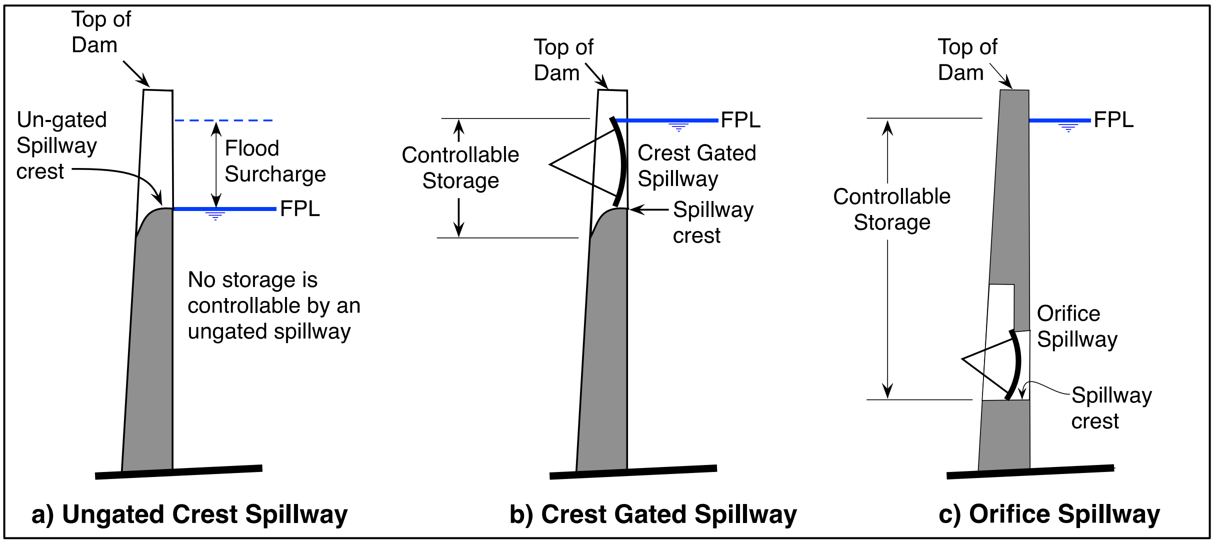

Figure 10.9 - Potential spillway configurations

[796] ICOLD, "Bulletin 58", *Spillways for Dams*, 1987, **Exhibit P-0314**, § 2.1.

10.66. As this diagram shows, one of the key advantages of controlled spillways (of both the crest gated and orifice varieties) is that they give the HEP operator control of the water stored above the spillway crest (i.e., above the bottom of the overflow opening), because operation of the gates allows water to be released more or less at will. The larger the gates, or the lower their placement in the reservoir, the greater the volume of water which can be controlled, either by way of storage or release.

10.67. Furthermore, although the principal function of a spillway is to manage flood conditions, the additional control granted to a HEP operator by a controlled spillway means that it can also be used for other purposes. One recognised subsidiary function of a controlled spillway is for sediment management through sluicing, as the spillway provides the large gates that this technique requires.[797]

10.68. To that end, a HEP may have multiple spillways, at different elevations, performing different functions. In the normal course, the selection of a spillway arrangement will depend, amongst other factors, upon: (i) flood conditions; (ii) topographical conditions; (iii) geological conditions; and (iv) dam site layout.[798] The dam and spillway are normally optimised jointly and an important factor in their design is the selection of the energy dissipation strategy in the river channel downstream from the dam to control downstream scour and prevent erosion of the riverbed which may even endanger the dam.[799]

10C.2 Interpreting Paragraph 8(e)

10.69. With the concept and function of a spillway thus defined, one turns to the wording of Paragraph 8(e) itself. As with the other sub-paragraphs of Paragraph 8, this introduces a design criterion within which India must work if an Annexure D.3 HEP is to be Treaty-compliant.

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[797] G. L. Morris, "Sediment Management Techniques", in G. W. Annandale and others (*eds*.), *Extending the Life of Reservoirs: Sustainable Sediment Management for Dams and Run-of-River Hydropower* (World Bank 2016), **Exhibit P-0524**, pp. 108–110.

[798] ICOLD, "Bulletin 58", *Spillways for Dams*, 1987, **Exhibit P-0314**, § 2.2. *See* also Bureau of Reclamation, *Design Standards No 14: Appurtenant Structures for Dams (Spillway and Outlet Works) Design Standards* (US Department of the Interior), October 2011, **Exhibit P-0490**, § 1.7.1.1.

[799] W. E. Hager and others, *Hydraulic Engineering of Dams* (CRC Press 2021), **Exhibit P-0528**, § 6.5.5. Various techniques for this exist, including designing the spillway so that the water jet dissipates partially before impacting the river below the dam, or otherwise armouring the riverbed with concrete or other hardened materials.

(a) "If the conditions at the site of a Plant make a gated spillway necessary…"

10.70. As with Paragraph 8(d), Paragraph 8(e) commences by binding India to a default position: a gated (that is, a controlled) spillway is only permitted in an Annexure D.3 HEP where "necessary". From this, it follows that Paragraph 8(e) only gives India an automatic right to an ungated (that, is an uncontrolled) spillway at the top of the dam.

10.71. For India to be entitled to a <u>gated</u> spillway of any kind, it must be established that such a spillway is "necessary"—with "necessary" in this context being given the same meaning as elsewhere in Paragraph 8 of Annexure D and the Treaty at large, *viz.*, something that is "required, needed or essential for a particular purpose".[800] Any need to depart from the default is to be determined objectively and with the burden of proof falling on India.[801] As the provision makes clear, necessity in this context is to be measured by reference to the "conditions at the site" of the HEP. This excludes, for example, consideration of cost; cost may be a consequence of site conditions, but it is not a site condition in and of itself.

10.72. What is to be considered a relevant site condition is to be measured by reference to the acceptable purposes of a spillway and the relevant factors of design.[802] In the first place, this means flood control—and, in particular, control of the design flood. In this respect, standard engineering practice prefers an uncontrolled spillway, as spillway gates may fail through human or mechanical error. As ICOLD Bulletin 178 notes:

> "Simplicity of design and construction is conducive to simpler operating rules, and simple rules which can be implemented quickly are quite obviously a determining factor in safety. This means that an ungated free-overflow spillway is the ideal solution which all dam operators would prefer."[803]

10.73. These considerations may be heightened in areas—like the Himalayas—where floods can rise quickly, thereby limiting the time available in which the gates of a controlled spillway must be raised (and any defects repaired) in order to allow the floodwater to pass. And it is further heightened by the type of dam used, with the catastrophic consequences of an erodible

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[800] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 397.
[801] *See* paragraph 8.32 above.
[802] *See* paragraphs 4.109–4.110 above.
[803] ICOLD, "Bulletin 178", *Operation of Hydraulic Structures of Dams*, 2021, **Exhibit P-0529**, p. 3.

rock-filled or embankment dam being overtopped, rendering the case for an uncontrolled (and thus less fallible) spillway greater than for a more erosion-resistant concrete dam.[804]

10.74. India may depart from this default position if flood analysis concludes that the site of the HEP is not suitable for an uncontrolled spillway—for instance because:

(a) the valley in which the dam is located is not sufficiently wide to accommodate an uncontrolled spillway capable of passing the design flood without excessive and undesirable overtopping;[805] and/or

(b) the geology of the valley is such that it cannot be widened (such that an uncontrolled spillway capable of passing the design flood can be accommodated) without risk of landslide or other accident.[806]

10.75. Another relevant site condition may be its sedimentation characteristics. If sedimentation analysis reveals that sluicing is necessary to maintain Live Storage or prevent sediment from entering the turbines, then a controlled spillway with gates may be necessary to enable sluicing to occur.[807] An uncontrolled spillway will require flood surcharge that would preclude sluicing, as this requires some drawdown of the Operating Pool (but not below Dead Storage Level). Where other sediment management techniques (excluding, for obvious reasons, empty reservoir or drawdown flushing) are sufficient to achieve these objectives, however, this option will not be available to India.

(b) "…the bottom level of the gates in the normal closed position shall be located at the highest level consistent with sound and economical design…"

10.76. If India can demonstrate that a gated spillway is necessary, this does not mean it gets a free hand to incorporate any controlled spillway it wants—crest gated or orifice—into an Annexure D.3 HEP. Paragraph 8(e) provides that the bottom level of the spillway's gates "shall" (that is, must) be as high as possible in the reservoir. As a matter of design reality, this means that India, assuming it demonstrates an uncontrolled spillway is unsuitable given the

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804 *See* paragraphs 4.114–4.116 above. *See* also Bureau of Reclamation, *Design Standards No 14: Appurtenant Structures for Dams (Spillway and Outlet Works) Design Standards* (US Department of the Interior), October 2011, **Exhibit P-0490**, § 3.3.1.
805 *See* paragraph 4.117 above.
806 *See* paragraph 4.113 above.
807 ICOLD, "Bulletin 115", *Dealing with Reservoir Sedimentation*, 1999, **Exhibit P-0530**, § 3.1.

site conditions, is entitled to a crest gated spillway, and will have to provide further justification for a fully submerged orifice spillway.[808]

10.77. As with Paragraph 8(d), one of the elements by which the placement of spillway gates is to be assessed is "sound and economical design". The term should be read identically as between Paragraph 8(d) and (e):[809] it refers to a HEP design that is fit for purpose and not unfeasibly expensive. It does not entitle India to claim its design reflects the "best practices" of the day and that it is automatically entitled to it—unless the best practices that its design reflects would enable it to raise the level of its gates. One example of best practices would be for India to use a HEP's Surcharge Storage—which it must design for, pursuant to Paragraph 8(b)—to situate an auxiliary spillway for extreme flood conditions, thereby enabling the gates of the main spillway to be smaller and higher.

10.78. Again, therefore, Paragraph 8(d) entails a two-step process in the event a gated spillway is deemed objectively necessary. First, India must identify appropriate options with respect to a gated spillway design which are sound and economical. Second, after the options are identified, India is obliged to pick the design option that best protects Pakistan's interests on the Western Rivers—i.e., the one that allows for the highest positioning of the bottom level of the gates when closed. As such, even a marginal decrease in the depth of the spillway gates is enough for one design to be preferred over another for the purposes of Annexure D.

(c) "…and satisfactory construction and operation of the works"

10.79. Much the same analysis again applies with respect to the other standard by which the height of a spillway's gate is to be fixed, namely satisfactory construction and operation of the works. India is entitled to the best dam possible within the constraints of the Treaty. Where this threshold is met by a crest gated spillway, it is not entitled to situate its spillway deeper in the reservoir because of any perceived construction or operational advantage derived from an orifice spillway. In reality, this means that the circumstances in which an orifice spillway will be justifiable will be very rare indeed, as in all or nearly all cases a crest gated spillway will do the job of an orifice spillway just as well or only marginally (but tolerably) worse.

[808] It will also mean that India is limited with respect to its choice of crest gated spillway. By the reference to height, Paragraph 8(e) plainly prefers a "wide" crest gated spillway with comparatively "shallow" gates over a "narrow" crest gated spillway with comparatively "deep" gates.
[809] *See* paragraphs 10.54–10.55 above.

10.80. Most importantly, however, it is always to be borne in mind that Paragraph 8(e) only applies where the spillway is **above** the Dead Storage Level in whole or in part, as in the case of a gated spillway. Where the spillway is entirely **below** the Dead Storage Level, as is often the case with an orifice spillway, it then becomes a low-level orifice that must be justified by reference to the more stringent requirements of Paragraph 8(d), as addressed above.[810]

10D POWER INTAKES AND PARAGRAPH 8(F)

10.81. Pakistan now turns to Paragraph 8(f) concerning intakes. As with spillways under Paragraph 8(e), these fall to be regulated, in the first instance, by Paragraph 8(f), which by its terms applies to intakes wherever located in an Annexure D.3 HEP's reservoir. In circumstances in which India proposes that a power intake should be placed entirely below the Dead Storage Level, the intake would also fall to be regulated as an outlet under Paragraph 8(d).

10D.1 The role of power intakes in a Run-of-River HEP

10.82. As **Chapter 4** has already explained, a power intake is a structure through which water is abstracted from a HEP's reservoir, for subsequent delivery to the turbines via pipe, tunnel or canal.[811] What is therefore an intake for the turbines is an outlet from the reservoir. Furthermore, the defining feature of the intake itself is the configuration used to extract water from the reservoir, and not the configuration of the subsequent conveyance elements.

10.83. Intakes are, self-evidently, essential for a HEP's power production. They must be situated to be able to take advantage of the full range of the HEP's live storage, as located in the operating pool. This will entail the bottom level of the intake being placed below the minimum operating level of the HEP—that is, below the Dead Storage Level of an Annexure D.3 HEP. This will convert all water above the invert of the intake into controllable storage. In Run-of-River HEPs one commonly used design configuration is a **surface-level intake** in which the water flowing from the reservoir into the intake is continuously open to the atmosphere and without being submerged. It may include a structure which limits withdrawals to the highest level possible to minimise the ingestion of sediment.

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[810] *See* **Chapter 10B.2** above.
[811] *See* **Chapter 4D.3** above.

10.84. Intakes may also be situated below the surface creating a submerged or **deep intake**. Again, this will result in all water above the intake's invert being converted into controllable storage. In this intake configuration the tunnel or pipe leading to the turbines terminates directly in the reservoir, without any structure designed to exclude sediment. This configuration is feasible in storage reservoirs, in the decades before the sediment deposits reach the dam, or in reservoirs where the sediment level at the dam can be controlled by flushing or other means.[812]

10.85. The difference between the two intake configurations is illustrated in the figure below.

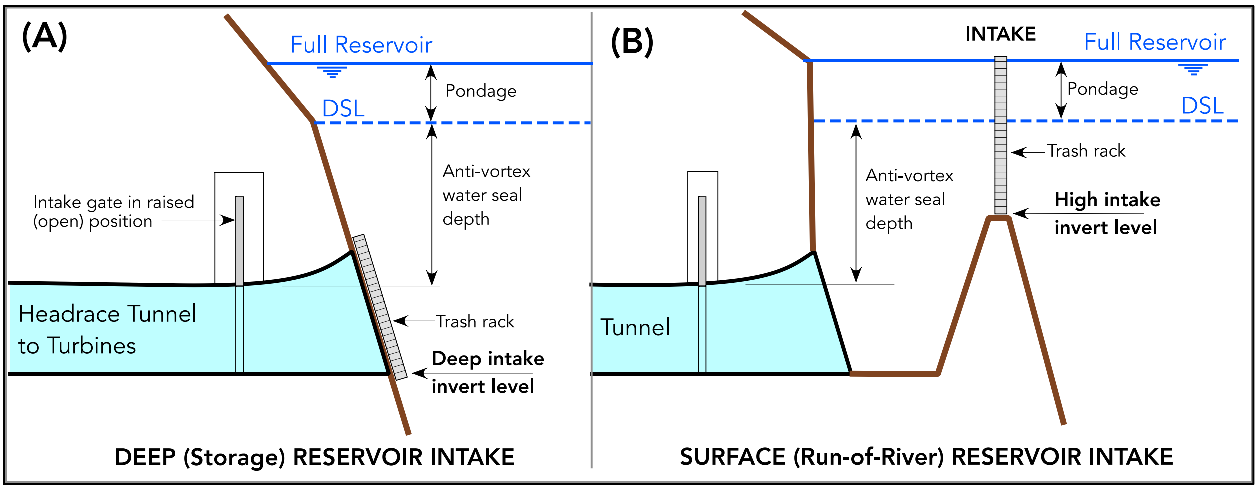

Figure 10.10 - Potential power intake configurations

10.86. It is notable that in both these examples, water is abstracted from the reservoir not via a surface canal but via a pressurised tunnel with a water seal to prevent vortexing (discussed further below). This is the norm for headrace design in the Himalayas. But as can be seen, the fact that an intake is a surface intake does **not** prevent the incorporation of a pressurised headrace, complete with water seal, into the HEP design.

10.87. Given their essential role in power production, intake design—which includes not just the structure of the intake itself, but its height within the reservoir—is an important part of the HEP planning process. Three factors are key:

(a) The minimum operating level of the reservoir which sets a benchmark for placement of the intake;

[812] As will be explained, this renders a deep intake susceptible to regulation as a low-level outlet under Paragraph 8(d).

(b) The need to prevent or minimise sediment entering the intakes, causing turbine abrasion;[813] and

(c) The need to prevent or minimise air entering the intakes through vortexing, resulting in power loss.[814]

10.88. For most Run-of-River HEPs, and especially those in the Himalayas, a key sediment management strategy is to situate the intakes as high as possible in the reservoir whilst still allowing for the live storage to be used in its entirety. Withdrawing water from the highest level minimises the entrainment of coarse sediment, which tends to settle toward the bottom of the water body, even when flowing. The design of intakes to minimise sediment entrainment is normally optimised by physical and numerical modelling. Settling basins are also frequently incorporated into the design.[815]

10.89. In the case of a submerged intake, placement at a higher level will make it more susceptible to objectional vortexes. While this can be solved setting the intake at a deeper level, this increases the operating pressure and thus the cost, as has long been recognised in hydro-engineering literature:

> "For a conventional hydroelectric intake, with a deck slab above water level, the cost of the intake structure increases with increasing depth of gate sill below water level. For maximum economy the gate sill should be set as high as possible. However, with gate sills at a shallow depth, there is a danger of vortices forming, which may entrain air, thus reducing the efficiency of the turbine. The problem then becomes one of establishing the gate sill at as high a level as possible for economy, but below the level at which vortices are produced for hydraulic efficiency."[816]

10.90. While a deep intake will have an easier time managing vortices, however, it is also more likely to encounter sedimentation issues. The better solution in many cases can be to use a surface intake to draw water from near the reservoir surface to minimise the movement of coarse sediment from the reservoir into the intake.[817] The pressurised tunnel downstream of the sediment-excluding intake can then be placed at the level that will prevent the formation of objectionable vortexing, whilst at the same time allowing for a cost-effective intake structure.

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[813] *See* paragraphs 4.85–4.89 above.
[814] *See* paragraphs 4.82–4.84 and 4.90 above.
[815] ASCE Hydropower Committee, *Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments*, 1989, Volume 2, **Exhibit P-0307**, p. 1–13; ASCE Committee on Hydropower Intakes, *Guidelines for Design of Intakes for Hydroelectric Plants*, 1995, **Exhibit P-0308**, § 9.3.2.4.
[816] J. L. Gordon, "Vortices at Intakes", *Water Power* (1970) (4(137)), **Exhibit P-0312**, p. 137.
[817] *See* paragraph 4.88 above.

10D.2 Interpreting Paragraph 8(f)

10.91. Having outlined the role of intakes and their key design challenges, one turns to the wording of Paragraph 8(f) itself. As with the other sub-paragraphs of Paragraph 8, this introduces a design criterion within which India must work if an Annexure D.3 HEP is to be Treaty-compliant.

(a) "The intakes for the turbines shall be located at the highest level…"

10.92. Unlike Paragraphs 8(d) and 8(e), Paragraph 8(f) does not commence by setting out a default position on intakes—it provides merely that the HEP's power intakes must be located at the highest level within the reservoir.

10.93. Pakistan acknowledges that, owing to the need for those intakes to have use of the full range of a HEP's Operating Pool (i.e., Pondage), the invert of any power intake will, of necessity and given the current state of the technology, need to be below the Dead Storage Level. But what the opening words of Paragraph 8(f) make clear is that the height of the intake in general, and any infringement on Dead Storage in particular, will need to be justified by India. Put another way, India is only entitled to the highest intake that is reasonably available to it under the scheme of the Treaty.

(b) "…consistent with satisfactory and economical construction and operation of the Plant as a Run-of-River Plant…"

10.94. The next words of Paragraph 8(f) introduce the limiting standard by which the height of the intake is to be justified—similar to Paragraphs 8(d) and 8(e). The words "satisfactory and economical construction and operation" are similar to the words as used in Paragraph 8(e) and should be given the same meaning.[818] But Paragraph 8(f) includes a further elaboration in specifying that the operation its drafters had in mind is "the operation of the Plant as a Run-of-River Plant".

10.95. This specification is deliberate and requires India to design the intakes of its Annexure D.3 HEPs with a view to the issues with which Run-of-River HEPs must grapple,[819]

[818] *See* paragraphs 10.54–10.55 and 10.79–10.80 above. *See* also, paragraph 10.46(b) above.
[819] In this, Paragraph 8(f) of Annexure D may be compared with the equivalent Paragraph 11(f) of Annexure E, providing only that "[i]f a power plant is incorporated into a Storage Work, the intakes for the turbines shall be located at the highest level consistent with satisfactory and economical construction and operation of the plant".

particularly in the Himalayas. Sediment ingress into the turbines is the principal difficulty for such HEPs and can be managed by a carefully designed surface level intake, which will frequently be complemented by a settling basin if the reservoir live storage is small or remains empty during the monsoon. The settling basin may be constructed on the surface of the land, if space is available, or may be excavated underground in rock.

10.96. Taking into account the requirement that the height of the intake must comport with "satisfactory and economical construction and operation", therefore, the drafters of Paragraph 8(f) expressed a clear preference for a surface intake situated high in the reservoir of an Annexure D.3 HEP. Such an intake is better able to manage sediment on account of said height, while also being cheaper to construct. Vortexing issues, as a general matter, can be successfully addressed during design through hydraulic modelling to optimise the hydraulic configuration and by proper submergence of the entrance to the pressurised tunnels downstream of a surface intake.

10.97. As with its preceding provisions, therefore, Paragraph 8(f) entails a two-step process with respect to intake design. **First**, India must identify appropriate options with respect to intake design which are satisfactory and economical, including the best practices of the day. **Second**, after the options are identified, India is obliged to pick the design option that best protects Pakistan's interests on the Western Rivers, i.e., the one that allows for the highest-level intake in the reservoir. As such, even a marginal decrease in the depth of the intake is enough for one design to be preferred over another for the purposes of Annexure D.

(c) *"…and with customary and accepted practice of design for the designated range of the Plant's operation."*

10.98. The coda of Paragraph 8(f) contains a further standard by which the permissible height of an intake is to be assessed, *viz*., that it must be consistent with the "customary and accepted practice of design for the designated range of the Plant's operation". Unlike the other standards of Paragraphs 8(d), (e) and (f), this language is *sui generis*—although similar language can be found in Appendix II of Annexure D, Paragraph 3(f) of which requires India to provide an Annexure D.3 HEP's "[d]esignated range of operation" as part of a wider suite of "hydraulic data" when notifying Pakistan of a new Plant under Paragraph 9 of Annexure D.

10.99. From this, it is inferred that the designated range in question refers to the varying water levels in the reservoir within which the intake is expected to function. Given that Paragraph

14 of Annexure D and Paragraph 19 of Annexure E prohibit the depletion of the reservoir below Dead Storage Level, and Surcharge Storage is defined in Paragraph 2(e) of Annexure D as "uncontrollable storage", this means that an Annexure D.3 HEP's operating range will invariably be between the Full Pondage Level and the Dead Storage Level.

10.100. In the context of an Annexure D.3 HEP, therefore, what this language regulates is exactly how deep below Dead Storage an intake is permitted to intrude. As already noted, India must be permitted to use its Live Storage to the fullest extent, which necessitates placing the invert of the intake below the Dead Storage Level. But given that this *ipso facto* allows India to deplete the reservoir below the Dead Storage Level, its ability to do so is tightly controlled by Paragraph 8(f): it can place the intake no lower than the "customary and accepted practice of design" permits.

10.101. But as with Paragraph 8(e), however, it is to be always borne in mind that Paragraph 8(f) only applies where the intake is, at least partially, **above** the Dead Storage Level, as in the case of a gated spillway. Where the intake is wholly **below** the Dead Storage Level, as a deep intake often is, then it becomes a low-level orifice that can only be justified by reference to the more stringent requirements of Paragraph 8(d), as addressed above.[820]

10E THE COURT'S QUESTIONS ON PARAGRAPHS 8(D), (E) AND (F)

10.102. The Court, in PO6, has identified the following questions with respect to Paragraphs 8(d), (e) and (f) of Annexure D:

> "(e) With respect to Annexure D, paragraph 8(d) of Annexure D, what is to be taken into account for the purposes of designing low-level sediment outlets for a plant and what is to be excluded?
>
> (f) With respect to Annexure D, paragraph 8(e) of Annexure D, what is to be taken into account for the purposes of designing gated spillways for flood control for a plant and what is to be excluded?
>
> (g) With respect to Annexure D, paragraph 8(f), what is to be taken into account for the purposes of designing submerged power intakes for a plant and what is to be excluded?"[821]

10.103. Given the commonality between these three provisions, as well as their interaction depending on where in an Annexure D.3 HEP's reservoir a particular feature is located, these

[820] *See* **Chapter 10B.2** above.
[821] PO6, ¶ 35(e)–(g).

relevant questions, to an extent, must be answered compendiously. Pakistan does so here, starting with the common methodological approach to Paragraphs 8(d), (e) and (f), before examining the individual provisions themselves.

10E.1 Methodological application of Paragraphs 8(d), (e) and (f)

10.104. Before the precise terms of Paragraphs 8(d), (e) and (f) can be addressed, their common methodology—determination of which is inherent in the Court's questions on these provisions—must be addressed. Four general points are relevant.

10.105. The **first** has already been canvassed in detail in **Chapter 9**, namely, that the provisions of Annexure D, in general, and Paragraph 8, in particular, are **exceptions** to the "let flow"/ no interference/ no storage rule contained in Article III, which provides the *raison d'être* of the Treaty so far as the Western Rivers are concerned. This raises two broad points, which set the tone for the application of each of Paragraphs 8(d), (e) and (f):

(a) **First**, to the extent that India relies on any of Paragraphs 8(d), (e) or (f) in the course of designing its Annexure D.3 HEPs, **it bears the burden** of showing compliance with respect to each. It is for India to show that its HEP design complies with these provisions; not for Pakistan to demonstrate that it does not.

(b) **Second**, Paragraphs 8(d), (e) or (f) are to be **interpreted narrowly** so as not to undermine the headline obligations of Article III. India is not given a free hand to determine whether, in its view, its reliance on these exceptions is justified. Rather, that must be determined objectively, in light of the strict limitations that these provisions impose on India's HEP design choices. India is not to be given the benefit of the doubt.

10.106. On this basis, India's **subjective** appreciation of whether it has complied with each of Paragraphs 8(d), (e) and (f) in matters of HEP design is irrelevant. Each of these provisions is, *ex facie*, **not** self-judging and India's opinion on its compliance is relevant to the extent it can be objectively justified on the basis of the evidence available.

10.107. The **second** general point concerns the process for assessing whether India has complied with each of the design criteria, a process that is broadly the same as between Paragraphs 8(d), (e) and (f), and requires a three-step analysis. In particular:

(a) **First**, if the provision entails a **default design criterion**—e.g., the prohibition on outlets below Dead Storage Level in Paragraph 8(d), or the need for an uncontrolled spillway in Paragraph 8(e)—India must establish either that (i) its Annexure D.3 HEP design reflects that default, or that (ii) departure from the default is "necessary", i.e., "required, needed or essential for a particular purpose".

(b) **Second**, India must identify **appropriate options** with respect to the design feature in question that comply with the limiting standards of the relevant provision (e.g., "of the minimum size, and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works").

(c) **Third**, and once the options are identified, India is obliged to pick, and to present to Pakistan in the Commission, the design option that best **protects Pakistan's interests** on the Western Rivers. And the protection of Pakistan's interests requires the option that will be most consistent with India's obligations under Article III(1), (2) and (4) of the Treaty, i.e., its "let flow", non-interference and no storage obligations. Even a marginal decrease in the amount and control of India's storage will be enough for one design option to be preferred over another for the purposes of Paragraphs 8(d), (e) and (f), keeping in mind the specific limiting standards in question. To the extent that Pakistan considers that any proposed design option is not the best option available, taking into account Paragraphs 8(d), (e) and (f), Pakistan is entitled to suggest alternatives, and India is obliged to engage with Pakistan in the Commission on the choice of design options. If there is a technical difference between the Parties on this issue that cannot be resolved within the Commission, this is quintessentially a matter than may be appropriate for third party settlement. A narrow issue of technical disagreement may be exactly the kind of issue that would be suitable for determination by a Neutral Expert on the basis of an agile procedure that is free from heavy legal content. Paragraph 11 of Annexure D and Paragraph 1(11) of Annexure F contemplate exactly such a procedure.

10.108. The **third** general item is the nature of the feature in question and its proposed location in the reservoir. This will determine which of Paragraphs 8(d), (e) and (f) apply to regulate the feature in question.

(a) As noted throughout this Chapter, Paragraph 8(d) sets out a basic prohibition on all outlets located **in their entirety below Dead Storage Level**—<u>including spillways and intakes</u> (being specialised types of outlets).

(b) In contrast, Paragraphs 8(e) and (f) apply only to spillways and intakes located **entirely or partially above the Dead Storage Level**—providing an additional layer of express regulation with respect to those features, but not to other outlets.

10.109. The **final** general item is the Treaty itself—and, in particular, the prohibition on the depletion of Dead Storage, as contained in Paragraph 14 of Annexure D and Paragraph 19 of Annexure E and identified explicitly by the *Kishenganga* Court of Arbitration.[822] As was further noted in that case "in many instances the Treaty does not simply restrict the Parties from taking certain actions, but also constrains their entitlement to construct works that would enable such actions to be taken".[823] If India seeks to construct a feature that will allow it to carry out such an operation, then unless some other justification for it can be established under Paragraphs 8(d), (e) and/or (f), it is *ex facie* Treaty <u>non</u>-compliant. If the HEP cannot be made to function without drawing the reservoir below the Dead Storage Level (e.g., flushing for sediment management), then the solution is not to insert a feature for the purposes of such flushing—it is to find somewhere else to build the HEP.

10E.2 Principles that are specifically applicable to Paragraph 8(d)

10.110. Turning now to Paragraph 8(d) and the factors that must be taken into account with respect to low-level outlets. For ease of reference, Paragraph 8(d) provides:

> "There shall be no outlets below the Dead Storage level, unless necessary for sediment control or any other technical purpose; any such outlet will be of the minimum size, and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works."

[822] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶¶ 513–515.
[823] *Id*., ¶ 506.

10.111. This language has already been unpacked in some detail above.[824] Pakistan refers to and adopts that analysis here. From that, and in addition to the general observations set out above, it is suggested that the following must be taken into account or excluded with respect to low-level outlets.

10.112. As to whether the outlet is "necessary for sediment control or any other technical purpose", the first factor to be taken into account is the purpose for which the outlet is designed. An outlet designed for sediment control or another "technical" purpose—i.e., related to the operation of the HEP as such—may be taken into account for determining if the outlet is "necessary" in the relevant sense. Any other ancillary, non-technical, benefit—be it social, economic, or environmental—is not to be taken into account in determining the necessity of the outlet.

(a) Thus, for example, if India were to claim that a low-level outlet is needed to help the HEP discharge its design flood, that would be a technical purpose and thus relevant to the assessment of whether the outlet is necessary.

(b) If, however, India was to claim that a low-level outlet is needed for the irrigation of nearby fields, that is not a technical purpose in the relevant sense, and thus not to be taken into account for the purposes of assessing the outlet's necessity.

10.113. As to whether an outlet shown to be necessary is "of the minimum size, and located at the highest level, consistent with sound and economical design and with satisfactory operation of the works", the first question to be addressed is the meaning of "sound and economical design" and "satisfactory operation of the works".

10.114. As already stated, the objective of this exercise is to identify a design and operational profile for the HEP that enables to have the best plant possible **within the constraints of the Treaty** on the basis of site-specific evidence and expert opinion, and then determine the **smallest and highest outlet** that India can construct within those parameters.

10.115. This assessment is unavoidably tied to the purpose that India has identified in justifying the outlet as "necessary". The question of what is to be taken into account for the purposes of "sound and economical design" and "satisfactory operation of the works" is therefore constrained by the reasons given by India for its initial departure from the default

[824] *See* **Chapter 10B.2** above.

prohibition on outlets below the Dead Storage Level—i.e., sediment control or some other technical (HEP-specific) purpose.

10.116. Thus, if India claims that it needs a low-level outlet for sediment management, the height and size of the outlet is assessed by what India needs to meet that objective within the limits of the Treaty. But India cannot say that it is entitled to a deeper or larger outlet by reference to objectives separate from the need for sediment management—e.g., the irrigation of nearby fields. Such concerns fall outside the parameters of the Treaty and cannot be taken into account for the purposes of Paragraph 8(d).

10.117. Further, it goes without saying that anything that is not expressly mentioned in Paragraph 8(d) is to be excluded as irrelevant. In this connection, and unlike Paragraphs 8(e) and (f), Paragraph 8(d) makes no mention of "construction" concerns as playing a role in determining the permissible height and the size of the outlet. It follows that the fact that it may be easier or cheaper for India to build a low-level outlet than one higher in the reservoir is to be excluded for the purposes of Paragraph 8(d). The focus must be on concerns of "design" and "operation" alone.

10E.3 Principles that are specifically applicable to Paragraph 8(e)

10.118. Turning to Paragraph 8(e) and the principles that must be taken into account with respect to spillways. For ease of reference, Paragraph 8(e) provides:

> "If the conditions at the site of a Plant make a gated spillway necessary, the bottom level of the gates in normal closed position shall be located at the highest level consistent with sound and economical design and satisfactory construction and operation of the works."

10.119. As with Paragraph 8(d), this provision has already been unpacked above in some detail.[825] But so far as the specific language of the provision is concerned, the following must be taken into account or excluded when assessing its application.

10.120. As to whether "the conditions at the site of the Plant make a gated spillway necessary", the emphasis is on the immediate site of the HEP itself. It follows that what is to be taken into account are those directly present conditions that may render an uncontrolled spillway inappropriate. In the first place, this will usually entail analysis of the width of the

[825] *See* **Chapter 10C.2** above.

relevant valley and, if it is too narrow for an uncontrolled spillway to pass the design flood safely, its geology—which is relevant to whether it can be widened safely to allow for an ungated spillway. Related concerns also concern the site's seismicity. Furthermore, given the acknowledged role of a gated spillway in allowing for sluicing, account may also be had of the site's hydrography and, more particularly, its sedimentation characteristics, to determine whether a gated spillway (as opposed to some other outlet) is necessary for sluicing.

10.121. What cannot be taken into account, conversely, is any factor not directly present at the site. The impact of the HEP on a village upstream is, while perhaps unfortunate, **not** reflective of the conditions at the site of the HEP itself, and so may not be taken into account for the purpose of spillway design—although it may of course have more general relevance. The same may be said of a different HEP at a site downstream of the HEP in question. By its terms, Paragraph 8(e) is limited to the site of the HEP itself, and any enquiry outside of that site is *ex facie* irrelevant.

10.122. Also irrelevant is the HEP itself. By its reference to the HEP's site only, Paragraph 8(e) makes clear that the expense of building an uncontrolled spillway is not a relevant factor in determining the necessity of a controlled spillway. Such considerations have nothing at all to do with the HEP's site but reflect the economic preferences of its operator only.

10.123. As to whether the spillway is "located at the highest level consistent with sound and economical design and satisfactory construction and operation of the works", as with Paragraph 8(d), what is to be taken into account under Paragraph 8(e) in making this assessment is unavoidably determined by the enquiry as to whether a gated spillway is necessary to begin with. A broader discussion, taking into account the wider situation away from the HEP, is excluded from the analysis, and cannot be used by India to justify a lower spillway.

10.124. Again, this means an investigation of the site of the HEP itself, including valley width, geology, seismicity and sediment profile. While what is taking place upstream and downstream of the HEP may be relevant to HEP design generally, the plain words of Paragraph 8(e) require that this be excluded from this element of the analysis.

10.125. Beyond this, the analysis under Paragraph 8(e) is also different from the analysis under Paragraph 8(d). The provision refers to "construction" in addition to "design" and "operation" elements. Unlike Paragraph 8(d), therefore, cost and ease of construction is a relevant consideration for a spillway that falls to be assessed within its bounds. At the same time, however, the exercise is devoted entirely to raising the level of the bottom level of the spillway gates when they are in the normal closed position. No enquiry is required as to the overall size of the gates—save to the extent that utilisation of a different gate size allows the bottom level of the gated spillway to be set at a higher elevation.

10E.4 Principles that are specifically relevant to Paragraph 8(f)

10.126. Paragraph 8(f) dealing with power intakes, provides:

> "The intakes for the turbines shall be located at the highest level consistent with satisfactory and economical construction and operation of the Plant as a Run-of-River Plant and with customary and accepted practice of design for the designated range of the Plant's operation."

10.127. As with Paragraphs 8(d) and (e), this provision has already been unpacked above in some detail.[826] But so far as the specific language of the provision is concerned, the following must be taken into account or excluded when assessing its application.

10.128. Unlike the preceding Paragraphs, there is no default position for intakes under Paragraph 8(f). The provision requires, in the first instance, that they be "at the highest level consistent with satisfactory and economical construction and operation of the Plant as a Run-of-River Plant". This phrase makes no mention of "design" (although it is mentioned later in the provision) but only "construction" and "operation", which terms have been dealt with above. Crucially, however, the exercise is bounded by the run-of-river character of the HEP in question. As already explained, this means that the intakes have to be built and operated satisfactorily and economically in light of the challenges that a Run-of-River HEP in the Himalayas will ordinary face—which refers to vortexing and, more importantly, sediment ingress into the turbines. While other operational questions may be relevant in this respect, the ability of the intakes to deal with vortices and sediment is paramount.

10.129. While Pakistan does not seek a specific determination to this effect, this will usually mean that the most effective intake design will be a surface intake that sits largely above the Dead Storage Level and is designed to minimise the entrainment of coarse sediment.

10.130. Thus, Paragraph 8(f)'s focus on the operation of the HEP *qua* HEP excludes consideration of wider elements that are not directly connected to the HEP's operation. To the

[826] *See* **Chapter 10D.2** above.

extent that matters up or downstream that are not implicated immediately in a HEP's operation as a run-of-river plant can impact on intake design, they must be excluded from consideration for the purposes of Paragraph 8(d).

10.131. So far as the height of the intakes is to be assessed by the "customary and accepted practice of design for the designated range of the Plant's operation", in Pakistan's view, this refers to the capacity of the intakes to be able to draw on the entirety of a HEP's Operating Pool to generate power, a reality that necessitates placement of the bottom of the intake below the Dead Storage Level. Thus, the only thing to be taken into account for the purpose of this passage is how far below the Dead Storage Level the intake's invert must be to allow all of the HEP's Pondage to be drawn upon. Any other question is irrelevant, and hence not to be taken into account.

10F THE APPROACH TO PARAGRAPHS 8(D), (E) AND (F) TAKEN BY THE NEUTRAL EXPERT IN *BAGLIHAR* AND BY INDIA TODAY

10.132. With the proper approach to Paragraphs 8(d), (e) and (f) set out, Pakistan turns to India's approach to these same provisions, and explains why it is not sustainable in light of the analysis set out above. It frames this in terms of the findings of the Neutral Expert in the *Baglihar* case—with the HEP at issue in that case serving as something of a prototype for India's standard Western Rivers HEP. As will be seen, Pakistan supports the conclusions in *Baglihar* in some respects—while rejecting them in others.

10F.1 Paragraphs 8(d) and (e)

10.133. India's approaches to outlets and spillways must be dealt with together, as India's Annexure D.3 HEP designs tend to combine the two: they include submerged orifice spillways located entirely below the Dead Storage Level. It claims that these are necessary for both sediment management and flood control—thereby engaging both Paragraph 8(d) on outlets and Paragraph 8(e) on spillways. This reflects the design that was considered by the Neutral Expert in *Baglihar*, to which Pakistan turns first.

(a) Paragraphs 8(d) and (e) in Baglihar

10.134. In *Baglihar*, the Neutral Expert was asked to consider, in the first instance, two competing spillway designs. First, India's design, which was comprised of three separate spillways, namely: (i) a submerged orifice spillway with five gates; (ii) a crest gated spillway with three gates; and (iii) a single gated auxiliary spillway (shown in the diagram below).[827] Second, Pakistan's design, which was comprised of a single uncontrolled spillway.[828]

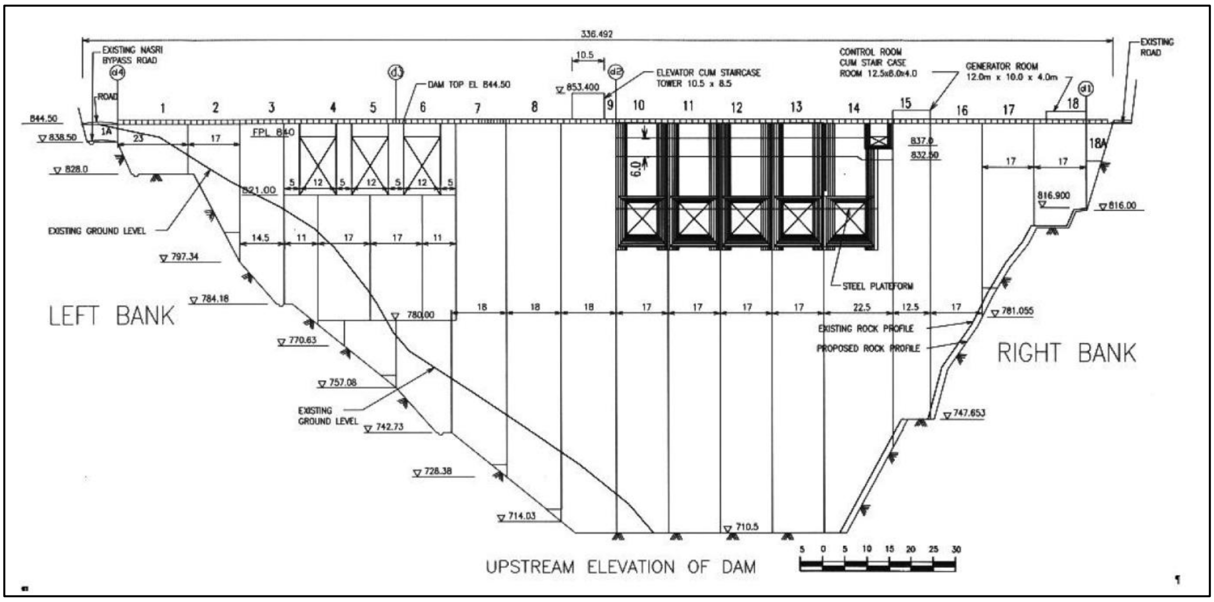

Figure 10.11 - India's proposed spillway design for the Baglihar HEP

10.135. The Neutral Expert first determined whether a gated spillway was necessary within the meaning of Paragraph 8(e) and concluded that it was. But the process by which he went about that determination is revealing. He rightly commenced the analysis with an examination of conditions at the Baglihar site, noting:

> "The determination of the possible arrangement of spillways must be driven by the general conditions of the site, which can be classified into the following four categories:
>
> - hydrology and sediment yield,
> - topography,
> - geology, and
> - seismicity."[829]

10.136. This statement is unexceptionable, and Pakistan agrees with it. These are the HEP site-specific conditions that Paragraph 8(e) has in mind when assessing the need for a gated spillway. They may also, in the case of *Baglihar*, have been determinative, as that HEP is built

[827] *Baglihar* Determination, **PLA-0002**, § 5.2.2.
[828] Pakistan presented four options, two ungated and two gated. The Neutral Expert selected one of them (A-2) as the basis for comparison as it allowed India to maintain the same power production: *Id*., § 5.2.3.
[829] *Baglihar* Determination, **PLA-0002**, § 5.2.4.

in a narrow valley with a high flood discharge, high seismicity and poor geology, with a small reservoir that prevents attenuation of floods.[830] In such circumstances, a proper application of Paragraph 8(e) may well result in the determination that a gated spillway is "necessary". Put simply, the valley has insufficient width for an uncontrolled spillway to handle the design flood and cannot be safely widened due to its geology. Even with the possibility of human and mechanical error that characterises a controlled spillway, it may still have been necessary in that particular case.[831]

10.137. Rather than end the analysis there, however, the Neutral Expert continued and fell into error. He noted that "for a given level of safety and taking into account site conditions, the economics of the project lead to the selection of the optimum arrangement of the spillway devices".[832] To that end, he identified the maximisation of production and the minimisation of construction costs as key factors in choosing between a controlled and uncontrolled spillway, noting that both would be improved with a gated spillway.[833] He was entirely wrong to do so—neither of these factors reflects **the conditions at the site** of the relevant HEP, and so are under the Treaty irrelevant for determining the necessity of a controlled spillway.

10.138. Another element of the Neutral Expert's analysis was a review of comparable projects to the Baglihar HEP, and the use of gated spillways therein. This led to a conclusion that "it has been demonstrated that the provision of gates on large spillways is a frequent practice" and "it has been demonstrated that the sole use of ungated free overflow spillways is marginal when the required capacity for flood releases is higher than 15,000 m^3/s".[834]

10.139. The difficulty with bolstering such a conclusion with such evidence is two-fold. **First**, it does not demonstrate that the use of a gated spillway in HEPs of this kind is "necessary", merely that such spillways are preferred by HEP designers when given a free hand (i.e., one that is not constrained by the strictures of the Treaty); and **second**, all of the relevant HEPs will have been constructed with (*inter alia*) the economic considerations identified by

[830] *Id.*, § 6.2 (¶ 1).
[831] For the avoidance of doubt, Pakistan does not concede that a gated spillway was necessary for the Baglihar HEP, but merely notes that this element of the Neutral Expert's analysis is defensible under the plain meaning of Paragraph 8(e).
[832] Baglihar Determination, **PLA-0002**, § 5.2.4.
[833] *Id.*, § 5.2.4 (b).
[834] *Id.*, § 5.2.8.

the Neutral Expert in mind, which considerations are rendered irrelevant by the plain words of Paragraph 8(e).

10.140. Paragraph 8 of Annexure D is not *ex facie* hostile to evidence of hydroengineering practice being used to inform application of its provisions.[835] But the relevance and weight of that evidence must be carefully assessed. The Treaty imposes standards on India's Annexure D.3 HEPs that are not applicable anywhere else in the world. Comparisons of Annexure D.3 HEP design with designs that are **not** subject to the same strictures is therefore invidious, and—unless carefully managed—risks undermining the very restraints that the Treaty seeks to impose.

10.141. Finally, the Neutral Expert erred by noting that a gated spillway was necessary to prevent the Baglihar HEP flooding of Pul Doda,[836] a village located 65 km upstream. Pul Doda, self-evidently, was not located at the site of the HEP, and so should not have been taken into account for the purposes of determining whether a gated spillway was "necessary" under Paragraph 8(e).[837]

10.142. It was in considering the subsequent level of the spillway gates, however, that the Neutral Expert went seriously astray. His analysis started off on the right track, correctly recognising that India's proposed design, with its multiple spillways, fell to be considered under different provisions of Paragraph 8. As such, he assessed India's proposed crest gated spillway under Paragraph 8(e), while holding that Paragraph 8(d) was the controlling provision for determining if India was allowed to site its proposed orifice spillway below the Dead Storage Level.[838] But his application of the latter was undermined by his finding that depletion below the Dead Storage Level was permissible under the Treaty[839] for sediment management—a determination that was subsequently reversed by the *Kishenganga* Court.

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[835] For example, if India were to present evidence of a Nepalese run-of-river HEP in similar conditions to the Baglihar HEP that suffered catastrophic damage due to lack of an ungated spillway, that would be of immense relevance in determining whether a gated spillway was "necessary" within the meaning of Paragraph 8(e).
[836] *Baglihar* Determination, **PLA-0002**, § 6.2 (¶ 1).
[837] Further, and in any event, the Neutral Expert fundamentally miscalculated; the Baglihar HEP still flooded Pul Doda with a gated spillway, and the village had to be moved: C. J. Werleman, "The human cost of India's Baglihar dam in disputed Kashmir", *TRT World*, 11 August 2020, available at: https://www.trtworld.com/opinion/the-human-cost-of-india-s-baglihar-dam-in-disputed-kashmir-38796 (last accessed 18 March 2024) **Exhibit P-0542**; A. Ayoob and M. Naik, "Multiple hydropower projects on the Chenab river ring alarm bells", *Mongabay*, 7 July 2022, available at: https://india.mongabay.com/2022/07/multiple-hydropower-projects-on-the-chenab-river-ring-alarm-bells/ (last accessed 18 March 2024) **Exhibit P-0543**.
[838] *Baglihar* Determination, **PLA-0002**, §§ 5.5.3 and 6.2.
[839] *Id*., §§ 5.4 and 5.5.

10.143. This error was catastrophic and renders the *Baglihar* determination unreliable on this point. It led to the Neutral Expert giving his blessing to an orifice spillway in which the bottom level of the gates was located **27 metres below the Dead Storage Level** to allow for sluicing[840]—an error he compounded by recommending that the gates be lowered by **a further eight metres** to protect Pul Doda against flooding.[841] None of this was relevant from the point of view of Paragraph 8(d) taking into account as it did (a) the need for India to carry out a form of sediment management that was prohibited under the Treaty, and (b) factors that were irrelevant to sediment management at the HEP itself, being the purpose for which the orifice spillway was introduced in the first place.

(b) India's position on Paragraphs 8(d) and (e)

10.144. India's position on the KHEP and the RHEP—as expressed in the Commission—is not a complete adoption of *Baglihar* and pays lip service only to the *Kishenganga* Court's finding that an Annexure D.3 HEP's reservoir cannot be depleted below the Dead Storage Level (with the obvious corollary of the Court's finding being that the Neutral Expert was wrong to find as he did).

10.145. As Pakistan has noted, India's use of an orifice spillway for passage of the design flood and sediment management is not automatically Treaty-inconsistent—but India must prove that the requirements of Paragraphs 8(d), on low-level outlets, and 8(e), on spillways, are met. Furthermore, it must not use the resulting multi-use orifice spillway to empty the reservoir below the Dead Storage Level, as prohibited by Paragraph 14 of Annexure D and Paragraph 19 of Annexure E. Put another way, India can use its multi-use orifice spillway to undertake sluicing at the Dead Storage Level, but not as a form of sediment management that relies on further depletion of an Annexure D.3 HEP's reservoir.

10.146. However, where a deep orifice spillway is **not** required to pass the design flood, India is not automatically permitted to install one for purposes of sediment management, as adequate sluicing in many cases can be accomplished with a crest gated spillway. However, India's standard Annexure D.3 HEP design places a low-level outlet for sediment management

[840] Pakistan, as noted, has no objection to sluicing as a method of sediment management but, as the *Kishenganga* Court found, sluicing ordinarily does not require the reservoir to be depleted below the minimum operating level (i.e., the Dead Storage Level) in order to be effective (*Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 518).
[841] He further recommended that the reservoir be depleted 17 metres below the Dead Storage Level twice a year to allow for sluicing to occur (*Baglihar* Determination, **PLA-0002**, § 6.3).

(a) without establishing such an outlet is necessary for sediment management, and (b) even if necessary, without establishing the non-suitability of higher level options for the carrying out of Treaty-compatible sediment management techniques, i.e., sluicing. In so doing, India is axiomatically in violation of Paragraph 8(d) of Annexure D.

10.147. Pakistan has explained as much to India in meetings of the Commission:

> "PCIW said that despite the fact that clear guidelines are provided regarding sediment management in *Baglihar* and *Kishenganga* cases yet India keeps on proposing deep orifice spillways in its designs. The [*Kishenganga* Court] has imposed a restriction upon India that it will not draw the water level down below [Dead Storage Level] for flushing and India has given assurance to abide by the Award of the Court. PCIW further stated that Pakistan does not have any objections to sluicing but is of the view that once drawdown flushing is ruled out, crest-gated spillways can effectively pass the sediments through the reservoir.
>
> PCIW explained that it is clear from reading of Paragraph 8 of Annexure D to the Treaty that its intent is to minimize the control over the flows by the upstream riparian and the Treaty scheme is to specify such limitations on the design so that the hydropower infrastructure that would be built by the upstream riparian would inherently get minimum control over the flows."[842]

10.148. India's response to this position was as follows:

> "Neither the Treaty nor the Court has imposed any restriction on the placement of orifice[s]. There has not been any literature which substantiates Pakistan side's view that orifice spillway can only be provided for drawdown flushing and not for sluicing. The restriction imposed by [the *Kishenganga* Court] is operational and India has given unequivocal assurance to abide by the same. India has right to manage the sediments within the means available and there is no provision in the Treaty which states orifice spillway cannot be provided by India. [The *Kishenganga* Court] has duly considered the orifice spillway configuration provided by India and has not objected to the same. India has adopted techno-economically sound design as per Treaty provisions duly considering all technical requirements including sluicing."[843]

10.149. With the greatest respect to India, this is wrong in almost every particular:

(a) Annexure D imposes a clear and obvious limitation on the placement of orifices for sediment management. That is the *raison d'être* of Paragraph 8(d), as the *Kishenganga* Court held.[844]

[842] Record of the 111th Meeting of the Permanent Indus Commission, 31 January-4 February 2015, dated 31 May 2015, **Exhibit P-0025**, ¶¶ 29–30.
[843] *Id.*, ¶ 33. *See* also Letter No. Y-11017/2/2015-IT/2155 from ICIW to PCIW dated 21 August 2015, **Exhibit P-0016**, ¶ 6.
[844] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 506.

(b) Pakistan's position is **not** based on engineering literature showing that an orifice spillway cannot be used for sluicing, but on the restriction of Paragraph 8(d), which precludes the use of low-level outlets for sediment management unless necessary. Where sluicing is sufficient for sediment management and can be accomplished with a crest gated spillway, a deep orifice spillway is, unless otherwise required to pass the design flood, **not** necessary and its inclusion in an Annexure D.3 HEP will breach Paragraph 8(d).

(c) The *Kishenganga* Court did **not** directly consider compliance of the deep orifice spillway design at the KHEP with Paragraph 8(d) because that question was not before it. Rather, it considered (as the Second Dispute) the question of whether reservoir or drawdown flushing was prohibited under the Treaty, and concluded that it was so prohibited.

(d) While the restriction so identified by the *Kishenganga* Court is operational in character, that does **not** prevent it from limiting significantly India's design options, with the Court noting that "in many instances the Treaty does not simply restrict the Parties from taking certain actions, but also constrains their entitlement to construct works that would enable such actions to be taken", and pointing specifically to Paragraph 8(d) as a reflection of this.[845] Consistently with this, it further recognised that:

> "*In the case of the KHEP, the Court is cognizant that changes to the design of the project may be required to optimize the management of sediment in light of this Partial Award.* In this respect, it is provident for the Court to note that its *Order on Interim Measures* has temporarily restrained the construction of 'permanent works on or above the Kishenganga/Neelum riverbed,' a development that may now serve to facilitate any changes in design that India may need to implement in light of the Court's decision on drawdown flushing."[846]

(e) To that end, it is an entirely fair reading of the *Kishenganga* Court's decision that it indirectly considered India's plans for sediment management at the KHEP and considered them non-compliant with Paragraph 8(d) of Annexure D.

[845] *Id.*, ¶ 506.
[846] *Id.*, ¶ 522 (fn. 739) (emphasis added).

10.150. On this basis, India's approach to sediment management under Paragraph 8(d) of Annexure D is not only incorrect, but fundamentally misguided, amounting to little more than a naked attempt to evade the clear findings of the *Kishenganga* Court.

10.151. Furthermore, even if India's multi-use orifice spillway falls to be regulated under Paragraph 8(e), its position is still incoherent:

(a) India must justify any departure from the default position of Paragraph 8(e), which is that it is entitled to an uncontrolled spillway only. While sediment management, and the role that a gated spillway may play in sluicing, may factor into determining if such a departure is required, the Treaty nevertheless poses a clear restriction on the availability of a gated spillway by reference to the conditions at the site of the HEP.

(b) Pakistan's position is, again, **not** based on engineering literature showing that an orifice spillway cannot be used for sluicing, but on the plain limitations of Paragraph 8(e), which provides that the bottom level of the spillway gates in the closed position must "be located at the highest level consistent with sound and economical design and satisfactory construction and operation of the works". Where effective sluicing is possible with a crest gated spillway (as it ordinarily will be), and unless an orifice spillway is otherwise required to pass the design flood (which it ordinarily will not be), the bottom level of the gates in an orifice spillway will be lower, and potentially considerably lower, than required. Such a spillway's inclusion in an Annexure D.3 HEP will therefore breach Paragraph 8(e).

(c) Again, the *Kishenganga* Court did not assess compliance of the deep orifice spillway design at the KHEP with Paragraph 8(e) because that question was not before it. Rather, it considered (as the Second Dispute) the question of whether reservoir or drawdown flushing was prohibited under the Treaty, and concluded that it was so prohibited.

(d) While the restriction so identified by the *Kishenganga* Court is operational in character, that does **not** prevent it from limiting significantly India's design options, as the Treaty prohibits in many places its ability to construct works that would enable prohibited activities to be undertaken.[847] Paragraph 8(e) is as much a reflection of this as Paragraph 8(d), and engages to the same extent as the *Kishenganga* Court's observation that, as a result of its determination, changes to India's HEP design may be required.[848]

10.152. As with Paragraph 8(d), therefore, India's approach to spillway design under Paragraph 8(e) of Annexure D aims to circumvent the defined limitations of that provision, as well as to evade the clear findings of the *Kishenganga* Court.

10F.2 Paragraph 8(f)

10.153. India's approach to Paragraph 8(f) is caught up to some extent by its position on Pondage as calculated under Paragraph 8(c)—which Pakistan addresses in **Chapter 11**. This is because Pondage determines the size of a particular HEP's Operating Pool—and, by extension, the location of its Dead Storage Level.

10.154. But even if Paragraph 8(c) were not contested, there is still an issue between the Parties on intake placement, as India often insists on submerged intakes in its Annexure D.3 HEPs, situated entirely beneath what even India considers to be the relevant Dead Storage Level. These were also incorporated in the design at issue in *Baglihar*, to which Pakistan turns first.

(a) Paragraph 8(f) in Baglihar

10.155. In *Baglihar*, the Neutral Expert was asked to consider two competing designs for the intake of the Baglihar HEP, namely India's preferred deep intake sitting entirely below Dead Storage Level, and Pakistan's alternative selective withdrawal intake, situated partially above the Dead Storage Level.

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[847] *Id.*, ¶ 506.
[848] *Id.*, ¶ 522 (fn. 739).

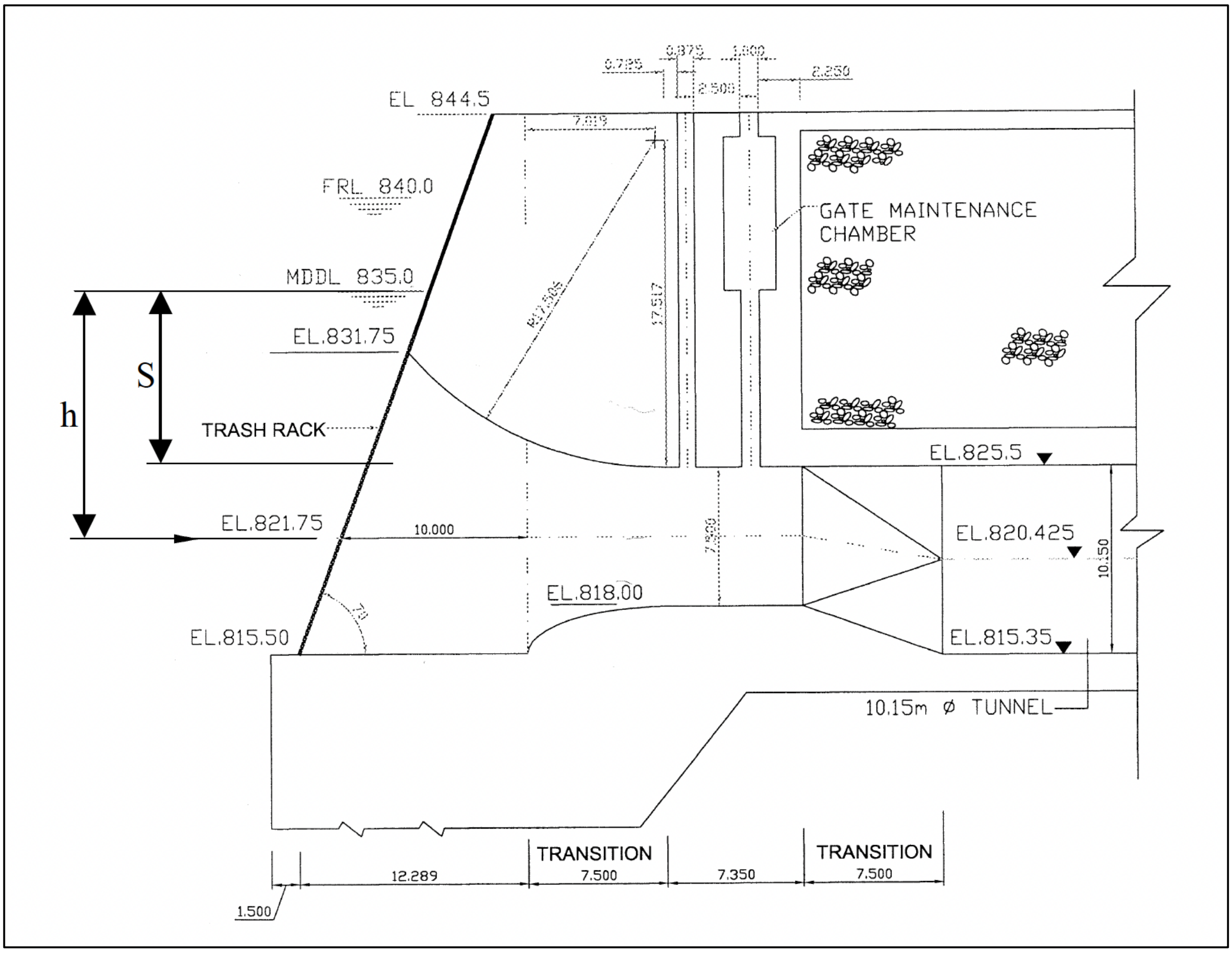

Figure 10.12 - India's proposed intake structure for the Baglihar HEP[849]

10.156. The Neutral Expert undertook to assess both designs under Paragraph 8(f), eschewing any mention of Paragraph 8(d) for India's intake, despite it being an outlet located entirely below the Dead Storage Level and intended to fulfil a technical purpose.[850]

10.157. With respect to Paragraph 8(f), however, the Neutral Expert acknowledged that the basic mission of the provision is to ensure that India's intakes are situated as high as they could be in the reservoir. In applying this mission to the practical challenges of Run-of-River HEPs, however, he gave undue priority to the need to prevent vortexing—and did not take proper account of the need to prevent sediment ingress into the turbines as a relevant factor in intake placement.[851] In Pakistan's submission, this was an error—prioritising as it did technical reasons for lowering the intakes, while ignoring technical reasons for raising them.

[849] *Baglihar* determination, **PLA-0002**, § 5.10.2 (Figure 5.10.1).
[850] *Id.*, § 5.10.
[851] *Id.*, § 5.10.7. The Neutral Expert treated these issues as part of his discussion of the deep orifice spillway, thereby isolating them from the discussion of intake placement: *id.*, § 6.6.

10.158. The Neutral Expert further held that an assessment of intake height could take place without considering whether anti-vortex devices could be effectively introduced into the HEP design, holding that "recourse to anti-vortex devices at the design stage is not common practice, and should be limited to particular cases where other measures cannot be undertaken to provide protection against the development of vortices".[852] Again, Pakistan submits this was an error. Paragraph 8(f) in no way excludes such consideration, but indeed compels that such options be assessed by (*inter alia*) the words "satisfactory and economical construction and operation of the Plant as a Run-of-River Plant".

10.159. Where the Neutral Expert was correct, however, was in his focus on the design of the intake itself as a relevant factor in the analysis. In particular, he noted that India's design (which Pakistan admittedly did not contest) included features within it that created highly asymmetric flow conditions, increasing the risk of vortex formation and that "[a] different arrangement with more symmetrical approach conditions […] could reduce the required minimum submergence depth".[853] To that end, while directing that India raise the level of the intakes by three metres (but rejecting Pakistan's suggested alternative), he recommended "that all possible structural measures should be taken to limit the circulation of flow within the intake structure and in its vicinity, especially avoiding sharp bends inside the intake structure and in its vicinity".[854]

(b) India's position on Paragraph 8(f)

10.160. India has minimal justification for such an approach to its intakes. In response to Pakistan's observation that a surface level intake is recommended for Run-of-River HEPs generally, and so the effective default under the Treaty,[855] India has responded that:

> "[…] Pondage does not dictate the type and location of the power intake. Hydraulics, topography, geology, techno-economics and many other factors play a role in the decision-making […] [M]ore often than not, site conditions do not allow surface intake as a techno-economically feasible option. Keeping in view that Pondage is needed to

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[852] *Id.*, § 5.10.7.
[853] *Id.*, § 6.6 (¶ 1).
[854] *Id.*, § 6.6 (¶ 2).
[855] *See* e.g., Record of the 109th Meeting of the Permanent Indus Commission dated 22-25 September 2013, 14 July 2014, **Exhibit P-0083**, ¶ 60; Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 36.

> meet load fluctuations, intakes accordingly provided with requisite water seal [i.e., submerged in all cases]".[856]

10.161. This comes nowhere near to meeting Pakistan's point. Pakistan does not contest that there are circumstances in which a deep intake is justified for an Annexure D.3 HEP—whether under Paragraph 8(d) or (f). But the fact remains that anything other than a surface level intake is a departure from the norm that **both** provisions set, the necessity of which departure is for India to prove. Such a departure is difficult to justify in circumstances where the design of the intake can allow for a surface level intake (meeting Pakistan's concerns) while maintaining a water seal above the headrace tunnel (meeting India's concerns).

10.162. As addressed above, all deep intakes constitute low-level outlets that fall to be regulated under the stringent requirements of Paragraph 8(d). To that end, if they are to be included in an Annexure D.3 HEP, they must be objectively necessary and no larger or deeper than required by sound and economical design and satisfactory operation of the works.

10.163. Even if that is not the case, however, and all intakes (including deep intakes) fall to be assessed under Paragraph 8(f), then this still sets a high threshold for India to meet. It is compelled to situate its intakes of its Annexure D.3 HEPs as high as possible in its reservoirs, insofar as consistent with "satisfactory and economical construction and operation of the Plant as a Run-of-River Plant and with customary and accepted practice of design for the designated range of the Plant's operation".

10.164. Given that, as discussed, many of the relevant factors for making this determination—cost, sediment management, and the availability of a variety of solutions for avoiding vortices—compel the adoption of a surface level intake with minimal intrusion below the Dead Storage Level, the circumstances in which a deep intake are justified for an Annexure D.3 HEP are limited indeed. Simply put, selection of a deep intake by India, knowing that the reservoir has a high sediment load, would not be sound practice, and will invariably lead to a request for a deeper spillway to solve the sediment problem caused by the initial poor decision with respect to the intake. This cuts clear across the plain scheme of Paragraph 8.

* * *

[856] Record of the 108th Meeting of the Permanent Indus Commission, 23-26 March 2013, dated 24 September 2013, **Exhibit P-0070**, ¶ 20.

CHAPTER 11: PONDAGE—ANNEXURE D, PARAGRAPH 8(C)

11A PRELIMINARY OBSERVATIONS

11A.1 Framing the dispute between the Parties about Pondage

11.1. In this **Chapter 11**, Pakistan addresses arguably the most important, and certainly the most technically complex, issue between the Parties, namely the calculation of maximum Pondage under Paragraph 8(c) of Annexure D. The dispute between the Parties on the correct approach to the calculation of Pondage goes back at least 20 years, to the period prior to the *Baglihar* Neutral Expert proceedings, in which it was one of the points of difference in issue. The Parties' opposition on this matter has not just been about the basis for and the outcome of the Pondage calculation for particular HEPs but about the broader methodology for the calculation of Pondage itself.[857]

11.2. The Parties have been, and remain, divided both about core elements of the calculation and about the relationship between the Pondage mandatory design criterion in Paragraph 8(c) of Annexure D, on the one hand, and other provisions of that Annexure and the overarching framework of Article III, on the other. India's position, in effect, is that the design, construction and operation of Western Rivers Run-of-River HEPs is a headline right under the Treaty, rather than an exception to Pakistan's let flow, non-interference and no storage rights under Article III(1), (2) and (4). India also reads into the mandatory design criterion the post-design and construction operational constraints on Annexure D.3 HEPs found in Paragraph 15 of Annexure D. Pakistan, in contrast, considers that it is the mandatory design criterion that is controlling and that the operational constraints in Paragraph 15 are to be referred to only for the tangential purpose of assessing whether the HEP will be capable of working within the prescribed design criteria.[858]

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[857] Record of the 90th Meeting of the Permanent Indus Commission, 15–19 January 2004, dated 19 January 2004, **Exhibit P-0544**, ¶ 6.2.4 (ii).

[858] Record of the 99th Meeting of the Permanent Indus Commission, 30 May–4 June 2007, dated 4 June 2007, **Exhibit P-0058**, pp. 10 and 12; Record of the 100th Meeting of the Permanent Indus Commission, 31 May–4 June 2008, dated 4 June 2008, **Exhibit P-0060**, pp. 12–14; Record of the 101st Meeting of the Permanent Indus Commission, 25–28 July 2008, dated 28 July 2008, **Exhibit P-0061**, pp. 8–9; Record of the 103rd Meeting of the Permanent Indus Commission, 31 May–5 June 2009, dated 5 June 2009, **Exhibit P-0066**, pp. 14–16; Record of the 104th Meeting of the Permanent Indus Commission, 27–31 March 2010, dated 31 May 2010, **Exhibit P-0330**, pp. 4–6; Record of the 109th Meeting of the Permanent Indus Commission, 22–25 September 2013, dated 14 July 2014, **Exhibit P-0083**, pp. 8 and 12; Record of the 110th Meeting of the Permanent Indus Commission, 23–27 August 2014, dated 1 February 2015, **Exhibit P-0024**, pp. 2–3; Record of the 111th Meeting of the Permanent Indus Commission, 31 January–4 February 2015, dated 31 May 2015, **Exhibit P-0025**, pp. 10–11; Record of the

11.3. At the level of detailed calculation, the Parties are in dispute about what can and should be taken into account for purposes of the technical calculation of maximum Pondage. The prism through which India approaches the exercise is that Indian Annexure D.3 HEPs are entitled to a level of Pondage that will enable them to meet the demand requirements ('load') of the Indian electricity grid into which they are plugged, to utilise the installed capacity of the HEP. Pakistan, in contrast, understands that the purpose of the Pondage of an Annexure D.3 HEP is to enable India to operate at "Firm Power" for a limited period throughout the day, in circumstances in which the flow of the river falls below "Minimum Mean Discharge".[859]

11.4. In a nutshell, this is the Parties' dispute over Pondage—crystallised around essentially these points over the past 20 years or more.

11.5. Against this background, the purpose of this Chapter is to respond to question (d) in paragraph 35 of PO6, in which the Court asks what must be taken into account, and what must be excluded, for purposes of calculating maximum Pondage under Paragraph 8(c).

11.6. In setting out its response, and elaborating on the methodology and calculations that underpin that answer, Pakistan has not confined itself simply to a repetition of the methodological case it put forward in the *Baglihar* Neutral Expert proceedings or in what are now long-stale discussions in the Commission on the issue of the Pondage entitlement of particular HEPs. The Court's question is aimed at informing guidance that the Court will give of a systemic nature on the correct interpretative approach required in respect of Paragraph 8(c) of Annexure D.

11.7. Based on the Parties' extensive engagement on these issues, and in particular about the legacy and reach of the *Baglihar* Determination, Pakistan understands, with a high degree of confidence, that India's position is largely one of adoption of the approach taken by the Neutral Expert in the *Baglihar* Determination.

11A.2 Key concepts

11.8. Against this background of the broad framework of the dispute about Pondage, it is useful to begin the analysis with a brief explanation of the key concepts that will be engaged

113th Meeting of the Permanent Indus Commission, 20–21 March 2017, dated 29 March 2018, **Exhibit P-0545**, pp. 7 and 9.

[859] Record of the 103rd Meeting of the Permanent Indus Commission, 31 May–5 June 2009, dated 5 June 2009, **Exhibit P-0066**, pp. 14–16.

by this Chapter, starting with Pondage. "Pondage" is a HEP's controllable "Live Storage". It is stored between the "Full Pondage Level" and the "Dead Storage Level" of an Annexure D.3 HEP reservoir—that is, in the HEP's "Operating Pool". As the Court will recall from **Chapter 9**, the Parties have agreed a special meaning for each of these terms, bespoke for purposes of the Treaty, in Paragraph 2 of Annexure D.

11.9. Given the imperative of Article III of the Treaty, pursuant to which India is only permitted to store the waters of the Western Rivers within closely defined parameters, Pondage as a manifestation of storage was already a controversial idea, given that Pondage is not essential for the operation of a Run-of-River peaking Plant. The greater the Pondage allocated to India for a particular HEP, the deeper in the reservoir the Dead Storage Level is set with respect to that HEP. As the Court has already seen in **Chapters 9** and **10**, the Dead Storage Level is the axis around which many of the critical features of an Annexure D.3 Run-of-River HEP are situated. As a result, the issue of Pondage is closely connected with many of the other elements of Paragraph 8 of Annexure D.

11.10. It is not surprising that India would wish to maximise its Pondage. Not only does a deeper Dead Storage Level give it greater controllable storage—an advantage, from a HEP operator's perspective—it gives it greater freedom to situate various other important HEP components (including outlets, spillways and power intakes) lower in its reservoirs, thereby giving India greater control of waters that the Treaty otherwise allocates, pursuant to Article III, for the exclusive use of Pakistan. By equal measure, this makes Pakistan apprehensive—as any additional storage or control of water by India is not immediately available for Pakistan's use and can be, in the worst case, weaponised by India, as was the case in 1948 and as India has periodically threatened since.860 And when this is measured against the considerable number of HEPs with significant Live Storage that India has planned for the Western Rivers—as addressed in Chapter 5—the cumulative impact of India's programme for Pakistan and its people is significant and damaging.

11.11. With this in mind, the Parties' respective visions for Pondage under the Treaty are far apart, disagreeing as they do on many of the foundational premises of the exercise of its calculation. Authoritative guidance from the Court on the issue of the methodology of calculating maximum allowable Pondage is essential.

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[860] *See* **Appendix A**, paragraph 105.

11.12. To that end, the rest of this Chapter proceeds as follows:

(a) **Section B** introduces the Treaty provisions which are relevant (and, in one case, largely irrelevant) for the calculation of maximum Pondage.

(b) **Section C** introduces Pakistan's approach to the calculation of maximum Pondage and explains it by way of a four-step analysis.

(c) **Section D** addresses India's methodology for the calculation of Pondage, as adopted from the *Baglihar* Determination, and explains why it is fundamentally misguided and cannot be correct.

(d) **Section E** sets out an interim conclusion on the Parties' respective approaches and compares them against objective benchmarks, before answering the Court's question, set out in PO6, on the calculation of maximum Pondage.

11.13. Information relevant to this Chapter is also found in **Appendix E**, which sets out:

(a) In **Appendix E.1**, the data for the calculation of the minimum mean discharge of a Western Rivers watercourse, being the critical integer in Pakistan's approach to maximum Pondage.

(b) In **Appendix E.2**, the equations behind Pakistan's approach for the calculation of maximum Pondage to enable the Court—and in particular its engineering members—to see how the provisions of the Treaty can be rendered real and meaningful in hydroengineering terms.

11B RELEVANT TREATY PROVISIONS FOR THE CALCULATION OF PONDAGE

11B.1 The relevance of the definitions in Annexure D, Paragraph 2

11.14. Paragraphs 8(a) to 8(c) of Annexure D concern the parameters for the design of a new Run-of-River Plant in relation to the Live Storage which, as said, informs a HEP's Dead Storage Level and the location of various other components.

11.15. As noted previously, Live Storage under the Treaty comprises, "all storage above Dead Storage" (Annexure D, Paragraph 2(b)). It therefore includes both:

(a) "Pondage" which is "Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant" (Paragraph 2(c)); and

(b) "Surcharge Storage" which is "uncontrollable storage occupying space above the Full Pondage Level" (Paragraph 2(e)). The "Full Pondage Level" (Paragraph 2(d)) is "the level corresponding to the maximum Pondage provided in the design in accordance with Paragraph 8(c)".

11.16. For completeness it is also worth noting that the "Operating Pool" is the "storage capacity between Dead Storage level and Full Pondage Level" (Paragraph 2(f)).

11.17. Taken together, the various storage-related definitions of Annexure D produce the following longitudinal profile of a HEP's reservoir.

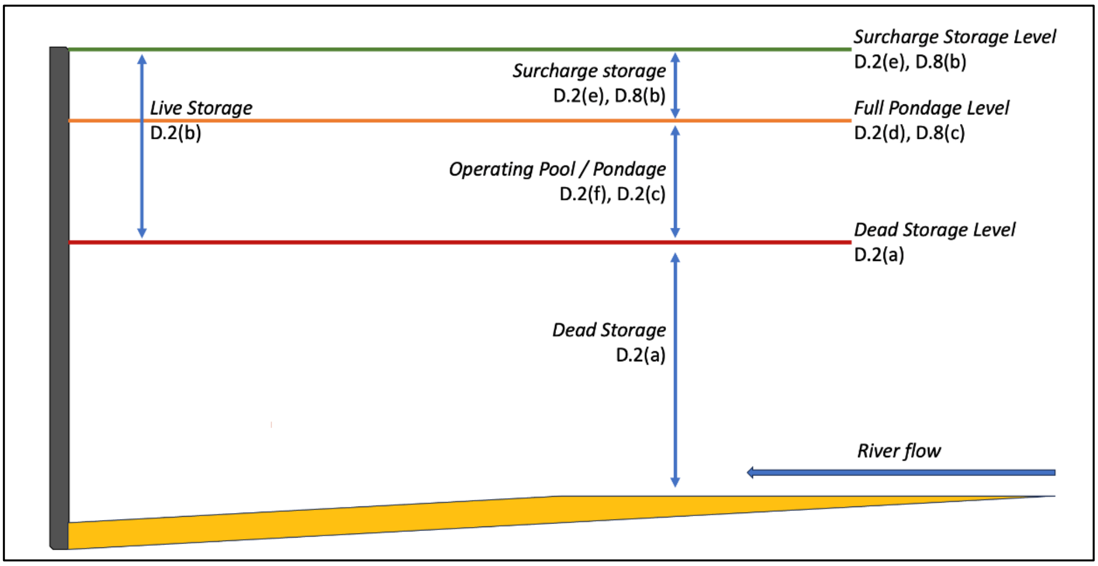

Figure 11.1 - Longitudinal profile of HEP reservoir using Annexure D definitions

11.18. Before getting to the issue of the calculation of the maximum Pondage permitted to Annexure D.3 HEPs, it is necessary to consider the special definitions given to key terms in Paragraph 2 of Annexure D.

11.19. As a matter of common English usage, the term "pondage" refers to "[t]he storage of water; the capacity of a pond".[861] In hydroelectric parlance "the word 'pondage' refers to short-term storage of water, usually on a daily basis, to meet the diurnal variations in power

[861] "Pondage", *Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2003), Volume 2, **Exhibit P-0418**, p. 2279.

demand".[862] Importantly, however, for the purposes of Annexure D of the Treaty the Parties have agreed that the term "Pondage" should be given a special meaning: Paragraph 2(c) of Annexure D provides that "Pondage" means "Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant." This special meaning is important as it engages the controlling principle of Treaty interpretation reflected in Article 31(4) of the VCLT, namely: "A special meaning shall be given to a term if it is established that the parties so intended."[863]

11.20. As this definition makes plain, "Pondage", for purposes of Annexure D, is a limited volume of stored water ("Live Storage of only sufficient magnitude") that is constrained by reference to a narrow and specified purpose ("to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant"). While the definition does not itself address the maximum capacity of Pondage that will be permitted to Annexure D.3 HEPs, it makes it immediately clear that limitations of both volume and purpose are intended with respect to the Pondage associated with them. The definition, in this way, reflects the broader scheme of the Treaty, and in particular the "let flow", non-interference and unrestricted use obligations upon India pursuant to Article III of the Treaty, subject to limited and tightly controlled exceptions.

11.21. It is also significant that Paragraph 2(c) precludes a conception of Pondage as storage that may be used for non-hydroelectric uses, e.g., as a reservoir that could double-up for purposes of agricultural use. This understanding follows also from a reading of the definition of Pondage alongside the definitions of "Dead Storage", "Live Storage", "Full Pondage Level" and "Operating Pool" in Paragraphs 2(a), 2(b), 2(d) and 2(f) of Annexure D. These make it clear that water stored as Pondage is the only water in the reservoir of an Annexure D.3 HEP that can be used for "operational purposes" (as per Paragraph 2(a)).[864] While the term "operational purposes" is not defined, a contextual analysis makes it plain that the term, as it is used in the Treaty, is Live Storage that, under Annexure D, has the purpose of meeting "fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant", i.e., corresponding to the definition of Pondage in Paragraph 2(c).

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[862] J. S. Gulliver and R. E. A. Arndt (*eds.*), *Hydropower Engineering Handbook* (McGraw Hill 1991), **Exhibit P-0477**, p. 1.10.
[863] VCLT, **PLA-0005**, Article 31(4). *See* **Chapter 8A.3(a)**.
[864] Water trapped as "Surcharge Storage" can also be used for this purpose – but as Paragraph 2(e) makes clear, this form of storage is "uncontrollable" and cannot be relied on.

11.22. It follows from this that a Plant cannot be designed to enable the storage of water, ostensibly as Pondage, but in fact for utilisation for purposes unrelated to operation of the HEP.

11.23. Equally, the definition of Pondage in Paragraph 2(c) makes it clear that Pondage is to be calculated on the basis of **daily and weekly use** only, and not for any longer period. Were this limitation not present, India could claim that Pondage was a form of **seasonal** storage—thereby allowing India to construct a storage work, rather than a new Run-of-River HEP under Part 3 of Annexure D.[865]

11.24. In addition to the definitions of Pondage, Dead Storage, Live Storage, Full Pondage Level and Operating Pool in Paragraph 2 of Annexure D, there are two further definitions in the Paragraph that are material to the approach to be adopted for the calculation of the maximum allowable Pondage in an Annexure D.3 HEP. These are the terms "Run-of-River Plant", defined in Paragraph 2(g), and "Firm Power", defined in Paragraph 2(i).

11.25. The "Run-of-River Plant" definition has already been addressed above.[866] The key element of the definition for present purposes is that it means a HEP "that develops power without Live Storage as an integral part of the plant, *except for Pondage* and Surcharge Storage" (emphasis added). As Surcharge Storage refers to "uncontrollable storage occupying space above the Full Pondage Level", an issue that is addressed in design terms in Paragraph 8(b) of Annexure D, it is **not** an issue that is directly engaged by the present dispute. The definition of Run-of-River Plant that is relevant for present purposes is that it is a HEP that develops power without Live Storage, except for Pondage. Given the limiting and constraining elements of the definition of Pondage in Paragraph 2(c), the Run-of-River Plant definition makes it clear that Indian Annexure D.3 HEPs cannot be designed, constructed and operated with storage other than for purposes of meeting "fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant".

11.26. Given its importance, and that it requires a series of computations, the definition of "Firm Power", in Paragraph 2(i), is addressed in some detail below. The essence of the definition of Firm Power, however, for present purposes, is that it provides a clear and certain

[865] Furthermore, for the specific purposes of the Treaty, even a storage work regulated under Annexure E could not be designed in this way, with Paragraph 21(a) of that Annexure limiting India's Pondage by adopting the Annexure D definition: "the maximum Pondage (as defined in Annexure D) shall not exceed the Pondage required for the firm power of the Plant, and the water-level in the reservoir corresponding to maximum Pondage shall not, on account of this Pondage, exceed the Full Reservoir Level at any time".
[866] *See* paragraph 9.8 above.

number, in megawatts ("**MW**"), that, for purposes of the Treaty, corresponds to a long-term minimum average flow of water (which the Parties typically measure in cubic metres per second ("**m^3/sec**")) on the particular river on which the HEP in question will operate. This is defined in Paragraph 2(i) of Annexure D as the "minimum mean discharge" ("**MMD**"), which is addressed in greater detail below. In other words, "Firm Power", for purposes of the Treaty, is the **deemed** electrical output of the Plant calculated by reference to the MMD of water in the river in question on the basis of the formula given in Paragraph 2(i).

11.27. As will be addressed more fully below, apart from its HEP-specific importance (i.e., that it is designed to come up with a Plant-specific rather than generic number), the definition of Firm Power is fundamental to the **methodology for calculating** the maximum allowable Pondage in that it ties the maximum allowable Pondage directly to the minimum average flow of water at the HEP site. In other words, Pondage is calculated on the basis of historical river flows at each particular site, and the power which can be generated at the lowest flow, and independent of the plant's (inevitably larger) installed power generating capacity—or any other feature that may be imposed by the designer.

11.28. Before turning to the calculation of the maximum allowable Pondage of an Annexure D.3 HEP, it is useful to illustrate the relevance and importance, but also the limitation, for purposes of this calculation, of the definition of Pondage under Paragraph 2(c) of Annexure D.

11.29. The water stored as Pondage is, in fact, a limited storage of the hydraulic energy of water, which can be released to generate power on an as-needed basis. Typically, water might be accumulated in the Pondage pool overnight, for release to satisfy peak power needs during the next day or the following evening. However, the definition of Pondage as, "Live Storage of only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant," tells us little, and certainly nothing directly, about (a) the size (the physical dimensions) of the permitted Storage, (b) the period during which the Storage would be intended to provide a supplementary power source, (c) the volumetric capacity of the Storage to hold water for subsequent use in the production of electrical power, and (d) the demand on the Plant arising from its connection to the electricity grid.

11.30. These gaps in the information arising from the definitions (but, as is addressed below, filled once Paragraph 8(c) is consulted) are all the more important in circumstances in which the refilling of the Storage is to be drawn from the normal river flow, but subject to an injunction that the volume of the water that flows into the operating pool in any given period must be the same as the volume of the water that flows out of the operating pool in the same period (an injunction that arises with respect to Annexure D.3 HEPs, which is addressed in the section immediately following).

11.31. This conveys the sense that, while the definition of Pondage is relevant and important, when it comes to calculating the maximum allowable Pondage to an Annexure D.3 HEP, it does not address the numerical elements of that calculation.

11B.2 The relevance, if at all, of Annexure D, Paragraph 15

11.32. Paragraph 15 prescribes tight **operational** limits on the manner in which the water stored as Pondage can be used. It provides:

> "Subject to the provisions of Paragraph 17, the works connected with a Plant shall be so operated that (a) the volume of water received in the river upstream of the Plant, during any period of seven consecutive days, shall be delivered into the river below the Plant during the same seven-day period, and (b) in any one period of 24 hours within that seven-day period, the volume delivered into the river below the Plant shall be not less than 30%, and not more than 130%, of the volume received in the river above the Plant during the same 24-hour period: Provided however that:
>
> (i) where a Plant is located at a site on the Chenab Main below Ramban, the volume of water received in the river upstream of the Plant in any one period of 24 hours shall be delivered into the river below the Plant within the same period of 24 hours;
>
> (ii) where a Plant is located at a site on the Chenab Main above Ramban, the volume of water delivered into the river below the Plant in any one period of 24 hours shall not be less than 50% and not more than 130%, of the volume received above the Plant during the same 24-hour period; and
>
> (iii) where a Plant is located on a Tributary of The Jhelum on which Pakistan has any Agricultural use or hydro-electric use, the water released below the Plant may be delivered, if necessary, into another Tributary but only to the extent that the then existing Agricultural Use or hydro-electric use by Pakistan on the former Tributary would not be adversely affected."

11.33. The purpose and effect of Paragraph 15 are to prescribe how the obligations by which India is bound pursuant to Article III of the Treaty, and the hydro-electric exception thereto, are to be operationalised. The *chapeau* of Paragraph 15, together with Paragraphs 15(i) and (ii), defines the limits of a HEP's daily operations (either in terms of a single day or seven-day periods) based on the location of the HEP in question on the Western Rivers—the Jhelum, the

Chenab above and below Ramban, and any other location on the Western Rivers or their Tributaries. Paragraph 15 thereby places **operational** restrictions on India to ensure a consistent flow of water is available to Pakistan on a daily and seven-day basis.

11.34. It is axiomatic that India is required to comply with the operational provisions of Paragraph 15 when filling and discharging an Annexure D.3 HEP's Operating Pool.

11.35. While it is evident that criteria and requirements related to the design and the operation of a Run-of-River HEP cannot ultimately be divorced from one another—in the sense that sound design must sensibly reflect the ability to satisfactorily operate the works in due course—it is significant that the Treaty expressly differentiates design (addressed in Paragraph 8) from operational requirements (in Paragraph 15). That this is not merely happenstance or an oversight in Annexure D is apparent from the parallel express differentiation of design and operational criteria in Paragraphs 1(11) and 1(12) of Annexure F of the Treaty, which address the putative competence of a Neutral Expert in respect of such matters in two separate provisions.

11.36. It follows from this that, while the calculation of the maximum allowable Pondage of an Annexure D.3 HEP for **design purposes** can and should properly have regard to the operating requirements that will apply to that HEP in due course, the calculation of the maximum allowable Pondage is self-standing and distinct from operational constraints. To put it another way, it is the mandatory Run-of-River HEP **design** criterion in Paragraph 8(c) relevant to Pondage that is controlling of the design, rather than the **operational** constraints in Paragraph 15. The latter will be appropriately used both for interpretative purposes (i.e., as an aid to interpretation and to ensure consistency of interpretation) and for purposes of testing the ultimate operational workability of the design in due course.[867]

11.37. The preceding analysis and conclusions are important as they shine a light on the divergent approaches adopted by Pakistan and India for purposes of calculating maximum allowable Pondage. Pakistan suggests that Paragraph 8(c) of Annexure D, read together with the relevant definitional provisions in Paragraph 2, determines maximum allowable Pondage, with Paragraph 15 thereafter constraining the operation of the works. In contrast, India contends that the Paragraph 15 criteria must be construed as an additional design criterion which, in effect, enlarges the maximum Pondage allowed to any Annexure D.3 HEP. In this

[867] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 409.

way, India's Pondage calculation is designed to **maximise** the size of its Annexure D.3 HEPs' Operating Pools—an outcome that is an anathema to its "let flow" and no storage obligations under Article III of the Treaty.

11C CALCULATING MAXIMUM ALLOWABLE PONDAGE

11.38. Paragraph 8(c) of Annexure D addresses the Pondage element of "the design of any new Run-of-River Plant", requiring that such design "shall confirm to the following":

> "The maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power."

11.39. Having regard to the preceding discussion, Paragraph 8(c) must be read in the light of the definition of Pondage in Paragraph 2(c), the definition of Firm Power in Paragraph 2(i), and the other definitions in Paragraph 2 that inform the limitations and constraints that apply to the concept of Pondage under Annexure D.

11.40. As part of its discussion of the context of the Treaty with respect to drawdown flushing, the *Kishenganga* Court made the following findings regarding the storage of water by India on the Western Rivers which are in turn relevant to Pondage:

> "The permissibility of depletion below Dead Storage Level is regulated explicitly by specific provisions in Annexure D (and, through incorporation by reference, Annexure E). These provisions are, however, to be interpreted within the context of the Treaty as a whole—in particular, against the background of permissible uses and the allocation of rights on the Western Rivers. […]
>
> *First, one of the primary objectives of the Treaty is to limit the storage of water by India on the Western Rivers (and, correspondingly, to prohibit entirely the storage of water by Pakistan on the upper reaches of the Eastern Rivers).* Annexure E to the Treaty strictly limits the volume of General Storage, Power Storage, and Flood Storage that India may develop on each of the Western Rivers. *For new Run-of-River Plants, Annexure D likewise restricts the permissible volume of pondage, and pegs this limit to power generation at the minimum mean discharge calculated at the site. These are not generous limits*—the volume of storage permitted to India on the Jhelum Main, for instance, is zero—and even the limited available record of the Treaty's negotiating history suggests that these amounts of storage were a key point of contention between the Parties. *The outcome was significant in that it achieved a careful balance between the Parties' respective negotiating positions, allowing India hydro-electric use of the waters of the Western Rivers while protecting Pakistan against the possibility of water storage on the upstream reaches of those Rivers having an unduly disruptive effect on the flow of water to Pakistan.*"[868]

[868] *Id.*, ¶¶ 503–504 (citations omitted, emphasis added).

11.41. Against this background, for purposes of calculating the maximum Pondage permitted in a HEP's Operating Pool, it is necessary to go through the step-by-step calculations required by the Treaty, namely:

(a) **First**, calculating the MMD for a given HEP site;

(b) **Second**, deriving Firm Power for the HEP in question based on the MMD calculation;

(c) **Third**, calculating the Pondage "required for" that Firm Power; and

(d) **Fourth**, following from these calculations, determining the size of the Annexure D.3 HEP's maximum allowable volumetric Pondage capacity.

11.42. Each of these steps is addressed in detail below. The key interpretative considerations informing the analysis are: (i) the centrality of Paragraph 8(c) and Paragraph 2(i) to the approach, (ii) the peripheral role of Paragraph 2(c) for purposes of the allowable Pondage calculation, and (iii) the tangential role of Paragraph 15 in the Pondage calculation.

11.43. The methodology for the calculation of maximum allowable Pondage takes as its starting point a number of core propositions drawn from the Treaty, namely:

(a) the methodology must be capable of coming up with a unique and fixed volume of maximum Pondage for each HEP, derived from the MMD at the site of the HEP in question;

(b) the methodology must be capable of generating a maximum Pondage figure using tools that would have been available at the time the Treaty was drafted, i.e., manual or graphical computation, with very limited use of calculators or more advanced forms of computation;

(c) the methodology should not require or warrant constant correction, or be rendered unfit for purpose by future developments;

(d) the result that the methodology produces should not be overly sensitive to input data such that data errors or discrepancies would significantly affect the outcome, opening the door to further disagreement;

(e) the methodology should be capable of resting on data expressly addressed in the Treaty and, in particular, it should not rely on information that India is not required to provide to Pakistan in the course of notifying Pakistan of a new Annexure D. 3 HEP; and

(f) the methodology should not be such that one Party would be capable of manipulating the result to suit its priorities, e.g., by making it dependent on mechanisms that a Party can influence unilaterally.

11C.1 Pakistan's approach to the calculation of maximum Pondage

11.44. Having regard to these propositions, to the close concordance of the approach set out below with the text of the Treaty, and to the internal coherence of the proposed approach, Pakistan submits that the following methodology correctly applies the terms of the Treaty with regard to the calculation of maximum Pondage.

(a) Step 1—Calculating the MMD for a given HEP

11.45. Paragraph 2(i) defines "Firm Power"—"hydro-electric power corresponding to the minimum mean discharge at the site of a plant"—and provides the formula for the calculation of the MMD as follows:

> "[…] the minimum mean discharge being calculated as follows:
>
> The average discharge for each 10-day period (1st to 10th, 11th to 20th and 21st to the end of the month) will be worked out for each year for which discharge data, whether observed or estimated, are proposed to be studied for purposes of design. The mean of the yearly values for each 10-day period will then be worked out. The lowest of the mean values thus obtained will be taken as the minimum mean discharge. The studies will be based on data for as long a period as available but may be limited to the latest 5 years in the case of Small Plants (as defined in Paragraph 18) and to the latest 25 years in the case of other Plants (as defined in Paragraph 8)."

11.46. On the basis of this formula, the MMD for a given river, and at a given HEP site, is derived from flow data that India is required to provide under Paragraph 9 of Annexure D and Paragraph 2(b) of Appendix II of Annexure D.[869] This is typically provided as a series of flow values in m^3/sec. The flow data provided is used for computations in accordance with the

[869] Requiring that India provide "[o]bserved or estimated daily river discharge data on which the design is based (observed data will be given for as long a period as available; estimated date will be given for as long a period as possible; in both cases data may be limited to the latest 25 years)".

formula given in Paragraph 2(i) of Annexure D to produce the MMD, expressed in terms of flow in m^3/sec. This calculation is uncontroversial between Pakistan and India.

11.47. An illustrative calculation is given in the table at **Appendix E.1** of the present Memorial. This is a real-world example derived from a proposed Indian HEP at Kiru on the Chenab—upstream from the RHEP, and just before the Chenab Main merges with its Singad and Bela tributaries.[870] As that table shows, on the basis that India provides 25 years of observed or estimated flow data for the site of the HEP, the Parties will divide each of the 25 years into 36 periods of 10 days and determine the average flow of the river for each 10-day period. The average of each of the periods over the 25 years will then be determined, resulting in 36 average flow rates: the 25-year average of the 10-day averages. The lowest of those values will then be selected as the MMD. It reflects the average m3/sec of flow in the river during one of the 10-day spans in the middle of the dry season, when flows are the lowest.

11.48. For the Kiru HEP, this produces an MMD of **65.3 m3/sec**—corresponding to the second 10-day period in February.

11.49. It is important to note that MMD is calculated on the basis of the minimum **average** (or "mean") flow of a given river over many years. It does not correspond to the lowest flow rate in the river during any specific year. It follows that the flow of the river will on some occasions fall **below** the MMD. The use of MMD for purposes of calculating Firm Power, and ultimately Pondage, is therefore not calibrated by reference to the lowest flow rate of the river, but rather to the minimum **mean** discharge calculated for as long a period as observed and estimated flow data are available (but not less than the latest 25 years). The purpose behind the MMD formula is therefore both to iron out aberrations in flow—daily, weekly, seasonal and annual—and to establish a formula for calculating an unambiguous flow rate based on the hydrologic conditions at each particular site on each river, and which is not predicated on either aberrations or a rare worst-case scenario.

[870] Pakistan gave careful thought to what illustrative example might usefully be provided to the Court. Although Pakistan has the relevant data for the Kishenganga and Ratle HEPs, having regard to the terms of PO6, it concluded that it should not use this data as this may cause the Court to go beyond the scope of the present phase of its proceedings and would also cut across the task that Pakistan has agreed should be left, for the time being, to the Neutral Expert for determination in the parallel proceedings. Against this background, the purpose of using the Kiru HEP data is to provide the Court with Indian-sourced data in respect of a planned HEP on a Western River with a view to giving a practical example of how the MMD calculation works.

(b) Step 2—Deriving Firm Power from the MMD

11.50. Firm Power is the power that a HEP can produce when the river on which it is located is discharging water through the turbines of the HEP at the MMD flow rate. MMD, as noted, is measured in m^3/sec. Firm Power is therefore the instantaneous power, in MW, that the HEP can generate while discharging the MMD through the turbines. Firm Power is different from Firm Energy, which is the sum of the power which the HEP will generate over any particular period of time, usually measured in Megawatt Hours (MWh). Firm Power thus refers to the **instantaneous rate** of energy production, while Firm Energy refers to the **cumulative amount**[871] of such energy produced over a specified period of time.

11.51. The formula for determining how much power a particular HEP can produce at a particular discharge rate is well known to engineers and involves a straightforward calculation.872 Power calculations require knowing the HEP's net generating head (i.e., the elevation difference, in meters, between the intake and the turbine, less turbulent losses during conveyance)873, which is multiplied by the discharge rate (here, the MMD), the plant's efficiency,[874] the force of gravity,[875] and the density of water.[876] The figure thus obtained in Watts (W), is divided by one million to calculate Megawatts (MW),[877] which is the Firm Power for the purposes of Paragraph 2(i).

11.52. An illustrative example showing the calculation of Firm Power is given in the figure below, using once again the data that India has provided for the Kiru HEP—save for the net generating head and the HEP's efficiency, which are assumed to be 100 m and 90% respectively to illustrate the calculation.[878] It is important to note that, so far as Pondage is

[871] W. P. Creager and J. P. Justin (*eds*.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309**, pp. 153–154.
[872] J. S. Gulliver and R. E. A. Arndt (*eds*.), *Hydropower Engineering Handbook* (McGraw Hill 1991), **Exhibit P-0477**, p. 4.7.
[873] *See* paragraphs 4.12-4.13 above.
[874] A HEP will never be able to capture all the potential energy contained in the water moving through its turbines. It is inevitable that some energy will be consumed by friction and other losses. Efficiency, therefore, refers to the ability of the equipment in a HEP to convert the potential energy (head) contained in the water into electricity. Hydropower is among the most efficient technologies for producing electrical energy, with a typical "water-to-wire" efficiency of 90%. *See Hydroelectric Power*, July 2005 (U.S. Bureau of Reclamation: Denver, Colorado), **Exhibit P-0531**, p. 2.
[875] Always approximately 1,000 kg/m^3.
[876] Always approximately 9.81 m/sec^2.
[877] 1,000,000 W = 1 MW.
[878] Pakistan has inserted these figures as being illustrative of the typical generating head and efficiency of a plant like the Kiru HEP, but they have no impact on the overall outcome, as Pondage only exists to supplement flow rate, and does not interact with other elements of the usual Firm Power calculation.

concerned, these assumptions concerning head and efficiency are irrelevant, since power computations can be made only after the MMD has been calculated, and it is the MMD, and not power, that is used to compute Pondage.

Basic calculation
P_F = Firm Power (W)
Q_{MMD} = Flow Rate (m³/sec)
H_n = Generating head (m)
ε = Efficiency (% of power retained)
ρ = Water density (1000 kg/m²)
g = Gravity (9.81m/sec²)
Assume Kiru HEP has an H_n of 100 and an ε of 90% (0.9)

$$P_F = Q_{MMD} H_n \varepsilon \rho g$$

$$P_F = 65.3 \text{ x } 100 \text{ x } 0.9 \text{ x } 1000 \text{ x } 9.81$$

$$P_F = 57{,}653{,}370\text{W}$$

$$P_F = 57.65\text{MW}$$

Figure 11.2 - Illustrative calculation of Firm Power for the Kiru HEP

11.53. From this, we can see that the Kiru HEP (incorporating the assumptions regarding generating head and efficiency) has a Firm Power of **57.65 MW**, which is the power the HEP can produce when the relevant stretch of the Chenab Main flows at the MMD of 65.3m³/sec. That is, using the language of the Paragraph 2(i) of Annexure D, for the Kiru HEP, its "hydro-electric power" (i.e., its Firm Power) of 57.65MW "correspond[s] to the minimum mean discharge at the site of [the] [P]lant" of 65.3 m³/sec.[879] As will be addressed in the following sections, for the purposes of calculating Pondage, the essential component is the MMD. This said, as Paragraph 8(c) of Annexure D addresses the calculation of maximum Pondage by reference to Firm Power, both the figures of MMD and Firm Power will be relevant to the calculation of the maximum allowable Pondage.

(c) Step 3—Calculating the Pondage required for Firm Power

11.54. The calculation of Pondage, for purposes of Paragraph 8(c) of Annexure D, ties Pondage to what is "required for Firm Power".

11.55. As noted, the concept of Firm Power in Paragraph 2(i) is derived from the MMD at the site of the HEP. The concept of Firm Power in the Treaty does not proceed on the basis of the HEP in question achieving Firm Power for any defined period of time, such as a minute, an hour, or a number of hours in a day, etc. Put another way, India is not entitled to a defined

[879] If the head were 50 m instead of 100 m, the Firm Power would be half the above, but the MMD value would remain unchanged.

quantum of Firm Energy, that is, it does not establish the duration over which India is entitled to produce Firm Power.

11.56. Given the Treaty's silence on this issue of duration, and the critical importance of determining the period over which a HEP may be permitted—subject to an available flow of water—to operate at Firm Power, it is necessary to derive the period relevant to the calculation of Pondage required for Firm Power from the terms of the Treaty as a whole. This includes the core and controlling concepts and principles in Article III of the Treaty, namely, "let flow", non-interference, unrestricted use, and limitations on storage.

11.57. Relevant to this exercise of Treaty interpretation of the method to calculate Pondage are also the following straightforward propositions:

(a) When the available flow of the river at the HEP, measured in m^3/sec, is **equal to or above the MMD**, the relevant calculations will inform there is no need for Pondage, as the HEP will be able to generate Firm Power without the need for any releases from storage.

(b) When the available flow of the river at the HEP site is **less than the MMD**, the HEP will not be able to generate Firm Power for any duration whatsoever without augmenting river flow by releasing a supplementary volume of water from storage.

(c) Thus, for the purpose of calculation, Pondage is only required for Firm Power on the relatively rare occasions during the year **when the flow of water from the river is less than the MMD**. At all other times the flow of water from the river will be sufficient to generate Firm Power without releases from storage.

(d) The amount of Pondage required to produce Firm Power will depend on **the difference between the available flow rate and the MMD**.

11.58. By this token, Paragraph 8(c) cannot be interpreted to mean that India is entitled to whatever Pondage may be necessary to enable it to generate Firm Power **constantly** throughout the dry season, irrespective of the flow of the water by reference to the MMD at any given point in time. Pondage is not permitted simply because there is a drop in the flow of the river—only when and for so long as that drop in flow falls below the MMD.

11.59. As noted above, the one point on which the Treaty is silent, at least in terms of its express articulation of the approach that is required for purposes of the calculation of allowable Pondage, is the period for which an Annexure D.3 HEP must be capable of operating at Firm Power. This is a matter that must therefore be derived or deduced from an objective construction of the Treaty as a whole.

11.60. There are two candidate periods in the Treaty for this calculation that require consideration: **first**, a period of 24 hours (or daily); **second**, a period of a week (or weekly). There are references to both periods in the Treaty. The question is which of these time periods is preferred.

11.61. Before turning to these issues, it should be noted as an aside that Pakistan has dismissed recourse to other time periods that are found in the Treaty, such as the reference to 10-day periods or annual periods (found, for example, in the definition of MMD in Paragraph 2(i) of Annexure D) as these and other periods bear no relation to either the "let flow" obligation in respect of the Western Rivers or the provisions addressing the operation of HEPs.

11.62. There are important references throughout the Treaty to daily (or 24-hour) periods, notably, for example, in:

(a) Articles I(15) and VI(1) of the Treaty,

(b) Paragraphs 2(c), 15 and 16 of Annexure D, and

(c) Paragraphs 2(b) and 4(h) of Appendix II of Annexure D.

11.63. There are similarly important references in the Treaty to weekly periods, including, Paragraph 2(c) of Annexure D and Paragraph 4(h) of Appendix II of Annexure D. This said, it is notable that the language in Paragraph 15 of Annexure D is cast in terms of "any period of seven consecutive days", rather than in terms of a "week".[880] This is a point to which Pakistan attaches some importance.

11.64. Of these two candidate periods, for purposes of deriving the period with regard to which a HEP must be capable of operating at Firm Power, Pakistan considers that a 24-hour (or daily) operating period is the only period that can reasonably and sensibly be deduced from an

[880] The same "seven consecutive days" formulation is used in Paragraph 21(b) of Annexure E.

objective construction of the Treaty for purposes of calculating maximum allowable Pondage. The reasons for this are as follows:

(a) Article I(15) of the Treaty, defining the term "interference with the waters", a term that is fundamental to the operation of the "let flow" obligation, addresses man-made obstructions to the "daily flow of the waters". This is then read into Article III(2) of the Treaty, which reaffirms the "let flow" obligation in Article III(1), subject to exceptions to the non-interference principle in the case (*inter alia*) of Run-of-River HEPs. This too demonstrates that just as the non-interference principle is focused on the operationalisation of the "let flow" obligation in terms of the "daily" flow of the waters, so too must the HEP exception to the let flow be operationalised by reference to "daily" (or 24-hour) periods.

(b) Paragraph 15 of Annexure D, which addresses the operation of Annexure D.3 HEPs, is formulated in terms of "any period of seven consecutive days"—in addition to daily constraints. This formulation, significantly, is not cast in terms of "any period of a week", or some similar weekly reference that might have been used. This too is an indication that the drafters of the Treaty had in contemplation that the operation of Annexure D.3 HEPs was to be approached on the basis of 24-hour operating cycles—either as an individual 24-hour period, or a stretch of seven such periods.

(c) This appreciation of 24-hour operating cycles for HEPs reflects the reality of such operations, in which HEPs used for power peaking operate on the basis of 24-hour load cycles, typically morning and evening peaks. These operating cycles, often calculated to run from one morning peaking-point to the next morning peaking-point—as is illustrated by the seven-consecutive day cycle indicated in Paragraph 16 of Annexure D (starting from 8.00 am on Saturday morning)—are calculated to allow the replenishment of Pondage during hours of relatively low demand, enabling the HEP to be operationally ready in time for peak demand of the next 24-hour cycle the following day.[881]

[881] W. P. Creager and J. D. Justin (*eds*.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309**, pp. 162–166.

(d) Paragraph 2(c) of Annexure D also makes it clear that the Treaty is predicated on variations in the daily (as well as the weekly) loads of a HEP. While Paragraph 2(c) does not accord priority to one time period over another, it is a good indicator that other potential candidate time periods are not relevant. Taken together with the other reasons to prefer a daily over a weekly time period, Paragraph 2(c) provides further underpinning of the relevance of a 24-hour calculating cycle.

(e) A 24-hour operating cycle would also facilitate the relative ease of calculation of the Pondage required of the HEP, which could be undertaken without the need for complex computer programming. In contrast, a weekly operating cycle would require a significantly more complex calculation, taking account of the daily and seven-day operational requirements of Paragraph 15. While this can be readily done on a desktop computer, such technology would not have been available in the 1950s, at the point at which the Treaty was being negotiated.

11.65. In contrast to the preceding, which persuasively support the adoption of a 24-hour period as the period which is appropriate for the computation of Pondage, the references in the Treaty to "weekly" periods are fewer in number, do not transpose readily in a maximum allowable Pondage calculation.

11.66. Leaving the Paragraph 2(c) reference to "weekly" aside—addressed above—the other potentially relevant reference to weekly periods in the Treaty is in Paragraph 4(h) of Appendix II of Annexure D, viz, "… expected variations in the discharge on account of the daily and weekly load fluctuations."882 While this reference is clear enough, it provides little useful indication that the drafters of the Treaty had in mind that the relevant period for calculation of Pondage in an Annexure D.3 HEP should be weekly. Furthermore, if a weekly time period were used, and then doubled as provided for in Paragraph 8(c), this would provide storage capacity for two weeks, which goes well beyond the maximum time period contemplated for Pondage operation at any point within the Treaty.

11.67. Further, in contrast to the reasons given above for preferring a daily period for such purposes, there is no reference to weekly periods in the definition of the term "interference

[882] Emphasis added.

with the waters" in Article I(15), a term that forms as essential part of the general obligations upon India in Article III of the Treaty, to which Annexure D.3 HEPs are an exception.

11.68. Finally, to the extent that any doubt remains as to whether daily or weekly periods is to be preferred, the well-known rule of effectiveness in treaty interpretation—whereby in circumstances where two readings of the treaty are fairly open—the interpreter may prefer the one that best coheres with the treaty's object and purpose.[883] In the present case, Article III of the Treaty—and the "let flow", non-interference and no storage requirements imposed on India therein—compel the selection of the daily over the weekly period.

11.69. For all these reasons, Pakistan considers that the relevant period within which the maximum Pondage calculation for which an Annexure D.3 HEP must be assessed is a period of 24 hours.

11.70. For the next part of the discussion, it is important to recall the equivalence between Firm Power and the MMD. Since, per Paragraph 2(i) of Annexure D, "'Firm Power' means the hydro-electric power corresponding to the minimum mean discharge at the site of a plant", when viewed in terms of the flow rate of water, Firm Power and MMD are one and the same. Thus, the term "Pondage required for Firm Power" is equivalent to saying "Pondage required for MMD". Pursuant to the Treaty, the Pondage volume is calculated directly from the MMD flow rate.

11.71. The Treaty states that the purpose of Pondage is to meet fluctuations in the load of the Plant, meaning that the Pondage will be used to allow the Plant to operate at different power or flow ratings throughout the day in response to changes in the load. This Treaty definition is consistent with both the intended purpose and the actual utilization of Pondage within the hydropower industry during the 1950s when the Treaty was drafted, and it continues to be the case today. Thus, when there is insufficient flow available for the plant to operate continuously at Firm Power, during some hours of the day, the Plant can store water in the Pondage pool by not releasing flow through the turbines. The Plant can subsequently release this stored water through the turbines to produce power during the remaining hours of the day (thereby supplementing the continuing river inflow), to deliver Firm Power by operating the turbines at the MMD flow rate. The "Pondage required for Firm Power" is thus the amount of Pondage

[883] Gardiner, 2015, **PLA-0017**, pp. 179–181.

required that will allow the plant to pass the entire daily inflow volume through the turbines at the Firm Power rate (i.e., at the MMD flow rate).

11.72. The calculation thus becomes one of establishing the volume of Pondage that is needed to allow all of the daily inflow to be passed through the turbines at the MMD flow rate, thereby allowing all the inflow to be used to produce Firm Power. To address this, Paragraph 8(c) requires a simple "water balance" exercise that would have been well-understood by the dam engineers engaged in the Treaty-drafting process. This exercise—the equations for which are set out in **Appendix E.2** to this Memorial—can be applied as a standard formula for any HEP. It essentially involves the balancing of water flowing into a HEP's reservoir in any 24-hour period, against passing this entire inflow through the HEP's turbines at Firm Power. Thus, the amount of Pondage required for any given inflow flow rate will be that which maximises the number of hours that the plant can operate at Firm Power.

11.73. Knowing the MMD for a particular site, this calculation results in a single unique Pondage capacity which can be expressed in Mm^3.

11.74. To help explain this concept (and also the calculations presented in more detail in **Appendix E.2**), it is useful to consider, for example, the case of a river inflow rate of MMD and the Plant operating at Firm Power (turbine discharge equal to MMD). In this case, the requirement for Pondage will be zero because the Plant can operate at Firm Power for the full 24 hours relying solely on the river inflow rate which equals MMD. In terms of the "water balance", the inflow to Pondage and outflow from Pondage will be the same for every hour of the day. Thus, Pondage will come into play only when river inflow is less than the MMD flow rate.

11.75. Consider now a second case in which the river inflow equals only 75% of MMD. In this case, if a water balance is constructed, there is only sufficient water inflow volume for the Plant to make releases at Firm Power over 75% of the day, that is, for 18 of the 24 hours. Under this scenario, if there is only sufficient inflow volume for the Plant to operate at MMD for 18 hours, then there will be 6 hours during which the turbines will be shut off and water will be accumulating in Pondage. Following the 6 hours of accumulation, the Plant can operate at Firm Power for 18 hours, being supplied with water from both river inflow together with the gradual release of the water that has accumulated as Pondage. At the end of this cycle, 6 hours of filling Pondage, followed by 18 hours of emptying Pondage, the Pondage pool will again be empty and ready to begin the next 24-hour cycle.

11.76. This calculation can be repeated for different flow rates, thereby resulting in the water balance table, reproduced below, with the meaning of each lettered column explained as follows:

(a)	(b)	(c)	(d)	(e)
Inflow Rate	Duration of Firm Power	Duration of Pondage Filling	Volume Stored in Pondage	Pondage Volume, Kiru Example
(% of MMD)	(hours)	(hours)	(hours of MMD inflow)	(Mm^3)
100.0%	24	0	0.00	0.00
75.0%	18	6	4.50	1.06
66.7%	16	8	5.33	1.25
58.3%	14	10	5.83	1.37
50.0%	12	12	6.00	1.41
41.7%	10	14	5.83	1.37
33.3%	8	16	5.33	1.25

Figure 11.3 – Water balance for Pondage at Kiru HEP

(a) The first column gives the daily river inflow to the plant, expressed as a percentage of the MMD flow rate.

(b) The second column indicates the number of hours that the plant can operate at Firm Power, given the total volume of water delivered to the plant for the full 24 hours at the flow rate previously shown in column (a).

(c) The third column computes the number of hours that flow to the turbines will be shut off, which is the time during which the pondage will be filling. Because the turbines will be either ON or OFF, the sum of the hours operating at Firm Power given in column (b) plus the hours the turbines are not operating in column (c), must equal 24 hours.

(d) The fourth column expresses the volume of water that can be stored in the Pondage pool during the time that flow to the turbines is shut off. It is calculated by multiplying the river inflow rate in column (a) by the number of hours that river inflow will be accumulating in the Pondage pool, which was previously calculated in column (c).

(e) The fifth column returns to the example of India's Kiru HEP, introduced previously, and determines the Pondage volume at that site corresponding to each inflow rate. This calculation converts the hours of inflow previously calculated in column (d) into an inflow volume that needs to be stored in the Pondage pool. This calculation is performed by multiplying the hours of MMD inflow in column (d) by the hourly volume corresponding to the MMD flow rate. At Kira the MMD flow rate is 65.3 m^3/s, which is equivalent to an hourly MMD inflow volume of 235,080 m^3/hour.

11.77. It will be seen from the table that the maximum amount of Pondage that is needed occurs when Pondage is being filled for 12 hours, and Firm Power is produced for the remaining 12 hours.

11.78. When this water balance exercise is performed considering many different inflow rates, what emerges for each HEP is a parabolic curve whereby the storage required to produce Firm Power increases as the flow rate drops below the MMD level. The curve then flattens as the inflection point is approached, before reversing and decreasing, falling away entirely as the flow rate reaches zero. This inflection point will be same for every HEP. It will occur where the river flows at 50% of the MMD, and will be equivalent to 12 hours of storage at 50% of the MMD and 12 hours of Firm Power production. This inflection point coincides with the maximum usable Pondage for daily regulation.

11.79. Taking again the Kiru HEP as an example, with its MMD of 65.3 m^3/sec, the parabolic curve is as seen below in **Figure 11.4**:

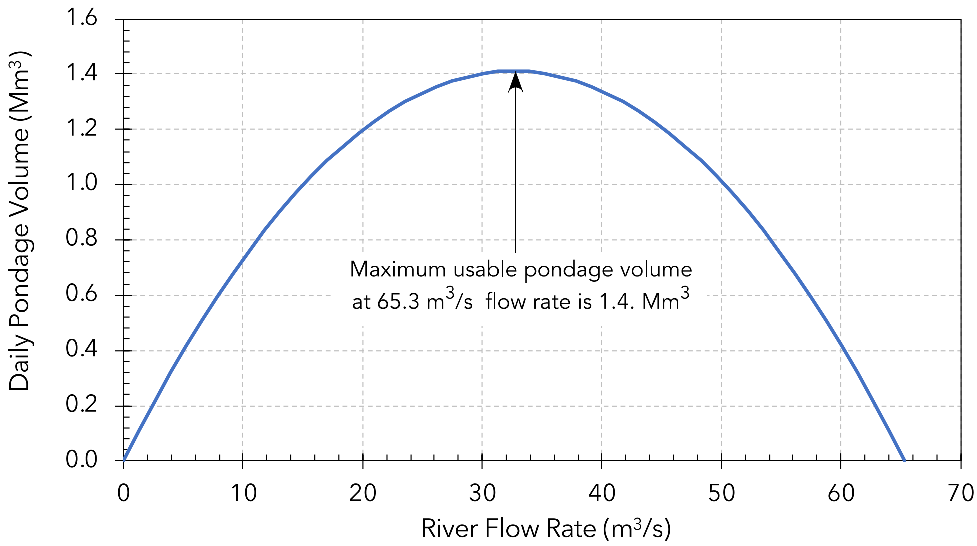

Figure 11.4 - Curve demonstrating maximum usable Pondage for Kiru HEP

11.80. It is essential to note here that any Pondage above and beyond the volume corresponding to 12 hours of inflow at 50% of MMD (which is the same as 6 hours of inflow at 100% of MMD), is superfluous. It cannot be used in a daily operating cycle. The reason for this is straightforward and derives from the fact that the HEP must balance time spent storing water to fill Pondage against time spent releasing water from storage to produce Firm Power, over the given 24-hour period. If water is being released to deliver Firm Power over the 24-hour period, the Plant cannot be simultaneously storing water—water cannot be stored, so that the volume of water in Pondage is increasing, at the same time as it is being released to decrease the volume of water in Pondage. While Pondage volume can alternate between increasing and decreasing, this cannot occur simultaneously. Accordingly:

(a) If the daily flow is higher than 50% MMD, then the HEP can store water for less than 12 hours (producing Firm Power for the balance) and will result in less storage overall due to the limited time available for accumulating water in storage.

(b) If the daily flow is lower than 50% MMD, then the HEP will have to store water for more than 12 hours (producing Firm Power for the balance), but at a very low inflow rate, and resulting in less storage overall due to the limited flow available for accumulating water in storage.

11.81. Put another way, irrespective of the hydrological conditions, the HEP will not, over the course of a day, be able to exceed the volume of water that would have been stored at 50% of the MMD level for 12 hours, without reducing the time it can spend generating Firm Power in any 24-hour period.

11.82. For the Kiru HEP, therefore, the Pondage "required for Firm Power" within the meaning of Paragraph 8(c) of Annexure D is **1.41 Mm^3**, as seen in **Figure 11.4** above. Furthermore, India may utilise this Pondage to produce power at any rate up to limit imposed by the installed capacity of the plant, and is not limited to using Pondage to produce power at the Firm Power rate, as long as such power production falls within the constraints given in Paragraph 15.

11.83. The Pondage that Paragraph 8(c), properly applied, would allow, is therefore both reasonable and meaningful within the scheme of the Treaty. The purpose of Pondage is to assist a HEP to meet intermediate and peaking loads on a daily and weekly basis.[884]

(a) According to the U.S. Army Corps of Engineers, the intermediate loading assumes the HEP is producing power for between 8–14 hours per day, and the peak loading assumes the HEP is producing power for 8 hours per day or less.[885]

(b) Paragraph 8(c) gives India greater than intermediate Firm Power (i.e., baseload power) in circumstances in which the available flow rate drops to 60% of the MMD and allows for intermediate loading until the available flow rate drops below 40% of MMD.

(c) Even below that threshold, the Pondage allocated allows India to use Firm Power to carry out a meaningful peaking plan until the available flow drops below 10% of MMD—a highly unlikely occurrence, even in an historically dry year.[886]

[884] United States Army Corps of Engineers, Engineer Manual 1110-2-1701, *Hydropower*, 31 December 1985, **Exhibit P-0302**, pp. 2–21.
[885] *Id.*, pp. 2–4.
[886] For example, applying the 25 years of actual and estimated data for the site of the RHEP, the lowest recorded available flow rate for any 24-hour period was 24.72 m^3/sec. This figure is itself an outlier that could easily have been the result of a data error. But assuming it is accurate, it reflects a flow rate of 23% of the RHEP site's MMD of 106.51 m^3/sec. In such circumstances, the Pondage that Paragraph 8(c) of Annexure D allocates to the RHEP as required for Firm Power will allow for the production of approximately five hours of Firm Power per 24-hour period. Furthermore, this does not take into account the doubling function of Paragraph 8(c), addressed further below.

(d) Step 4—Calculating the maximum allowable Pondage

11.84. The final step in the calculation of maximum allowable Pondage goes back to the language of Paragraph 8(c), which provides that maximum Pondage permitted "shall not exceed twice the Pondage required for Firm Power." On this basis, for purposes of calculating the maximum allowable Pondage for an Annexure D.3 HEP, the Pondage calculated on the basis set out in the preceding sections is simply doubled.

11.85. For the Kiru HEP, therefore, by this doubling the capacity of the previously computed Pondage for daily operation, the capacity of maximum Pondage (the Operating Pool), will be **2.82 Mm^3**.

11.86. The terms of Paragraph 8(c) are self-evidently intended to impose limitations on the permissible volume of Pondage, an outcome that is (unsurprisingly) fully consistent with the definitional limitations on Pondage in Paragraph 2, addressed above. It is cast in terms of a "maximum" Pondage that "shall not exceed" twice the Pondage required for Firm Power. The "twice the Pondage required" formula itself imposes significant limitation—it might easily have permitted four times or six times, or some other multiple, required for Firm Power.

11.87. Despite this limitation, the effect of this doubling is that it provides Indian Annexure D.3 HEPs with significant flexibility and operating headroom, allowing for regulation during the week. The maximum Pondage available to the HEP under the Treaty will be **twice** that required for Firm Power, not simply that which is required for Firm Power.

11.88. Significantly, this doubling of Pondage also gives a HEP the operational flexibility within the limits permitted by Paragraph 15 of Annexure D. Significantly, once the capacity of the Operating Pool has been established, India is then entitled to use this capacity to pass flow through the turbines at any desired rate, including at full installed power, which will typically be several times larger than Firm Power. Subject to Paragraph 15, a HEP can use its Pondage to generate power at a rate higher than Firm Power level for a shorter period of time to meet peak demand. Or it could generate power at a rate lower than Firm Power level as base power. Or it could store water for more than one day in the anticipation that it will be required on a subsequent date. How India produces power using its allowable Pondage is no business of Pakistan's—provided that India complies with Paragraph 15.

11C.2 Why Pakistan's approach to the calculation of maximum Pondage is correct

11.89. Pakistan submits that the approach set out above is the correct application of Paragraph 8(c) of Annexure D, as it complies with each of the cardinal principles for the calculation of maximum Pondage identified above.[887]

(a) **First** and foremost, Pakistan's approach is fully compliant with the scheme, the letter and the spirit of the Treaty, relying on (i) the ordinary daily cycle by which most HEPs are operated, and (ii) the twin concepts of Firm Power and MMD on which Paragraph 8(c) is based. It is further compliant with the "let flow", non-interference, unrestricted use, and limitations on storage principles set out in Article III.

(b) **Second**, it provides India with a meaningful amount of Firm Power for each 24-hour period irrespective of the available flow, which amount is then doubled to allow India to address unforeseen issues and give it weekly operational flexibility through use of Paragraph 15.

(c) **Third**, it results in a clear and certain volume of maximum Pondage for each HEP, derived from the MMD at the site of the HEP in question. It does not leave any ambiguity or uncertainty over which the Parties may subsequently be in dispute.

(d) **Fourth**, it is capable of generating a maximum Pondage figure using tools that would have been available at the time the Treaty was drafted. It can be deployed solely through manual or graphical computation with very limited use of calculators or more advanced forms of computation.

(e) **Fifth**, the clear and certain volume of Pondage derived for a given HEP will not require constant correction and cannot be rendered unfit for purpose by future developments.

[887] *See* paragraph 11.37 above.

(f) **Sixth**, the result that it generates is not overly sensitive to input data, such that data errors or discrepancies in any one year cannot affect the result significantly, giving rise to further disagreement.

(g) **Seventh**, it does not require assumptions concerning data not expressly required by the Treaty. It is based entirely on the concept of the MMD which is derived from information that India must provide to Pakistan upon notification of a new HEP under Appendix II to Annexure D.

(h) **Eighth** and finally, it does not allow either Party to manipulate the result to suit its priorities by making the calculation dependent on mechanisms that one Party can influence unilaterally. It is reliant solely upon the historical data that is used to generate the MMD.

11D The shortcomings of India's approach to the calculation of maximum Pondage

11.90. India has claimed that the correct approach to Pondage under the Treaty is not the reading of the provisions set out above, but the approach taken by the Neutral Expert in *Baglihar*. Indeed, in correspondence with the PCIW, the Indian Commissioner has made clear that India considers the Neutral Expert's approach to Pondage in that case to have approached the status of *stare decisis*.[888] This is incorrect.

11D.1 The Neutral Expert's approach to Pondage in *Baglihar*

11.91. In his determination, the Neutral Expert in *Baglihar* mistakenly read the definition of Pondage in Paragraph 2(c) and the mechanism for its calculation in Paragraph 8(c) together. In doing so, he appears (wrongly) to have given priority to the former and to have effectively disregarded the latter, viz:

> "With these two provisions, the Treaty specifies that the pondage volume should be calculated to satisfy daily or weekly load variations of the plant and consequently the variations in the turbine discharge necessary to produce this variable demand of power.

[888] *See* e.g., Letter No. Y-11017/2/2015-IT/2155 from ICIW to PCIW dated 21 August 2015, **Exhibit P-0016**, ¶ 9.

> An important matter to be stressed is that the Treaty does not say that 'Pondage' means live storage of only sufficient magnitude to meet the fluctuations in the daily and weekly inflow of the Chenab River."[889]

11.92. In calculating Firm Power, the Neutral Expert started his analysis by referring **not** to the definition of Firm Power in Paragraph 2(i), but to the definition given by the ASCE, *viz.*: "[p]ower intended to have assured availability to the customer to meet all or any agreed upon portion of his load requirements".[890] On this unexplained and unusual basis, effectively re-writing the Treaty, the Neutral Expert held that, according to the requirements of consumers, Firm Power could be peak or base load power.[891] Only at that point did he turn to the Treaty definition in Paragraph 2(i), fixing the MMD at that point on the Chenab at 125.68 m^3/sec, and using a flow duration curve to note that MMD would be exceeded for 93% of the year.[892]

11.93. The Neutral Expert then used the same process with respect to the HEP's design discharge of 430 m^3/sec, to determine this would be exceeded 47% of the time.[893] He then noted that, in his view, that "the firm power is the rating at which the plant should operate with certainty throughout the year, in fact, 95% of the time", such that the "firm power is the result of the discharge reached or exceeded 95% of the time".[894]

11.94. When it came to calculating Pondage, the Neutral Expert adopted the following methodology. He first reiterated the MMD and then calculated the total weekly inflow resulting therefrom (76.01 Mm^3).[895] He then purported to define the hours of operation of the HEP and the power it produced during those hours, during the week, by reference to the Paragraph 15 operating constraints. He then introduced the further assumption that Pondage would be stored during the weekend and used during the week in accordance with a series of mass curves to come up with a total Pondage of 14.3 Mm^3—which he then doubled to reach a final volume of 28.6 Mm^3.[896]

11.95. The Neutral Expert then noted:

> "But the objective of the pondage is to enable operation during peak load hours.

[889] *Baglihar* Determination, **PLA-0002**, § 5.9.2.
[890] *Id.*, § 5.9.3.
[891] *Id.*.
[892] *Id.*.
[893] *Id.*.
[894] *Id.*.
[895] *Id.* § 6.5 (¶ 1).
[896] *Id.*, § 6.5 (¶ 2).

> Moreover, the NE cannot ignore the fact that one of the object(s) and purposes(s) of the Preamble is for the two parties to attain "(…) the most complete and satisfactory utilisation of the waters of the Indus system of rivers (…)". In this context, the pondage should be as large as possible, with the condition, naturally, that the provisions of the Treaty are respected. In particular, [Paragraph 15] is fundamental.
>
> If we introduce peak load hours in the mode of operation described in [Paragraph 15], […] the volume of the water delivered into the river below the Plant during a 24 hour day (no less than 50%, no more than 130%) determines exactly the number of peak load hours during the week and the distribution each day."[897]

11.96. He then held:

> "The determination of the time of the peak load during each day should be based on a forecast of the power demand over 15 or 20 years in the Northern Region [of India]. We have made this only on the basis of the graph of power demand in December 2004 […]. We are aware of all the uncertainties of this approach, but it is the best available to us at this time. The 49.1 hours of peak load are produced when the total demand in the region reaches approximately 22,500 MW."[898]

11.97. The end result of this is that the Neutral Expert further increased the amount of Pondage available to India to enable it to meet the relevant load curve and still satisfy the requirements of Paragraph 15. This produced a Pondage of 16.28 Mm^3, which when doubled per Paragraph 8(c) resulted in an Operating Pool with a volume of **32.56 Mm^3**.[899] This was only slightly less than India's requested Pondage of 37.5 Mm^3 and bore no relation at all to Pakistan's requested Pondage of 6.22 Mm^3.

11D.2 Assessment of the India/*Baglihar* approach in light of the proper interpretation of Paragraph 8(c)

11.98. The Neutral Expert's approach in *Baglihar*—subsequently embraced by India—is wholly inconsistent with the terms of the Treaty, and by the Neutral Expert's own admission, seeks to maximise the Pondage available to India.[900] Four core errors may be identified:

(a) The Neutral Expert's prioritisation of load planning (which he derived from the definition of Pondage in Paragraph 2(c) of Annexure D)—as opposed to the Pondage required for Firm Power—to determine the value of Pondage.

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[897] *Id*., §6.5 (¶ 3) (emphasis omitted).
[898] *Id*. (citation omitted).
[899] *Id*..
[900] *Id*..

(b) The Neutral Expert's errors in his resort to the Treaty's Preamble for interpretative purposes and his corresponding neglect of Article III.

(c) The Neutral Expert's unwarranted rewriting of the definition of Firm Power in Paragraph 2(i).

(d) The Neutral Expert's failure to have regard to the wider context and imperative of Annexure D, read as the elaboration of an exception to the key principles set out in Article III, insofar as it concerns the storage by India of the waters of the Western Rivers.

(a) The Neutral Expert's incorrect use of Paragraph 2(c)

11.99. The Neutral Expert's principal error arose from the over-importance given by him to the definition of Pondage in Paragraph 2(c) of Annexure D.

11.100. The Neutral Expert was wrong in that emphasis. Paragraph 2(c) is a **definition** of Pondage, designed to distinguish it as a form of storage from the kind of mass impounding of water seen in a conventional storage work, and confirm the HEP as a true run-of-river Plant. But, as already shown, that definition plays almost a background role in the **calculation** of the Full Pondage Level and the size of the Operating Pool, which is the province of Paragraphs 2(i) and 8(c). The Treaty drafters could easily have said, in Paragraph 2(d), that the Full Pondage Level means "the level corresponding to Pondage of sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and weekly loads of the plant". But they did not. Rather, the agreement was that Full Pondage Level "means the level corresponding to the maximum Pondage provided in the design in accordance with Paragraph 8(c)", requiring Pondage to be calculated via the definition of Firm Power in Paragraph 2(i). Plant loading has no direct role to play in this process.

11.101. In relying on Paragraph 2(c), moreover, the Neutral Expert noted that the Treaty "does not say that 'Pondage' means Live Storage of only sufficient magnitude to meet the fluctuations of the daily and weekly inflow of the Chenab River".[901] Further, the Neutral

[901] *Id.*, § 5.9.2.

Expert noted that "[n]o explicit mention is made in the Treaty of the use of pondage to regulate fluctuations in the river flow to the reservoir".[902] This was wrong on both counts.

11.102. Paragraph 2(c) defines Pondage as Live Storage sufficient for "fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant". The fluctuations in the discharge of a Run-of-River HEP's turbines arise from fluctuations in the inflow leading to the power intake. There is therefore a direct physical linkage between the inflow and the outflow. The fluctuations referred to in Paragraph 2(c) can occur for many reasons, and not just India's desire for power peaking.[903] The Neutral Expert neglected this broader understanding of the purpose of Pondage and focused only on the peaking schedule.

11.103. Paragraph 8(c), in any event, expressly provides that the maximum Pondage is twice that "required for Firm Power"—which Firm Power is defined by the MMD and the need for variable inflow to be supplemented to allow for its generation. Contrary to the Neutral Expert's suggestion, the Treaty does mention the use of Pondage to regulate fluctuations in available flow, and indeed builds the entire calculation of Pondage around the need to do so in order to generate Firm Power irrespective of hydrological variation in river flows above or below MMD.

11.104. Finally, the Neutral Expert's claim that the reference to HEP loading in the context of Paragraph 2(c) can be used to determine Pondage is unsustainable because of Appendix II to Annexure D:

(a) That Appendix sets out the information which India must give to Pakistan as part of the Treaty.

(b) The information to be so provided includes the MMD discharge data along with the proposed HEP's generating head: in other words, the data essential for calculating the Firm Power and thus Pondage. What it does not include is the load curve that the HEP, once online, is intended to meet. Nor does it include the expected peak load hours of the HEP on a daily and weekly basis.[904]

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[902] *Id.*, § 5.9.4.
[903] Other sources of variation include power system fluctuations causing load following, and inflow variations causing HEP load to vary from a set point.
[904] Whilst Paragraph 4(h) of Appendix II states that India must tell Pakistan the "expected variations in the discharge on account of the daily and weekly load fluctuations". Both Parties have at all times understood that as requiring India to indicate the range of potential discharges from the HEP in m^3/sec. *See*, e.g., Letter No. 3/6/2007-

(c) As a result, the Neutral Expert's analysis as to the calculation of maximum Pondage relies on information which does not arise under the Treaty, which India does not even have to provide, and which India may well not even know for certain when the design is completed.

11.105. The Neutral Expert's recourse to a load curve and/or expected hours of peak operation to determine Pondage therefore amounted to the use of impermissible extra-Treaty considerations to interpret its provisions.

(b) The Neutral Expert's incorrect use of the Treaty's Preamble and failure to consider Article III

11.106. In adopting his unorthodox approach with respect to Paragraph 2(c), the Neutral Expert drew support from the Treaty's Preamble—and, in particular, the statement therein that the Parties were desirous of "attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers".

11.107. Making this statement pre-eminent turned the Treaty on its head by effectively stating that, where hydropower was concerned, Pakistan was only entitled to the waters of the Western Rivers once India was done with them, with the only effective limitation on India being the operational requirements of Paragraph 15—which have no bearing on the calculation of Pondage, but only on its use once calculated.

11.108. In effect, by this approach, the Neutral Expert denied any material role at all for Paragraph 8(c) in the analysis.

11.109. The Neutral Expert's error was compounded, moreover, by failing to consider Article III in his approach—which reflects the true object and purpose of the Treaty. Article III provides critical context for any consideration of India's rights with respect to the Western Rivers. Through its language of "unrestricted use" and "let flow", it is the rule from which Annexure D derogates. In line with the usual principles of treaty interpretation, Article III requires Annexure D to be interpreted restrictively,[905] a conclusion that is *a fortiori* in light of the *Kishenganga* Court of Arbitration's conclusion that "one of the primary objectives of the

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IT/2371 from the ICIW to the PCIW, dated 1 June 2021 (with enclosure), **Exhibit P-0546**, Enclosure – Kiru HE Project (Appendix II to Annexure D) (Paragraph 9).

[905] *See* generally, **Chapter 8**.

Treaty is to limit the storage of water by India on the Western Rivers".[906] When this is taken into account, the Neutral Expert's finding that "the pondage [afforded to India] should be as large as possible, with the condition, naturally, that the provisions of the Treaty are respected"[907] is plainly wrong. The Neutral Expert was under a duty to interpret the Treaty in such a way that Indian storage on the Western Rivers was minimised. He signally failed to do so.

(c) The Neutral Expert's failure to take due account of Paragraph 2(i)

11.110. The Neutral Expert committed yet further errors in his interpretation and application of Paragraph 2(i)—by replacing the carefully agreed definition of Firm Power therein with an entirely different and entirely contradictory definition developed by a non-Party to the Treaty—the ASCE. The ASCE, as noted, considers firm power to be the power guaranteed to be available to meet a consumer's needs as reflected in the HEP's load requirements. But the drafters of the Treaty deliberately avoided such a definition, and instead developed their own, bespoke, understanding of the concept in Paragraph 2(i).[908]

11.111. The Court may feel that it is remarkable the Neutral Expert simply disregarded Paragraph 2(i) in this way. His approach was certainly directly contrary to VCLT Article 31(4), which requires that a special meaning must be given to a term when the parties so intend. In ignoring or failing to appreciate that direction, the Neutral Expert effectively but illegitimately rewrote the Treaty.

(d) The Neutral Expert's failure to take due account of the overall scheme of the Treaty

11.112. Stepping back to look at the overall policy of the Treaty, it is easy to see why Annexure D is drafted the way it is. If one purpose of the Treaty is to limit India's storage of water on the Western Rivers, it would make little sense for India to be given the right to determine unilaterally the amount of Pondage it requires through specifying the load that each HEP is intended to meet.

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[906] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 504.
[907] *Baglihar* Determination, **PLA-0002**, §6.5 (¶ 3).
[908] And, indeed, elsewhere in the Treaty. In Annexure E, "firm power" is not capitalised as a defined term and the definition given in Paragraph 2(i) of Annexure D does not apply. This is a clear indication that the drafters of the Treaty did not intend any special meaning to be given to the term in Annexure E, while the contrary intent appears for Annexure D. This is in keeping with Annexure E allowing India to construct far larger storage works, which may include a HEP, in limited geographical conditions on the Western Rivers.

11.113. In *Baglihar*, however, the Neutral Expert undermined his policy—not only through his fixation on load variations as determining Pondage, but by accepting India's position that the variation that the Pondage was to meet was to be determined not by the load on the HEP itself, but the entire Northern Region of India. Even if Paragraph 2(c) was the hinge of the Pondage analysis (which it is not) this would still be wrong, as Paragraph 2(c) speaks in terms of "the daily and the weekly loads of the plant", not "the daily and the weekly loads of the power system".

11.114. The Northern Region of India is an immense area covering not only Indian-administered Jammu and Kashmir, where the Baglihar HEP is located, but includes the states of Himachal Pradesh, Punjab, Haryana, Rajasthan and Uttarakhand; as well as India's most populous state, Uttar Pradesh, and its most populous city, Delhi (see **Figure 11.5** below). The idea that the Treaty's drafters, anxious as they were to ensure Pakistan's uninterrupted use of the Western Rivers, could have intended such an outcome need only be stated to be confirmed as absurd.

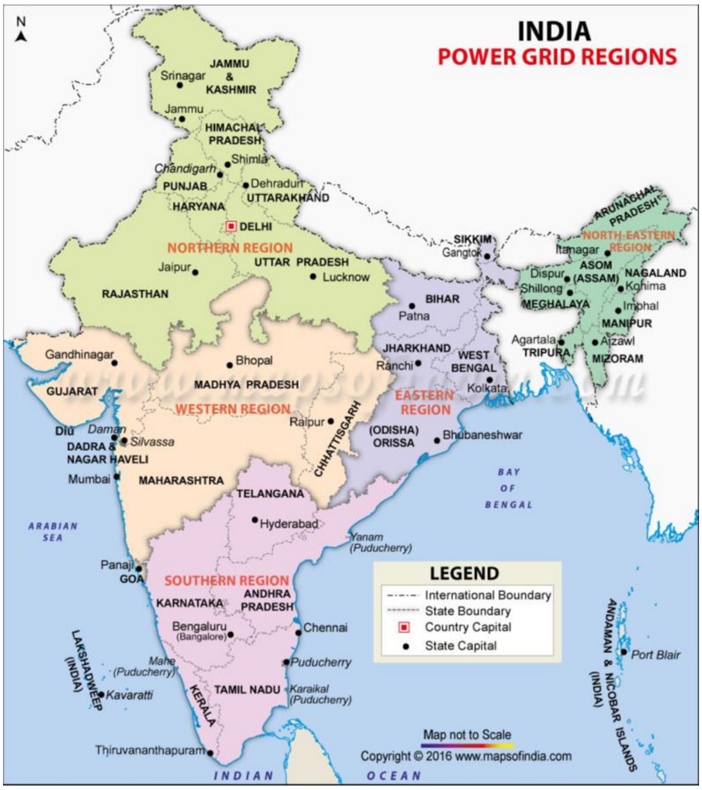

Figure 11.5 - India's power grid regions[909]

11.115. The load curve favoured by the *Baglihar* Neutral Expert to determine Pondage is also unsustainable for a different reason, namely that it is fundamentally uncertain. Indeed, the Neutral Expert himself admitted this in terms.[910] While load curves can model long term use of a HEP to an extent, they can also evolve in response to changes in demography, hydrography, the power system, etc. The use of the load curve to determine a fixed maximum Pondage at the outset of a HEP's design process therefore runs the risk that the size of the Operating Pool will rapidly become unfit for purpose as the load curve changes—meaning that neither India nor Pakistan's interests are being met. Again, it would be highly unusual if the Treaty's drafters had intended such an outcome. By contrast, the Treaty's drafters clearly intended the storage capacity of the Operating Pool to be capable of determination by reference to the data which India is expressly required to provide under Appendix II, i.e., the flow data used to calculate the MMD.

11.116. Once this is understood, it renders the Neutral Expert's approach to the question of Firm Power as unsustainable as his approach to the definition of Pondage more generally,

[909] The map is available at: https://www.mapsofindia.com/maps/india/power-grid.html (last accessed 18 March 2024).

[910] *Baglihar* Determination, **PLA-0002**, § 6.5 (¶ 3): "[w]e are aware of all the uncertainties of this approach, but it is the best available to us at this time" (citation omitted).

misreading as it does key parts of Paragraphs 2(i) and 8(c) out of Annexure D. But the matter becomes worse when one considers the elements of Paragraph 8(c) that the Neutral Expert **did** retain, namely the requirement that Pondage for Firm Power be **doubled**.

11.117. This resulted in the bizarre outcome of the Neutral Expert determining the volume of additional water required for India to use the HEP to meet a particular load curve within the constraints of the Treaty, and then allowing India **twice** that amount.

11.118. So far as the Neutral Expert's logic can be understood, this was done for no particular policy reason,[911] and despite Paragraph 2(c)—on which he placed such strong reliance—defining Pondage as being of "only sufficient magnitude to meet fluctuations in the discharge of the turbines arising from variations in the daily and the weekly loads of the plant". At no point did he contemplate why the Treaty's drafters—who were otherwise adamant that India's storage on the Western Rivers be minimal—would have tolerated such an outcome. Had he done so, he would (or should) have rapidly concluded that his approach to the question of Pondage could not be correct.

11E CONCLUSION ON PARAGRAPH 8(C)

11.119. As will be appreciated from the above, the Parties have approached the question of maximum Pondage in fundamentally different ways. For Pakistan, Paragraph 8(c), when given its natural and ordinary meaning, read together with Paragraphs 2(i) and 2(c), produces a straightforward answer to the question posed. This has a number of significant advantages.

(a) **First**, Pakistan's approach is rooted in the plain words of the Treaty. It seeks to do nothing more than read Paragraph 8(c) together with Paragraphs 2(i) and 2(c), and in light of the overarching rule of Article III by which India's storage of the waters of the Western Rivers is to be minimised. It does not seek to read words out of the Treaty, nor render provisions ineffective.

(b) **Second**, Pakistan's approach is computationally straightforward and can be achieved without the use of sophisticated models that would not have been available at the time the Treaty was concluded. But for the calculation of the MMD, it does not require data handling. Nor does it require any iterative

[911] *Id*., § 6.5 (¶ 3).

calculations to deal with particular hydrological circumstances: it produces a single, fixed volume of Pondage, unique to each HEP.

(c) **Third**, Pakistan's approach does not require the making of any assumptions about a HEP's future load or operational parameters and relies solely on information that India is obliged to provide under the Treaty, i.e., the discharge data necessary to calculate the MMD, and the generating head of the particular HEP.

(d) **Fourth**, Pakistan's approach is not sensitive to hydrological data discrepancies or errors, with these being effectively neutered by the averaging process required to calculate the MMD.

(e) **Fifth**, Pakistan's approach enables an Indian HEP to achieve Firm Power on any given day with the number of hours of generation dependent on the actual flow rate. Or, India may operate the Plant at any higher rate, for a duration that will be defined by the river flow and the allowable Pondage. This is consistent with the concept of a Run-of-River HEP operating to provide peaking power within the constraints of the Treaty.

(f) **Sixth**, Pakistan's approach is objective, in the sense that it links Pondage and Firm Power strictly to the MMD, a factor that is governed by the watercourse at the HEP site, and outside the control of either Party. It does not give India control over the calculation of Pondage by linking it to a load curve specified by India or to an installed capacity selected by India that is not constrained by the Treaty.

11.120. India's proposal for the calculation of maximum Pondage suffers by comparison. It ignores key parts of the Treaty and re-writes others. It appears to have been designed for a single purpose: to give India the maximum amount of Live Storage possible for its HEPs.

(a) **First**, India's approach seeks to re-write Paragraph 2(i) and 8(c) of Annexure D of the Treaty, substituting the definition of Firm Power found therein with an entirely different and contradictory definition of the term that the Treaty's drafters had deliberately avoided by developing a bespoke definition of their own.

(b) **Second**, India's approach fails to take proper (or, indeed, any) account of Article III, being the rule from which Annexure D is an exception, in formulating its methodology for the calculation of Pondage. Rather, it uses the Treaty's Preamble as a charter to rewrite Annexure D when its limitations become inconvenient.

(c) **Third**, India's approach turns Pondage into a form of storage intended to meet a load curve that India has formulated unilaterally, giving it effective control over the process of its calculation. In so doing, it implements a concept of pondage from which the Treaty's drafters sought to depart. The only apparent limit placed upon it is Paragraph 15 of Annexure D, which, properly interpreted, is an operational and not a design criterion.

(d) **Fourth**, India's approach is reliant on extra-Treaty information, namely the provision of a load curve that it is not required to give to Pakistan under Appendix II to Annexure D. This use of a load curve, moreover, renders the calculation of Pondage inherently uncertain and potentially obsolete as India's power grid changes, ensuring that neither Pakistan nor India's needs will be met in the long run.

(e) **Fifth**, having calculated Pondage by reference to a load curve, thereby granting the HEP exaggerated storage, India's approach then purports to implement Paragraph 8(c) of Annexure D by doubling the amount of Pondage so produced, giving it more water than it needs and cutting across the animating principle of Article III that Indian storage of the waters of the Western Rivers be minimised.

(f) **Sixth**, to derive an actual volume of maximum Pondage, India's approach relies on a series of assumptions concerning the operating hours of the HEP, and is computationally dense, requiring a series of mass curves to come up with a single figure.

11F THE COURT'S QUESTION ON PARAGRAPH 8(C)

11.121. The Court, in PO6, has identified the following question with respect to Paragraph 8(c):[912]

> "With respect to Annexure D, paragraph 8(c), what is to be taken into account for the purposes of calculating maximum pondage for a plant, and what is to be excluded?"

11.122. For ease of reference, Paragraph 8(c) provides:

> "The maximum Pondage in the Operating Pool shall not exceed twice the Pondage required for Firm Power."

11.123. Pakistan proceeds to address the Court's question in three parts. **First**, it addresses the interpretive methodology behind Paragraph 8(c) and identifies some unusual features of that methodology—not just generally but in comparison with other provisions of Paragraph 8 of Annexure D. **Second**, and based on that interpretive methodology, it addresses what is to be taken into account for the purposes of determining maximum allowable Pondage of an Annexure D.3 HEP. **Third**, it addresses what is to be excluded for the purposes of this exercise.

11F.1 Interpretive methodology of Paragraph 8(c)

11.124. On the issue of interpretive methodology, unlike Paragraphs 8(d), (e) and (f) of Annexure D, addressed in the preceding chapter, Paragraph 8(c) does not require the placement of any particular HEP feature to be justified by India. Rather, it sets a wholly objective standard by reference to "Pondage required for Firm Power", with the definition of Firm Power being provided in Paragraph 2(i) of Annexure D. Paragraph 8(c) therefore does not necessarily lend itself to questions of burden of proof in quite the same way as do Paragraphs 8(d), (e) and (f)—beyond India having to establish that its design does **not** exceed the fixed volume of maximum Pondage that the Treaty permits.

11.125. The other interpretive priority of the Treaty, the requirement that exceptions to the supervening principles of "let flow", minimal interference and no storage of Article III be interpreted narrowly, is of considerable importance with respect to Paragraph 8(c). Pondage is the principal source of Live Storage for an Annexure D.3 HEP, and the only one that is controllable.[913] The internal logic of the Treaty—resting on the prohibition on storage and the

[912] PO6, ¶ 35(d).
[913] The other is Surcharge Storage, which by definition (see Paragraph 2(e) of Annexure D) is "uncontrollable storage occupying space above the Full Pondage Level".

construction of storage works, in Article III(4)—approaches the concept with caution, requiring that it be minimised to the extent permitted by the language of Paragraph 8(c) and its affiliated provisions.

11.126. Finally, the interpretative methodology behind Paragraph 8(c) differs from other provisions of Paragraph 8 in a further material respect, namely, that any approach to the calculation of maximum allowable Pondage derived from reading that provision must comply with the propositions set out in paragraph 11.37 above, namely (in summary of what was addressed above):

(a) the methodology must be capable of coming up with a clear and certain number for each HEP;

(b) it must be capable of generating a maximum allowable Pondage figure using tools that would have been available in the 1950s;

(c) it should not require or warrant constant correction, or be rendered unfit for purpose by future developments;

(d) the outcome should not be overly sensitive to input data such that it would be materially affected by data errors or discrepancies;

(e) it should be capable of resting on data and information that India is required to provide to Pakistan under the Treaty; and

(f) it should not be such that one Party would be capable of manipulating the result to suit its priorities.

11.127. In Pakistan's submission, these propositions emerge naturally from the ordinary meaning of the Treaty in the light of its object and purpose and the circumstances of its conclusion. They represent a valuable interpretive 'sense check' against which any proposed methodology for the calculation of maximum Pondage may be measured.

11F.2 What is to be taken into account for the purposes of Paragraph 8(c)

11.128. Pakistan's direct answer to the question of what is to be taken into account for purposes of Paragraph 8(c) is split into two parts. In the first part, Pakistan reiterates in legal terms what Paragraph 8(c) requires. In the second part, Pakistan converts the legal conclusions into equations, so that they may inform the calculation of the maximum allowable Pondage as a matter of engineering.

(a) Legal considerations

11.129. As regards what is to be taken into account in the calculation of maximum allowable Pondage, the plain words of Paragraph 8(c) make clear that the touchstone of the provision is the words "required for Firm Power"—i.e., a *renvoi* to Paragraph 2(i)—which contains a bespoke, Treaty-specific definition of the concept that departs from the term as it is conventionally understood in hydroelectric engineering—being the power that the HEP is capable of producing when the river is flowing at the MMD level, with the MMD also defined in Paragraph 2(i). The centrality of this concept was confirmed by the *Kishenganga* Court which, apprehending exactly this point, observed:

> "*For new Run-of-River Plants, Annexure D likewise restricts the permissible volume of pondage, and pegs this limit to power generation at the minimum mean discharge calculated at the site.* These are not generous limits[.] […] The outcome was significant in that it achieved a careful balance between the Parties' respective negotiating positions, allowing India hydro-electric use of the waters of the Western Rivers while protecting Pakistan against the possibility of water storage on the upstream reaches of those Rivers having an unduly disruptive effect on the flow of water to Pakistan."[914]

11.130. The next consideration to be taken into account is the relationship between Firm Power and the MMD. As already noted, this is such that the phrase "Pondage required for Firm Power" is directly equivalent to saying, "Pondage required for MMD". Given that an Annexure D.3 HEP will be able to produce constant Firm Power in all cases when the relevant watercourse flows **at or above** the MMD, it follows that Pondage will not be required unless the watercourse is flowing **below** the MMD. Where this occurs, Pondage may be used to supplement the available flow of the river such that the water flows into the turbines at the MMD level, with the HEP storing water at its natural flow for part of the day and releasing it through the turbines at the MMD level for the remainder of the day.

11.131. This—necessarily and unavoidably—means that computation of the Pondage required for Firm Power (and, by extension, the size of the HEP's Operating Pool) will depend on just how far below the MMD the river is flowing at a given point in time. While Pondage

[914] *Kishenganga* arbitration, Partial Award, **PLA-0003**, ¶ 504 (emphasis added).

will equally be required where the river is flowing at 90% of the MMD as it will at 50% of the MMD, the **amount** of Pondage required in the latter case will be greater than the former.

11.132. From this, a further element to be taken into account is that an Annexure D.3 HEP must have sufficient Pondage to produce Firm Power at any flow rate below the MMD the watercourse falls—and, indeed, it must have the capacity to maximise the Firm Power so produced. This raises the question of the period of time for which it is to be used for calculating the Pondage required for Firm Power. As addressed above, a contextual reading of the Treaty leads unavoidably to the conclusion that the relevant period is 24 hours.

11.133. Once each of these elements is taken into account, the calculated amount of Pondage required for any given daily inflow rate will be that which maximises the number of hours that the HEP can operate at Firm Power during that day, with the Operating Pool sized in such a way as to allow the necessary Pondage to be stored pending release through the turbines. In simple terms:

(a) If the average flow rate for a day is below the MMD, the HEP will not be able to produce Firm Power without assistance from Pondage.

(b) To produce Firm Power in that case, the HEP is turned off, so that no water is released through the turbines, thereby allowing water to accumulate in the Operating Pool in the form of Pondage for part of the day.

(c) Once sufficient Pondage has accumulated, the HEP is switched back on (returned to Firm Power production), with the accumulated Pondage being added to the natural flow of the river such that discharge through the turbines is equivalent to the MMD for the remaining hours of the day.

(d) Firm Power is maximised by ensuring that the Pondage accumulated in step (b), once added to the natural flow of the river, is sufficient that the HEP can generate at the Firm Power (MMD) level for the remainder of the day.

11.134. The Pondage required for Firm Power in Paragraph 8(c) is therefore fixed by determining the maximum amount of storage that could conceivably be required in step (b) such that the operation described in step (d) can be carried out in any sub-MMD conditions.

11.135. When this is done, the maximum amount of Pondage that an Annexure D.3 HEP could conceivably use in a 24-hour period to achieve Firm Power, irrespective of how far below the MMD the river falls, is the Pondage required for Firm Power. As a general rule, and as explained further below, this equates to **12 hours of storage at 50% of the relevant MMD**.

11.136. With this figure—being the "Pondage required for Firm Power"—derived, the only thing left to take into account is the requirement of Paragraph 8(c) that it be doubled to produce the maximum allowable Pondage.

(b) Equations

11.137. The process by which this essentially legal exercise, produced by interpreting the plain terms of Annexure D, is made real in engineering terms is set out fully in **Appendix E2**. Ultimately, it is a straightforward exercise of calculation. It is nonetheless helpful for an explanation to be provided here with the view that, if the Court is persuaded to adopt it, it would serve as the universally applicable formula for the calculation of maximum Pondage for all Annexure D.3 HEPs moving forward. As before, the Kiru HEP with its MMD of 65.3 m^3/sec is provided as an example.

11.138. As already explained, the proper interpretation of Paragraph 8(c) starts with the recognition that its plain terms require that an Annexure D.3 HEP must be able to deliver Firm Power on any given day, irrespective of the flow conditions—and, in particular, irrespective of how far below the MMD the flow falls. When computing Pondage, which is a volume of water, the Firm Power measured in MW can be replaced by the MMD measured in m^3/sec. Firm Power is available from the HEP at any time that the flow rate through the HEP's turbines is equal to the MMD.

11.139. Computation of Pondage starts with the proposition that the total flow volume into the HEP Operating Pool (the **inflow**), within a 24-hour period must be equivalent to the total flow out of the Operating Pool in the same 24-hour period (the **outflow**), with the HEP producing Firm Power for the greatest possible number of hours from that flow.

11.140. The inflow is equal to the average flow rate in m^3/sec (**Q**) multiplied by the number of hours in the day (**24**). This gives a flow volume with units of m^3/sec-hours, which can be converted to cubic meters by multiplying by the number of seconds in an hour (i.e., 3600).

11.141. When the HEP is operating to produce Firm Power, the outflow is equal to the flow rate (**MMD**) multiplied by the number of hours that the plant operates **(t_P)**. If the flow rate of the river in a given 24-hour period is **less** than the MMD, then the HEP must store water for some of the day so that when the water so stored is released through the turbines to produce the MMD. Because the inflow and outflow volumes are equivalent over the course of the 24-hour period, this means the HEP will not be operating for some of the 24 hours while it is storing water. The number of hours generating will depend on the inflow volume during any given 24-hour period. This is what was referred to in paragraph 11.66 above as the "water balance" exercise.

11.142. Drawing the above together in a formula for computational purposes, the number of hours of power generation providing this equivalence can be computed as:

$$t_P = \frac{Q \times 24}{MMD}$$

11.143. So, for example, if the **MMD** is set to that of the Kiru HEP (65.3 m^3/sec) and hypothetical river flow rate **Q** is 50 m^3/sec (i.e., simply for purposes of illustration), then the HEP will be able to produce Firm Power for t_p hours, calculated (rounding to one decimal place) as:

$$t_p = \frac{50\ x\ 24}{65.3} = 18.4\ hours/day$$

11.144. The Pondage volume (**V_P**) is computed from the balance of inflow and outflow. V_P is simply the volume of water that flows into the reservoir while the HEP is storing water. The units of this volume are in m^3/sec-hours, being the product of a flow rate in m^3/sec and the number of hours. The Pondage varies daily with the result that the Firm Power is available on each day. The HEP operates at MMD for t_P hours in the day. The flow into the reservoir accumulates with no discharge for the remaining hours in the day (24 – t_P). In the example given above, that would be 5.6 hours (24 – 18.4). The volume that can accumulate as storage during this period is the Pondage that is then used for the subsequent period when the HEP operates at Firm Power level. The Pondage required is also equal to the MMD multiplied by the number of hours of operation.

11.145. Drawing the above together in a formula for computational purposes, the Pondage volume (V_P) that can be stored to be used during the peak period can be computed as:

$$V_P = Q \times (24 - t_P) \times 0.0036$$

or

(substituting the above formula for t_P)

$$V_P = Q \ \times \left(24 - \frac{Q \times 24}{MMD}\right) \times 0.0036$$

11.146. So, for example, in the case of the Kiru HEP, the Pondage volume is calculated as 50 m^3/sec × (24 – 18.4) × 0.0036, where the factor 0.0036 converts the result of a volume in m^3/sec-hours to a volume in million cubic meters (Mm^3). The same result in m^3 could be obtained by multiplying the volume by 3600, being the number of seconds in an hour. In the case of the Kiru HEP, therefore, the volume of inflow required for the HEP to produce Firm Power continuously for 18.4 hours is 1.008 Mm^3.

11.147. The Pondage for any 24-hour period depends only on the flow rate available for that day and the MMD determined in accordance with Paragraph 2(i). From here, all that remains is to determine what the greatest amount of storage that a HEP will require given a particular inflow rate if the output is to be equal to the MMD for the remainder of the 24-hour period. For this, it is necessary to consider all possible inflow rates between 0 m^3/sec and the MMD and pick the largest value of storage required. This is a straightforward exercise, as the formula given above is a quadratic equation, which, as the MMD will be known in all cases, has a single variable: Q (the average inflow rate).

11.148. When the various Q values are plotted on a graph with the MMD set to 65.3 m^3/sec, the following curve—which will be familiar to the Court from paragraph 11.73 above—appears:

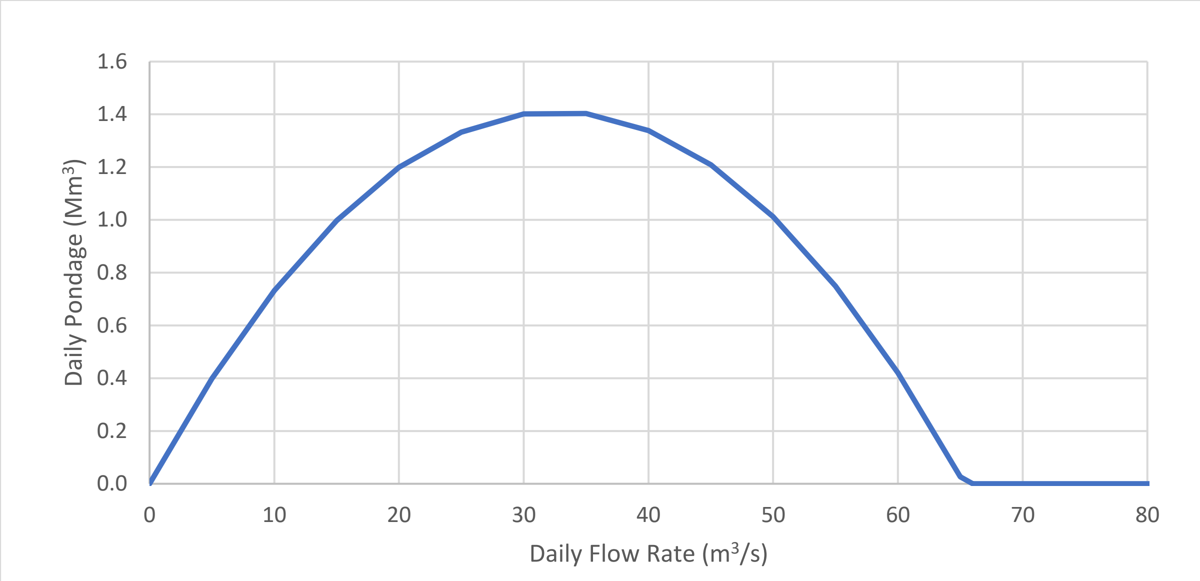

Figure 11.6 - Curve demonstrating maximum usable Pondage for Kiru HEP

11.149. To determine the highest point on the curve—which will be the greatest amount of Pondage required for Firm Power—a differential of this equation (being the point at which a completely level tangent intersects the curve) can be used. The formula necessary to do this straightforward calculation (addressed more fully in **Appendix E.2**), produces the following:

$$Q = \frac{MMD}{2}$$

11.150. For the Kiru HEP, this gives Q of 50% of 65.3 m^3/sec, i.e., 32.65 m^3/sec.

11.151. With Q obtained, it can be reinserted into the formula at paragraph 11.139 above with the MMD set at 65.3 m^3/sec. The result is 1.41 Mm^3—which is the greatest amount of Pondage required for Firm Power. When this is doubled in accordance with Paragraph 8(c), it fixes the maximum Pondage, and therefore the size of the Operating Pool. The Operating Pool for the Kiru HEP is therefore **2.82 Mm^3**.

11F.3 What is to be excluded for the purposes of Paragraph 8(c)

11.152. It follows from the preceding that anything that is not mentioned above is to be excluded from the calculus. The following warrant express reference.

11.153. **First**, while the definition of Pondage in Paragraph 2(c) provides helpful context to the calculations noted above and must of necessity be read into Paragraph 8(c) as a defined term, it is not the core criterion for the calculation itself—which is, as stated, live storage for the purpose of producing Firm Power, and nothing more. Paragraph 2(c) is thus of tangential relevance to the question of how to calculate the maximum allowable Pondage. This said, the definition of Pondage in Paragraph 2(c) is entirely consistent with the methodology advanced by Pakistan.

11.154. **Second**, the operational parameters are not directly relevant to the Pondage calculation. While Paragraph 15 of Annexure D addresses the operation of the Plant, it does not have any application in the calculation of maximum Pondage.

11.155. **Third**, what is also to be excluded from the calculation of maximum allowable Pondage is any information not included within the Treaty itself or required to be provided to Pakistan by India pursuant to the Treaty. In the first instance, this refers to any load curve prepared by India as the supposed basis for Pondage under Paragraph 2(c) (itself excluded from direct consideration for the reasons already given). While this may have application in a HEP the Operating Pool of which is unconstrained by Paragraphs 8(c) and 2(i), it is of no relevance in the case of Annexure D.3 HEPs, with those provisions making abundantly clear that—as the *Kishenganga* Court observed—maximum Pondage is to be calculated by reference to the power the HEP is capable of producing where the river is flowing at the MMD rate, and nothing more.

11.156. **Fourth**, also excluded is any material external to the Treaty that would undermine the bespoke approach adopted by the Treaty for the calculation of maximum Pondage. The most egregious example of this arises in the *Baglihar* Determination, in which the Neutral Expert replaced the Treaty definition of Firm Power in Paragraph 2(i) with a hydroengineering definition drawn from the ASCE. Such an approach amounts to an impermissible rewriting of the Treaty that cuts clear across the Parties' bargain.

11.157. **Finally**, non-Treaty inputs are *ipso facto* to be excluded if they would render the procedure for the calculation of maximum Pondage more computationally complex than that which reasonably have been undertaken in 1960, at the time of the Treaty's conclusion.

* * *

CHAPTER 12: FREEBOARD—ANNEXURE D, PARAGRAPH 8(A)

12.1. In this **Chapter 12**, Pakistan addresses the final item of controversy between the Parties, namely the question of the means by which the acceptable freeboard of an Annexure D.3 HEP is to be calculated. Two provisions of Paragraph 8 of Annexure D are relevant for these purposes—one controlling, the other contextual. The controlling provision is Paragraph 8(a), the focus of the dispute of which the Court is seised. This provides:

> "The works themselves shall not be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design."

12.2. The contextual provision is Paragraph 8(b). This provides:

> "The design of the works shall take due account of the requirements of Surcharge Storage and of Secondary Power."

12.3. Together, these two provisions define the permissible height of an Annexure D.3 HEP's **freeboard**, a concept introduced in **Chapter 4**. Put simply, freeboard refers to the vertical distance between a specified water level of the HEP's reservoir and the lowest portion of the dam wall that is not designed for overflow. The height of the freeboard is determined to provide assurance against overtopping by waves generated by wind, landslide and seismic motion, settlement (in the case of embankment dams), malfunction of spillway gates, or other uncertainties.

12.4. The Parties' dispute over the height of the freeboard of the RHEP was raised as a discrete issue in Pakistan's Arbitration Request, with the difference between the Parties focusing on the interpretation and application of Paragraph 8(a) of Annexure D—the focus of the Court's question in paragraph 35(c) of PO6. As will be seen from what follows, Paragraph 8(a) is the relevant controlling provision, and it is the Court's guidance on the interpretation of this provision in this phase of the proceedings that is important. As will also become apparent, however, a sound interpretation of Paragraph 8(a) will depend on an appreciation of how Paragraph 8(a) interacts with other provisions of the Treaty, and in particular, for these purposes, with Paragraph 8(b). In treaty-interpretative terms, Paragraph 8(b) is thus necessary context for the proper interpretation of Paragraph 8(a). It could also be said to be an ancillary issue, tied to the interpretation of Paragraph 8(a). This said, while the Court will be required to form a view on the meaning of Paragraph 8(b) for purposes of appreciating its interaction with Paragraph 8(a), in order to provide dispositive guidance on the interpretation of Paragraph

8(a), Pakistan does not ask the Court to give a dispositive ruling on the meaning of Paragraph 8(b) as this particular issue has not so far been a matter of discussion within the Commission.

12.5. This Chapter proceeds as follows:

(a) **Section A** recalls the concept of freeboard in an ordinary Run-of-River HEP, as first introduced in **Chapter 4**.

(b) **Section B** addresses the centrally-important Paragraph 8(a) and interprets its elements—in the process introducing contextual elements from other relevant provisions of Annexure D.

(c) **Section C** addresses the Court's question on freeboard, as set out in paragraph 35(c) of PO6.

(d) **Section D** addresses India's approach to the question of freeboard and identifies relevant points of difference with Pakistan.

12A THE ROLE OF FREEBOARD IN A RUN-OF-RIVER HEP

12.6. Turning first to freeboard as an engineering concept.[915] As already stated, the freeboard of a dam refers to the distance between the ordinary maximum reservoir level (i.e., with any operating pool full), or a specified flood water level, and the top of the dam itself. The elevation of a dam crest ordinarily provides for **surcharge storage** (also called **flood surcharge**), which reflects an area of storage above the operating pool that can accommodate flood water that exceeds that which the reservoir is capable of disposing of immediately via spillways. This form of storage is normally uncontrolled, i.e., it exists only while a flood is occurring and cannot be retained for later use. Where surcharge storage is included in a reservoir, the freeboard to the top of the dam that is required during a flood will be measured from the top of the flood surcharge to the top of the lowest non-overflow portion of the dam (rather than from the top of operating pool). The space between the top of the operating pool and the top of the dam is called the **normal freeboard**, with the smaller space between the top of surcharge storage (if any) and the top of the dam described as the **minimum freeboard**.[916] These definitions are presented schematically below in **Figure 12.1**. The amount of freeboard

[915] See also **Chapter 4D.5** above.
[916] Federal Energy Regulatory Commission, *Engineering Guidelines on Selecting and Accommodating Inflow Design Floods for Dams*, August 2015, **Exhibit P-0532**, §§ 2−4.3.1.

required for these conditions is computed based on site conditions and the dam crest elevation is set at the higher of the resulting values, with the computations considering the likelihood of uncertainties in the design.

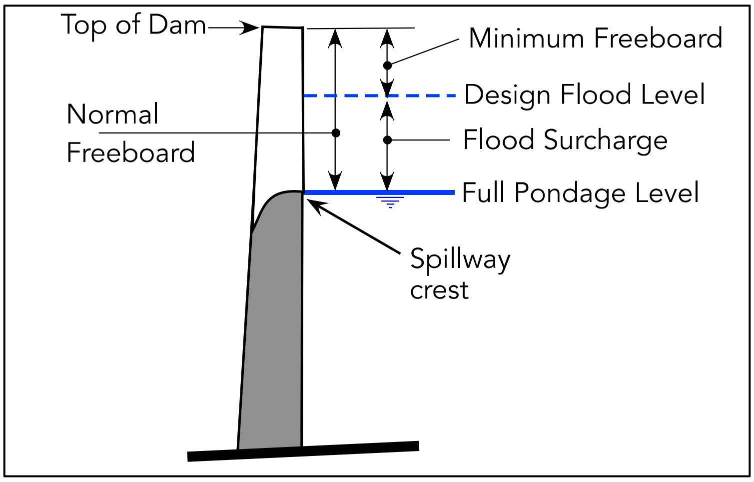

Figure 12.1 - Freeboard for Free Overflow Spillway

12.7. Where the HEP incorporates a crest gated or orifice spillway (described in **Chapter 4** and addressed in **Chapter 10**), surcharge storage may not form part of the design of the dam if the spillway gates are sized to enable the HEP's design flood to be discharged at the full pool level. However, if the gates are smaller, then flood surcharge will also be present with gated spillways.

12.8. Freeboard (and, within it, surcharge storage) is necessary to prevent dam **overtopping**, i.e., water spilling over the top of the dam at locations not so designed.[917] The basic mission of the freeboard in this respect is well-described by the U.S. Department of the Interior:

> "Specification of freeboard is critical in protecting downstream areas against possible hazards resulting from overtopping of a dam. The objective of freeboard is to provide defense against overtopping due to high reservoir inflows, wind setup and wave runup, landslides and seismic activity, unanticipated settlement of the embankment, malfunction of water release structures, uncertainties in the operation and maintenance of the dam and appurtenant structures and hydrological uncertainties.
>
> This basic objective of freeboard does not necessarily require total prevention of splash over the dam by occasional waves under full [flood] surcharge and extreme conditions, but does require that such occurrences will be of such magnitude and duration as to not threaten the safety of the dam. However, the objective of freeboard allowance for dams should include prevention of any overtopping of the dam by either frequent or infrequent high waves that might interfere with efficient operation of the project, create

[917] United States Army Corps of Engineers, "Engineer Regulation 1110-8-2(FR)", *Inflow Design Floods for Dams and Reservoirs*, 1 March 1991, **Exhibit P-0533**, § 9(a).

> conditions hazardous to personnel, or cause other serious effects not necessarily associated with the general safety of the structure."[918]

12.9. Unanticipated overtopping is often a precursor to dam failure, particularly when considering more vulnerable embankment dams (as opposed to more robust concrete dams).[919] For this reason, the principal consideration of any designer when incorporating freeboard into a HEP will be the type of dam and the expected spillway design, together with the possible consequences if the dam is overtopped.[920] Thus, a concrete dam (with a small risk of failure due to overtopping) that incorporates a surface spillway may require a relatively small freeboard.[921] By comparison, an embankment dam (with a greater risk of failure due to overtopping) and a dam with an orifice spillway will require a larger freeboard.[922]

12.10. The characteristics of the spillway and the associated reliability of any gate equipment also contribute to uncertainties that can affect the selection of freeboard. Spillway gates may fail to operate or could be blocked by debris during floods, leading to a requirement for freeboard to limit overtopping hazard. Some flood conditions, such as landslide generated waves, can occur without providing enough time for opening of spillway gates, the effect of which is partially mitigated by freeboard.

12.11. In addition to the HEP-specific conditions of dam and spillway design, freeboard must also take into account various conditions at the HEP's site, which may be combined while being cognizant of the resulting probability of the combined occurrence. These fall into two broad categories.

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[918] Assistant Commissioner - Engineering and Research, "ACER Technical Memorandum No. 2 – Freeboard Criteria and Guidelines for Computing Freeboard Allowances for Storage Dams" (Revised Edition), U.S. Department of the Interior, 1992, **Exhibit P-0535**, § I.A.

[919] W. P. Creager and J. D. Justin (*eds*.), *Hydroelectric Handbook* (2nd Edition: John Wiley & Sons 1950), **Exhibit P-0309**, pp. 410–411.

[920] To this end, all dams require classification by reference to the severity of the consequences of failure. Different terminology may exist across different published guidance but the principle and purpose behind the classification is the same, *viz*. to ensure that the minimum safety requirements of the dam are commensurate to the risk of dam collapse: *see* e.g., United States Army Corps of Engineers, "Engineer Regulation 1110-8-2(FR)", *Inflow Design Floods for Dams and Reservoirs*, 1 March 1991, **Exhibit P-0533**; Canadian Dam Association, *Dam Safety Guidelines* 2007 (Revised Edition 2013), **Exhibit P-0534**, Table 2-1.

[921] That being said, the possibility of human and/or mechanical error that attends a gated spillway (*see* United States Army Corps of Engineers, "Engineer Regulation 1110-8-2(FR)", *Inflow Design Floods for Dams and Reservoirs*, 1 March 1991, **Exhibit P-0533**, § 8(e)) may require additional freeboard to buy time for any such error to be remedied before the dam is overtopped. The calculation is therefore more subtle than first appears.

[922] To that end, ICOLD recommends a freeboard of between 1–2 m for a concrete dam, and potentially more than 5 m for an embankment dam: ICOLD, "Bulletin 82", *Selection of Design Flood: Current Methods*, 1992, **Exhibit P-0536**, § 4.6.

(a) **First**, the **meteorological conditions**, particularly as regards wind at the HEP site, which can generate waves on the surface of the reservoir that will push water up and potentially over the top of the dam through a process referred to as the 'wave run-up'. HEP designers must accordingly consult accurate models of wave prediction (encompassing wave generation and wave height) when determining the height of the freeboard.[923]

(b) **Second**, the **bathymetric conditions**, particularly as regards dam and foundation consolidation over time, the seismicity of the site, and the potential for any landslide and its consequences. All of these—which reflect topographic, geologic and geotechnical conditions—may cause movement of the dam or displacement of the water in the reservoir, with attendant risk of overtopping.[924]

12B PARAGRAPH 8(A) OF ANNEXURE D AND THE PROHIBITION ON RAISING ARTIFICIALLY THE WATER LEVEL IN THE OPERATING POOL

12.12. With the basic concept in hand, Pakistan turns to Paragraph 8(a) of Annexure D. As with the other provisions of Paragraph 8(a), this provides a design criterion with which an Annexure D.3 HEP must comply if it is to be Treaty-compliant.

12B.1 "The works themselves…"

12.13. Paragraph 8(a) opens by defining its subject matter. Notably, it does not refer to freeboard specifically (indeed "freeboard" as a term is not mentioned anywhere in the Treaty) but rather "the works" generally. This refers to the entirety of the HEP, including all of its various components—as similar references in Paragraphs 8(d) ("satisfactory operation of the works") and 8(e) ("satisfactory construction and operation of the works") make clear.

12.14. What this means is that, for purposes of assessing whether Paragraph 8(a) has been complied with, it is not sufficient to look at **just** the freeboard. It is necessary to examine **all the elements** of the HEP—and, in particular, the components of the dam, including its

[923] A variety of methodologies exist, but the most widely used is that of the USACE: United States Army Corps of Engineers, "Engineer Manual 1110-2-1101", *Coastal Engineering Manual – Part II*, 30 April 2002, **Exhibit P-0537**. *See* also Design Standard 13, *Embankment Dams – Chapter 6: Freeboard*, U.S. Department of the Interior, 2012, **Exhibit P-0538**, § 6.1.6.

[924] Assistant Commissioner - Engineering and Research, "ACER Technical Memorandum No. 2 – Freeboard Criteria and Guidelines for Computing Freeboard Allowances for Storage Dams" (Revised Edition), U.S. Department of the Interior, 1992, **Exhibit P-0535**, § I.B.

spillways, intakes and other outlets. As will be seen, it is the interaction of the freeboard with these elements that will determine whether an Annexure D.3 HEP is Paragraph 8(a) compliant.

12B.2 "…shall not be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design"

12.15. Following statement of the subject matter of the provision, Paragraph 8(a) then sets out a prohibition. The works themselves must not "be capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design".

12.16. As will be recalled, the term "Operating Pool", pursuant to Paragraph 2(f) of Annexure D, means the storage capacity between Dead Storage Level and Full Pondage Level—with the "Full Pondage Level", pursuant to Paragraph 2(d), being the level corresponding to the maximum Pondage provided for in the design.

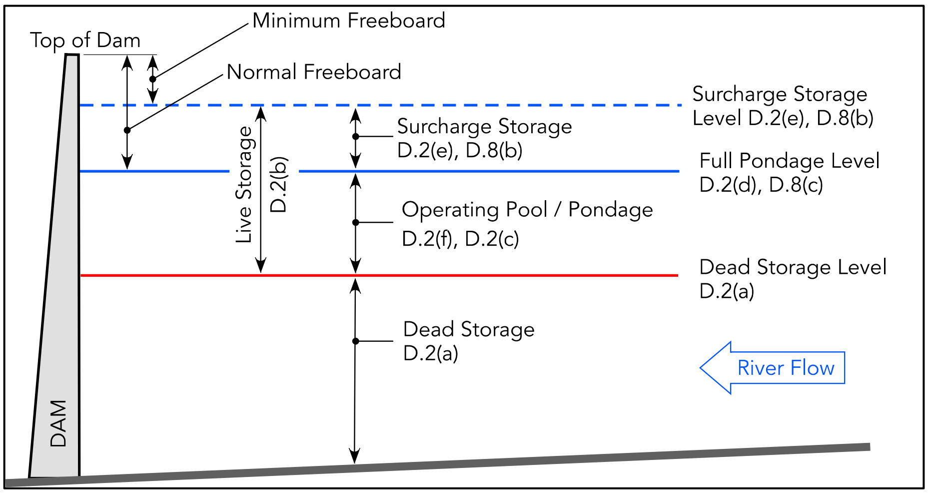

Figure 12.2 - Longitudinal profile of a HEP reservoir using Annexure D definitions and including freeboard

12.17. The relevant forms of storage are shown in the elaborated longitudinal profile of an Annexure D.3 HEP set out above in **Figure 12.2**, with the freeboard located in relation to the top of the dam wall.

12.18. What Paragraph 8(a) does is prohibit India from increasing the reservoir level in an Annexure D.3 HEP above the Full Pondage Level, i.e., increasing the amount of water stored and therefore controlled by the HEP operator. This prohibition—but for one exception, addressed below—is absolute in character and consistent with the obligations set out in Article III, which limit India's capacity to store and/or control the waters of the Western Rivers.

12.19. It bears noting in this respect that Paragraph 8(a) is not an operational rule. It does not prohibit India from raising the level of the Operating Pool above the Full Pondage Level. Rather, it is a design and construction rule that prohibits India from designing and constructing a HEP that is even capable of raising the water level in this way.

12.20. The plain reading of Paragraph 8(a) gives rise to two issues, of which only the second arises for determination in these proceedings. The first, though, provides vital context for the determination of the second.

(a) Spillways and Surcharge Storage

12.21. The first issue concerns the exception to Paragraph 8(a) referred to above. The exception is to be found in Paragraph 8(b), which provides that "[t]he design of the works shall take due account of the requirements of Surcharge Storage and of Secondary Power". "Secondary Power" for these purposes is not relevant.[925] "Surcharge Storage", however, is—being defined under Paragraph 2(e) as "uncontrollable storage occupying space above the Full Pondage Level".

12.22. On a superficial review, Paragraphs 8(a) and 8(b) appear to be inconsistent—India, on the one hand, is prohibited from designing works that are capable of raising the Operating Pool above the Full Pondage Level; but, on the other, India must take account of the requirements of Surcharge Storage in its Annexure D.3 HEP.

12.23. On closer review, however, this apparent inconsistency is not an inconsistency at all. Paragraph 8(a), by its terms, prohibits the **artificial** raising of the water level above the Full Pondage Level. Surcharge Storage, however, by definition, is **uncontrollable** storage, i.e., it is a volume of water that India is not permitted to control. So long as Surcharge Storage remains uncontrollable, therefore, Paragraph 8(a) is not engaged—as what it prohibits is the ability of a HEP operator to artificially raise the water level in the Operating Pool by shutting all means of egress from the reservoir (e.g., the spillways, the intakes and any other outlet) and letting the water level rise. Where the HEP operator is capable of doing this, because the dam

[925] Being defined in Paragraph 2(j) of Annexure D as "the power, other than Firm Power, available only during certain periods of the year". So far as it pertains to Secondary Power, therefore, Paragraph 8(b) speaks not to Paragraph 8(a) but to Paragraph 8(c), which compels India to size its Operating Pool on the presumption that the HEP will be producing Firm Power only (as discussed in detail in **Chapter 11**). Put another way, Paragraph 8(b) states to India that despite the limitations on the size of its Operating Pool, it can design other aspects of its HEP—most notably its intakes and turbines—on the basis that the HEP will be capable of producing Secondary Power.

is designed and constructed to allow this to take place, the dam would be inconsistent with the requirements of Paragraph 8(a) as the operator would be capable of raising artificially the water level above the Full Pondage Level.

12.24. It is, however, an entirely straightforward matter to design and construct a dam that maintains the uncontrollable character of surcharge storage—through the simple expedient of ensuring that the HEP includes within its design an ungated outlet or **free overflow structure** at the Full Pondage Level. With this structure, which leaves the dam operator unable to control the surcharge storage, the dam becomes Paragraph 8(a) compliant. Like the overflow drain at the top of a bath, this structure provides a means by which water can escape from the reservoir in an uncontrollable manner when the water reaches the Full Pondage Level. Where the HEP includes an uncontrolled spillway—which is the Treaty-mandated default under Paragraph 8(e)—Surcharge Storage is also uncontrollable and thus not in violation of Paragraph 8(a), serving as temporary flood storage for when the water is flowing over the spillway crest, and discharging this stored water through the spillway as flood conditions recede.[926]

12.25. That said, India's ability to artificially raise the spillway crest by the installation of obstacles such as fusegates or flashboards on the spillway crest (both being, effectively, a modular wall that will break-away during a large flood) means that this is not a complete solution, especially where the spillway is relatively narrow with deep Surcharge Storage.

12.26. Paragraph 8(a) will also be an issue in the case of a gated spillway with the top of the gates in the normal closed position at the Full Pondage Level. In such a case, Surcharge Storage may not be required, and if it is required, rendered uncontrollable by the fact that the reservoir can discharge over the top of the gates, which are not designed to form a watertight seal with the dam structure above. However, gated spillways nearly always make provision for stoplogs, being modular beams that can be inserted into the dam wall allowing for maintenance of gated structures to take place.[927] Where stoplogs are inserted into a dam to allow for maintenance of a gated spillway, it can create a watertight seal to a level higher than the top of the gates—

[926] Consistently with this, Paragraph 17(b) of Annexure D provides that India is not entitled to the benefits of Paragraph 15 when considering Surcharge Storage. Were this exclusion not present, India's ability to apply the storage and discharge requirements of Paragraph 15 to Surcharge Storage would imply that Surcharge Storage is capable of being controlled.

[927] P. C. F. Erbisti, *Design of Hydraulic Gates* (2nd Edition: CRC Press 2014), **Exhibit P-0539**, § 2.3.

potentially allowing the water level in the Operating Pool to be artificially raised during the dry season when spillway gates will not be opened.

12.27. Where the Paragraph 8(a) injunction will most certainly be engaged is in the case of a dam with an orifice spillway. In such a case, the dam wall above the spillway may have no uncontrolled outlets at all, meaning that when the spillway gates are closed, the Operating Pool can readily be filled above the Full Pondage Level. In such a case, the Treaty-mandated solution would be for India to include a free overflow structure—for example, an auxiliary uncontrolled spillway—at the Full Pondage Level, to prevent the reservoir from rising in a controlled manner above that elevation.

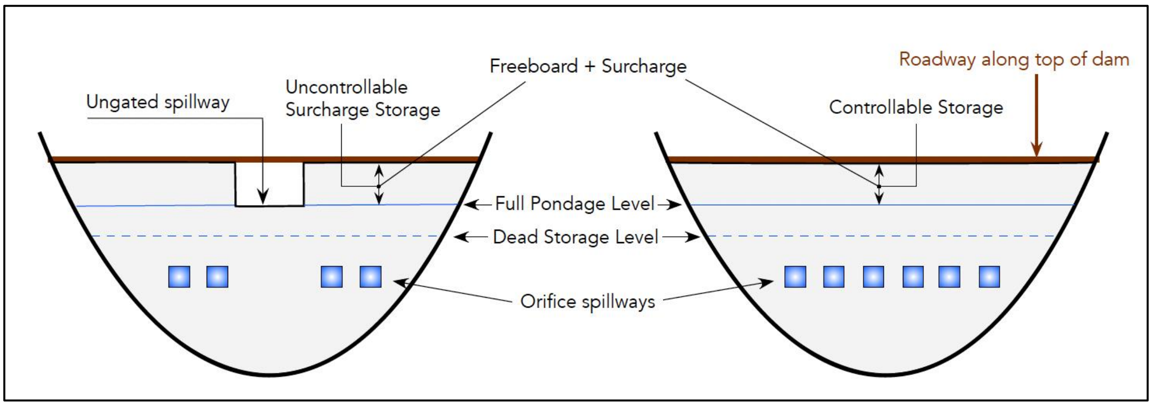

Figure 12.3 - Latitudinal profile of Paragraph 8(a) compliant (left) and non-compliant (right) freeboard designs

12.28. How this looks in practice is shown in two designs in the diagram above. Both show Annexure D.3 HEPs with orifice spillways, which are assumed for present purposes to comply with Paragraphs 8(d) and 8(e), as described in **Chapter 10**. In the lefthand diagram, the presence of an ungated spillway at the Full Pondage Level prevents the reservoir in that design from being deliberately filled above that level when the orifice spillway is closed. This design is Paragraph 8(a) compliant. In the righthand diagram, however, the absence of such a feature above the Full Pondage Level will allow the reservoir to be raised artificially above the Full Pondage Level when the orifice spillway is closed, increasing the controllable storage in the reservoir. This design enhances India's ability to artificially raise the water level and thus is not compliant with Paragraph 8(a).

12.29. The righthand design would remain Paragraph 8(a) non-compliant even if a gated spillway were included in the design as, in such a case, stoplogs could be used to close the gap between the top of the gates and the dam above, allowing the water level to be artificially raised. Alternatively, the capacity to overfill the reservoir may be enlarged by installing smaller orifice gates, which will expand the zone of flood surcharge (and thus the height of normal freeboard and top of dam) above the Full Pondage Level. Such a design is therefore capable of raising artificially the water level in the Operating Pool above the Full Pondage Level. Again, the only way for the design to be rendered Paragraph 8(a) compliant is for a **free overflow structure** to be included at the Full Pondage Level.

12.30. It should be added that designs that are Paragraph 8(a) compliant are by no means unusual in hydroengineering practice, as multiple spillway features are often included in a single HEP. This can be seen in the example below, being the Karun III HEP in Iran, which includes orifice, surface gated and uncontrolled spillways. Uncontrolled spillways have reliability advantages when compared to gated spillways and are usually preferred to orifice types.[928]

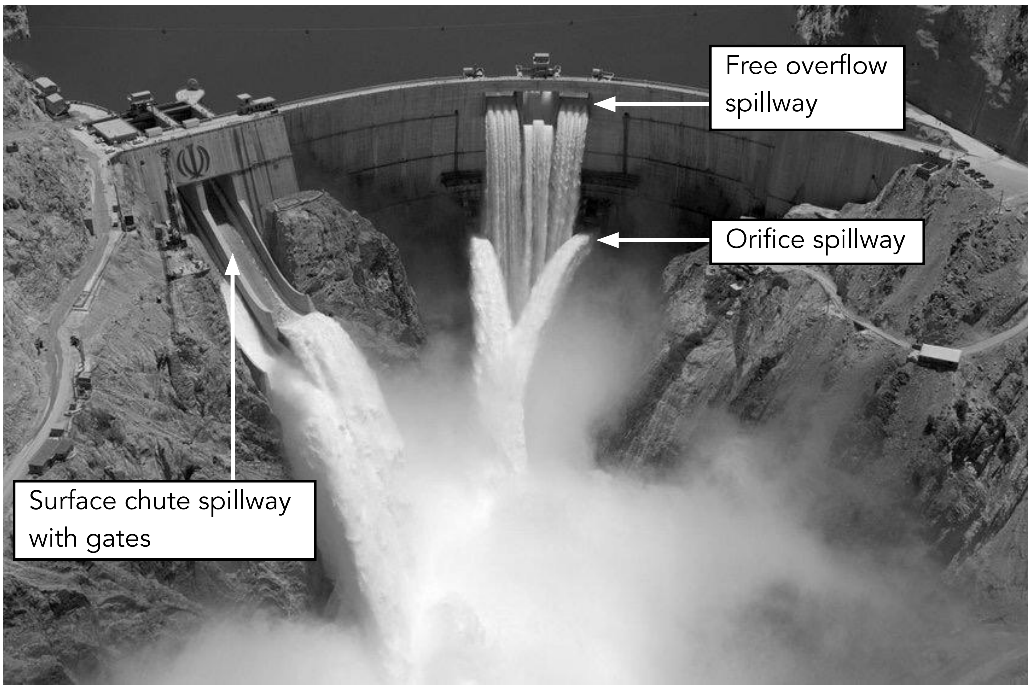

Figure 12.1 - Paragraph 8(a) compliant HEP design (Karun III dam, Iran[929])

[928] ICOLD, "Bulletin 82", *Selection of Design Flood: Current Methods*, 1992, **Exhibit P-0536**, § 4.5.
[929] Photograph is available at: https://www.researchgate.net/figure/Spillage-at-Karun-III-dam-in-Iran-example-of-simultaneous-use-of-different-jet_fig1_272173753 (last accessed 18 March 2024).

(b) Freeboard

12.31. Beyond the above considerations in relation to spillways and Surcharge Storage, Paragraph 8(a)—necessarily and unavoidably—carries with it implications for the height of an Annexure D.3 HEP's freeboard.

12.32. This much is implicit in Paragraph 8(b). That provision is carefully and specifically phrased to not give India any **entitlement** to Surcharge Storage, but merely that "the design of the works shall take due account of the *requirements* of Surcharge Storage" (emphasis added). Put another way, in circumstances in which India's design does **not** require Surcharge Storage, there is no need to raise the top of the dam above the normal freeboard level.

12.33. Even with a free overflow spillway crest set at the Full Pondage Level, there remains the possibility that this spillway crest may be blocked through use of fusegates, flashboards or other similar obstacles, which requires that India's ability to overfill the reservoir be constrained. This, in turn, means that India can incorporate freeboard up to the non-overflow part of the dam only in the amount that can be justified by the safety concerns inherent in the HEP in question. Provision of an ungated spillway set at Full Pondage Level does not relax the requirement to constrain freeboard to only the minimum required.

12.34. This was the premise of the Parties' argument before the Neutral Expert in *Baglihar*, where the freeboard of the Baglihar HEP was considered:

> "For a surface gated spillway, the artificial raising of the level is possible by increasing the height of the gates […]. In the case of ungated surface spillways, the artificial raising of the full pondage level […] is a generally accepted way of improving the performance of an existing dam. This is achieved by placing gates on the crest (possibly fusegates) so as not to affect the spilling capacity of the spillway.
>
> A way to limit the technical possibility of raising the Full Pondage Level is to limit the freeboard to the minimum required."[930]

12.35. To that end, the *Baglihar* Neutral Expert concluded that "[t]he possibility of a further raising of the Full Pondage Level and the extent of the possible raising is directly related to the height of the available freeboard".[931] Given this, he concluded that Paragraph 8(a) required that "the dam crest [top of dam] elevation should be set at the lowest elevation compatible with

[930] *Baglihar* Determination, **PLA-0002**, § 5.8.1.
[931] *Id.*, § 5.8.9.

a sound and safe design based on the state of the art".[932] On this basis, he agreed with Pakistan that India's proposed freeboard for the Baglihar HEP of 4.5 m was too high, requiring that it be lowered to 3 m.[933]

12C THE COURT'S QUESTION ON PARAGRAPH 8(A)

12.36. In paragraph 35(c) of PO6, the Court posited a single question on the height of the freeboard:

> "With respect to Annexure D, paragraph 8(a), what is to be taken into account for the purposes of designing the freeboard for a plant and what is to be excluded?"[934]

12.37. A complete answer to this question would require the Court to address both (i) the requirements of Paragraph 8(b) and surcharge storage, and (ii) whether India's HEP design included within it a free overflow structure at the Full Pondage Level that cannot be easily blocked, such that the resulting works are so far as is possible, "not […] capable of raising artificially the water level in the Operating Pool above the Full Pondage Level specified in the design". The Court is, however, constrained by discussions in the Commission and the terms of Pakistan's Arbitration Request, neither of which indicate that the Parties are in dispute about the interpretation or application of Paragraph 8(b). For this reason, while it is necessary for the Court to have an understanding of the meaning of Paragraph 8(b) for purposes of answering the question posed concerning the interpretation of Paragraph 8(a), Pakistan does not, in these proceedings, ask the Court to give a dispositive interpretation of Paragraph 8(b). In answering the question posed, the Court is therefore invited to accept the premise that India is entitled to a safe and effective freeboard, with a view to preventing overtopping and dam failure, but not more than that.

12.38. In assessing whether this threshold is met, the usual factors for the calculation of freeboard are to be taken into account, as set out in the major international standards—including those of ICOLD, USACE and ASCE.[935] While these may differ in emphasis, their overall approach is broadly consistent.

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[932] *Id.*, § 6.4 (¶ 2).
[933] *Id.*.
[934] PO6, ¶ 35(c).
[935] *See*, e.g., Federal Energy Regulatory Commission, *Engineering Guidelines on Selecting and Accommodating Inflow Design Floods for Dams* (August 2015), Exhibit **P-0532**, § 2–4.3.2.

12.39. The first and most important factor is the nature of the dam itself and the risk factor associated with it in light of its design flood. As is well-recognised in the literature, given the catastrophic downstream consequences of embankment dam failure from overtopping, such dams require a higher freeboard to be considered safe than a concrete gravity dam, which may be designed to handle limited overtopping and is unlikely to suffer wholescale collapse.[936]

12.40. A further relevant factor in this respect is spillway design and the extent to which Surcharge Storage is required. As already noted, an ungated spillway will have a higher maximum flood level and top of dam elevation, due to the need to account for Surcharge Storage, when compared to a crest gated or orifice spillway, which may require no Surcharge Storage at all. Inherent in this idea is the notion that the spillway design itself may need to be examined and, if necessary, optimised.[937] For example, a narrow ungated spillway will require considerably more flood surcharge, as compared to a wider spillway extending a greater distance along the length of the dam. The shorter spillway crest will require greater water depth above its crest for a given design discharge, as compared to a longer spillway crest.

12.41. Also to be taken into account are the meteorological and geometric conditions at the site itself—in particular wind velocity and its intersection with wave-run up on the face of the dam, as these determine the level to which waves can rise against the dam's structure. A reasonable combination of conditions should consider the likelihood of contemporaneous occurrence of winds, floods, and other uncertainties.

12.42. As for what is to be excluded for the purposes of this analysis, the answer is straightforward: anything that is not intended to guarantee the safety of the dam from overtopping. For example, in many cases—especially when considering a concrete dam where some overtopping is considered acceptable—it is normal for certain structures to be located on the top of the dam wall to assist with dam and HEP maintenance. For a normal HEP, the designer would have a free hand to raise the freeboard to ensure that these would not be inundated in an otherwise safe overtopping event. But this is not relevant in the case of an Annexure D.3 HEP. If India wishes to place such structures on the top of its dams, it must secure them against corrosion or water damage, modify the design, or find somewhere else to

[936] ICOLD, "Bulletin 82", *Selection of Design Flood: Current Methods*, 1992, **Exhibit P-0536**, § 4.6.
[937] *See* e.g., *Baglihar* Determination, **PLA-0002**, § 6.4.

put them, all this being part of the conventional design process for spillways.[938] This cannot be used to justify the raising of freeboard further than the dictates of safety require.

12D INDIA'S POSITION ON FREEBOARD

12.43. In contrast to other areas of HEP design, the difference between the Parties, at least as crystallised in their dispute over the RHEP freeboard height, is relatively small. In the case of the RHEP, India has proposed a freeboard of 2.07 m. Pakistan considers that a freeboard of no more than 1.1 m is warranted.[939] However, against these apparently small differences in elevation, one must bear in mind that the increment in storage volume per meter of elevation change is maximum at the top of the reservoir, because that is where the reservoir surface area is greatest.

12.44. India has given two broad reasons as to why it believes a higher freeboard is required—which reasons may be taken to reflect its general views on the subject. The first—which Pakistan agrees is relevant and to be taken into account for the purposes of calculating freeboard—are the wind conditions at the RHEP, which affect wave run-up.[940] While the Parties may differ on the precise calculations in such a scenario, there is no disagreement between them that this is an important element assessing risk of overtopping (even for a concrete dam) and thus in determining freeboard height.

12.45. But India also maintains that it is entitled to a higher freeboard in order to keep the girders of the spillway bridge—i.e., the walkway running above its crest gated spillway—clear of wave splashes, and to ensure that the bearings of that bridge are not submerged below the Full Pondage Level.[941] The minutes of the 110th meeting of the Commission give some sense of the debate on this issue:

> "PCIW mentioned that the bearing plates under the bridge girder can be coated or covered with some material to save them from corrosion as in many cases steel parts or concrete remain under water continuously. He further stated, by referring to the NE's determination on *Baglihar* that there is a possibility of raising artificially the water level in the operating pool by increasing the gate height when the freeboard is excessive.

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[938] It can also include a low parapet wall above the dam crest that will not allow the reservoir level to be increased but provide a modicum of protection to work being carried out at the top of the dam wall.
[939] Record of the 109th Meeting of the Permanent Indus Commission, 22–25 September 2013, dated 14 July 2014, **Exhibit P-0083**, ¶ 39.
[940] *Id.*, ¶¶ 39–40.
[941] *Id.*, ¶ 40; Record of the 110th Meeting of the Permanent Indus Commission, 23–27 August 2014, dated 1 February 2015, **Exhibit P-0024**, ¶ 26.

> Pakistan side also added that reduction in freeboard should not have any problem if the higher freeboard is due to submergence of bearing pads, rubbers, stainless steel parts. If complete structure can go underwater permanently, girder parts should have no problem and that a designer can design a beam/girder for any depth.
>
> Regarding freeboard provision, ICIW mentioned that with the crest gate top at Full Pond Level (FPL), there is no possibility to raise water level artificially. Further, Indian side mentioned that keeping the bearings of the bridge below the FPL is neither advisable nor an adopted practice throughout the world. There is no scope for reduction of depth of girder either which has been kept as bare minimum required from structural point of view to keep deflections within permissible limit. The freeboard provided by India is bare minimum from practical point of view as the girder depth under spillway-bridge in the instant case cannot be reduced below 1.70 m from structural considerations. Moreover, the arrangement does not provide capability to artificially raise the water level. There cannot be any credible argument for keeping the bearings submerged in water by keeping them below FPL. It is a worldwide practice to provide freeboard of about 2 m wherever crest gated spillways are provided.
>
> PCIW requested ICIW for the details/drawings of the girder for examination. Indian side mentioned that details have already been explained to Pakistan side."[942]

12.46. From this, it can be seen that India's case concerning freeboard, at least in part, has nothing to do with preventing overtopping and dam safety at all. Rather, it is concerned with preventing certain design features—all of which could be rendered in rubber, concrete or stainless steel, could be changed, could be moved elsewhere, or could be dispensed with altogether—from getting wet. This does not provide any basis for raising the freeboard, potentially affording India considerable additional storage from overfilling contrary to Paragraph 8(a) if the additional height is multiplied out across the entire surface area of the reservoir. This cuts clearly across the spirit of Paragraph 8 and, of course, India's obligations in Article III.

12.47. The Parties' interpretative dispute concerning Paragraph 8(a) cannot be minimised by the seemingly small difference between them concerning the height of the RHEP freeboard. From a systemic perspective, with a very large number of HEPs planned as part of India's construction programme on the Western Rivers, setting the interpretative parameters of Paragraph 8(a) at this point will be essential for purposes of avoiding disputes of potentially much greater practical significance in the future, and especially as it relates to India's designs that inherently enhance—rather than limit—India's ability to artificially raise the water level.

* * *

[942] *Id.*, ¶¶ 24–27.

CHAPTER 13: CONCLUDING OBSERVATIONS AND FINAL SUBMISSIONS

13A THE SCOPE OF THIS FIRST PHASE ON THE MERITS, WHAT IS REQUIRED AND THE FORM OF THE COURT'S AWARD

13.1. In its Competence Award, the Court declared that it "is competent to consider and determine the disputes set forth in Pakistan's Request for Arbitration."[943] In the face of India's objections to the Court's competence, constitution and legitimacy, this was an affirmation of competence without limitation, save as regards the scope of the disputes set forth in Pakistan's Arbitration Request and the controlling terms of Article IX of the Treaty. The latter remains important, both for its enabling and its limiting effects. Article IX(2) provides for third party settlement "[i]f the Commission does not reach agreement on any of the questions mentioned in Paragraph (1)." The questions mentioned in Article IX(1) include "[a]ny question which arises between the Parties concerning the interpretation or application of this Treaty or the existence of any fact which, if established, might constitute a breach of this Treaty." It follows from these provisions that the Court's competence is essentially unrestricted, save that the questions of which it can be seised are questions on which the Commission has been unable to reach agreement. In its Competence Award, the Court found that "the matters referred to arbitration in Pakistan's Request for Arbitration concern a dispute or disputes within the meaning of Article IX(2) of the Indus Waters Treaty."[944]

13.2. In its Procedural Order No. 7 ("**PO7**"), the Court gave Pakistan leave to apply to amend its 19 August 2016 Request for Arbitration and gave directions in respect of that Application. Those directions required Pakistan to (a) file a "redline" copy of its Request for Arbitration "that incorporates and distinguishes the proposed amendments from the original Request", (b) provide a brief explanation of the proposed amendments and the reasons therefor, and (c) confirm that the proposed amendments do not fall outside the competence of the Court or the scope of the dispute in respect of which Pakistan had recourse to arbitration.[945] PO7 further directed that, after the filing of Pakistan's Application, India would be afforded an opportunity to indicate whether it intended to object to Pakistan's Application. Pakistan submitted its Application as directed. India gave no indication of any objection.

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[943] Competence Award, ¶ 318(H).
[944] *Id.*, ¶ 318(C).
[945] Procedural Order No. 7 (Leave to apply to amend the Request for Arbitration; Schedule for written submissions in the First Phase on the Merits), 22 July 2023 ("**PO7**"), ¶ 1.2.

13.3. In its Procedural Order No. 8, by which the Court granted Pakistan permission to submit its Amended Request for Arbitration, the Court stated and found, *inter alia*, as follows:

> "**WHEREAS** the Court has carefully reviewed the Amendment Application;
>
> **WHEREAS** the Court considers that the amendments proposed by Pakistan do not alter the scope of the dispute reflected in the Request for Arbitration, and in respect of which the Court found it had competence in its Award on the Competence of the Court dated 6 July 2023;
>
> **WHEREAS** the Court considers the limited amendments proposed by Pakistan are not inappropriate having regard to the relevant circumstances, in particular the significant passage of time since the Request for Arbitration was originally submitted and the procedural developments that have taken place in the interim, and the absence of any identifiable prejudice to India as a result of the amendments".[946]

13.4. It follows from the preceding that the Court is competent without limitation in respect of all of the disputes raised in Pakistan's Request for Arbitration, as amended, described in this Memorial generically as "Pakistan's Arbitration Request".[947]

13.5. The exercise of this competence was addressed by the Court in PO6, having regard to the parallel proceedings commenced by India before the Neutral Expert. Having regard to Pakistan's statement in the competence hearing, that it had resolved to participate in the Neutral Expert proceedings subject to a residual reservation of position regarding the possibility of a competence challenge engaging Paragraph 13 of Annexure F of the Treaty, the Court stated the following:

> "It appears, therefore, that irrespective of whether the Neutral Expert was properly appointed or is competent pursuant to Article IX of the Treaty, the Neutral Expert may be competent in respect of the issues presented to him on the basis, and to the extent, of the Parties' joint consent (expressed by India through its request for the appointment of a Neutral Expert and by Pakistan through its participation in the Neutral Expert process).
>
> Accordingly—although the Court expressly reserves taking any position on the status of the Neutral Expert proceeding—it may be the case that both the Court of Arbitration and the Neutral Expert are presently competent to address the KHEP/RHEP Design and Operation Issues that have been presented in both processes. On these issues, the Court of Arbitration is competent pursuant to the operation of Article IX of the Treaty; the Neutral Expert may be competent either by operation of that article or through the Parties' joint consent."[948]

[946] Procedural Order No. 8 (Application to amend the Request for Arbitration), 10 August 2023, Recitals 12–14.
[947] *See* paragraph 1.33 above.
[948] PO6, ¶¶ 27–28.

13.6. On this basis, and having found in its Competence Award that parallel proceedings before the Court and the Neutral Expert are "entirely possible under the Treaty",[949] the Court resolved to conduct the proceedings before it "in a phased manner, bearing in mind the status of, and developments concerning, the proceedings taking place before the Neutral Expert."[950] The basis of this phased approach was the Court's finding and affirmation of the principle of "mutual respect and comity", described by the Court as "a general duty of any international dispute resolution body" with regard to the exercise of its competence.[951]

13.7. Addressing the application of this "general duty of mutual respect and comity" with regard to the Court and the Neutral Expert proceedings, the Court stated as follows:

> "[…] The Court will organize its future proceedings mindful of the general duty of mutual respect and comity referred to above, given the possible parallel competence of the Neutral Expert in respect of the KHEP/RHEP Design and Operation Issues. The Court considers it axiomatic that the same duty of mutual respect and comity is applicable to the Neutral Expert in the organization and conduct of his proceedings.
>
> At present, the Court has little insight into the status or likely course of the Neutral Expert proceedings. It is apparent, however, that the dispute presented to this Court by Pakistan in its Request for Arbitration includes a series of issues relating to the interpretation or application of the Treaty that are not part of the difference before the Neutral Expert, who has been presented only with the application of the Treaty to the KHEP/RHEP Design and Operation Issues. Accordingly, the Court considers it appropriate to organize its future proceedings in phases, addressing in the first instance certain issues presented to it by Pakistan that are not specific to the KHEP/RHEP Design and Operation Issues (and that are therefore not also before the Neutral Expert), without prejudice to being informed as to the KHEP/RHEP Design and Operation Issues.
>
> The Court will determine at a later date, after seeking the views of the Parties, whether and how it may be called upon to exercise its competence in respect of the other issues of the dispute set out in Pakistan's Request for Arbitration."[952]

13.8. On this basis, the Court went on to address the scope of the present First Phase on the Merits of its proceedings by reference to seven questions "concerning the overall interpretation or application of Article III of the Treaty and paragraph 8 of Annexure D thereto, as well as the related general question […] concerning the legal effect of past decisions issued by dispute

[949] Competence Award, ¶ 313.
[950] PO6, ¶ 34.
[951] *Id.*, ¶ 30.
[952] *Id.*, ¶¶ 31–33.

resolution bodies established pursuant to Article IX of the Treaty upon the Parties and upon subsequent dispute resolution bodies".[953]

13.9. Having regard to the Court's phased approach to the proceedings—without prejudice, at this point, to whether the KHEP and RHEP-specific elements of the Parties' dispute will be addressed by the Court, in a subsequent phase, or by the Neutral Expert—the scope of the present First Phase of the proceedings is on questions of **systemic** interpretation and application of Article III and Part 3 of Annexure D of the Treaty, within the overall scheme of the Treaty, and having regard to its object and purpose. Design, construction and operational issues regarding the KHEP and the RHEP are not before the Court at this point, and, as noted in **Chapter 1**, Pakistan has refrained from putting before the Court in this Memorial any information regarding the KHEP and the RHEP other than to contextualise and illustrate Pakistan's case concerning the interpretation and application of Article III and Part 3 of Annexure D of the Treaty. The Court, accordingly, is not asked at this stage to make any findings or reach any conclusions with regard to the KHEP or the RHEP, or indeed any other Indian Annexure D.3 HEP.

13.10. This said, the Award that the Court will render in due course, if it is to be useful—whether for the Neutral Expert, in the parallel proceedings, for any other Neutral Expert proceedings to come, or for the Parties in their future engagement—must reach conclusions and provide guidance on interpretation and application in granular form. Painting with a broad brush—addressing the issues at a level of abstraction—or proceeding in nuanced terms that do not meet the need for clarity and certainty, will not resolve the Parties' dispute. As the Court observed in PO6, the general duty of international dispute resolution bodies is to exercise their competence "in such a manner as to facilitate the actual resolution of the Parties' dispute and to avoid the risks of duplicative proceedings or conflicting decisions."[954] As observed in **Chapter 1**, an economy of reasoning will not serve the Parties well. This Phase requires a considered and reasoned award which, through its analysis and conclusions, not just its operative part, will provide a benchmark by reference to which the Parties will be able to pursue their future relations.

13.11. As will be evident from the detail of this Memorial, what is required of the Court's Award in this Phase poses challenges. The questions identified in paragraph 35 of PO6 do not

[953] *Id.*, ¶ 35.
[954] *Id.*, ¶ 30.

readily lend themselves to summary answers. A *dispositif*, or operative part, that adopts a series of summary, conclusory statements setting out the Court's findings at a high level of abstraction will not suffice for the task at hand. Something more elaborated and considered will be necessary.

13.12. Given this, Pakistan considers that the Court should render as part of its Award a **narrative *dispositif*** that sets out as the operative part of the Award elaborated findings on each of the issues that are engaged by this Phase of the proceedings. The scope and content of these issues are addressed further below.

13.13. Paragraphs 16 and 23 of Annexure G of the Treaty address decisions of the Court and the form and effect of its Awards. They provide, in relevant part, as follows:

> [16] "Subject to the provisions of this Treaty […], the Court […] shall determine its procedure […]. All such decisions of the Court shall be by a majority of those present and voting. Each arbitrator, including the Chairman, shall have one vote. In the event of an equality of votes, the Chairman shall have a casting vote."
>
> [23] "The Court shall render its Award, in writing, on the issues in dispute and on such relief, including financial compensation, as may have been claimed. The Award shall be accompanied by a statement of reasons. An Award signed by four or more members of the Court shall constitute the Award of the Court. […] Any such Award rendered in accordance with the provisions of this Annexure in regard to a particular dispute shall be final and binding upon the Parties with respect to that dispute."

13.14. Having regard to these provisions, it appears that the term "Award", used in Paragraph 23 of Annexure G, is intended as a reference to the operative part, the *dispositif*, of the Court's substantive decisions that take the form of an award.[955] This follows from the reference to the "statement of reasons" accompanying rather than being part of the "Award"—and the absence of language that might otherwise have stated something along the lines of "the Award shall state the reasons on which it is based". While the point may not ultimately be material, as principles going to the binding effect of an award, its *ratio decidendi*, and its *res judicata* effect, all require that the reasoning informing the Decision forms part of that Decision,[956] it will nonetheless be important that the Court ensures that maximum clarity attaches to its Decision

[955] In its Competence Award, the Court used the term "Decision" to describe this part of its Award (see Competence Award, heading of § VI on p. 128).
[956] The term "Decision" is used here to describe the operative part of the Court's Award, adopting the language used by the Court in describing this part in its Competence Award (see the preceding footnote).

in these proceedings. It will be important to avoid future disputes about what constitutes the content of the operative part of the Court's Award.

13.15. Insofar as Pakistan can establish, there is no constraint of either law or principle that would preclude the Court from adopting a narrative *dispositif* approach. The key consideration is what is requested by the Parties as it is this that defines the *petita* of the case.

13B THE CONTENT OF THE COURT'S AWARD—WHAT NEEDS TO BE ADDRESSED

13.16. Turning to the content of the Court's Award, and what needs to be addressed in the operative part of that award, three points are warranted. The **first** concerns the scope of the questions posed in PO6. The **second** concerns the interpretative context of the provisions engaged by the Court's questions and ancillary issues that may require determination. The **third** concerns the scope of the interpretative findings warranted from the Court.

13.17. On the **first** point, in paragraph 35 of PO6, the Court put seven questions to the Parties. The formulation of those questions was influenced by the unusual nature of the proceedings that the Court determined it should direct—having regard to the Court's affirmation of its own competence, the parallel Neutral Expert proceedings, but residual uncertainty over the status of those proceedings (on which the Court expressly reserved its position[957]), the narrow scope of the Neutral Expert's competence, and the general duty of mutual respect and comity that must inform the organisation of both the Court and the Neutral Expert proceedings. The questions posed are therefore unavoidably abstract and systemic in nature.

13.18. Given this, the *petita* of this case, and what the Court is required to address in this phase of the proceedings, are not limited to the ostensible scope of the questions set out in PO6. In other words, the operative part of the Court's Award in due course is not constrained by the formulation of the questions posed in PO6. The Court can, and Pakistan contends must, go further. It is bound to address everything that needs to be addressed to enable a complete answer to be given to the Treaty-systemic interpretative issues that are in dispute between the Parties. Within the scope of the disputes of which the Court is seised, the Court is competent to, and should, give an answer to the interpretative issues raised by the disputes for purposes of providing the fullest possible guidance to the Parties for purposes of their future relations under the Treaty. The Court's Award should also give the fullest possible guidance to the

[957] PO6, ¶ 28.

Neutral Expert in the parallel proceedings, and to any Neutral Expert who may be appointed in other cases in due course, to enable them to determine differences of which they may be properly seised without taking them beyond the bounds of their competence as defined by Part 1 of Annexure F of the Treaty. The primary objective of these proceedings is to address, once and for all, the Treaty-systemic interpretative issues that have been dividing the Parties for two decades. Following the Court's Award in this phase of the proceedings, the Parties and any other dispute settlement body that may come after this Court, should be as clear as possible about the meaning of Paragraphs 8(a), (c), (d), (e) and (f) of Annexure D, as construed in their context and in the light of the object and purpose of the Treaty, within the bounds of the disputes of which the Court is seised pursuant to Pakistan's Arbitration Request.

13.19. This comes to the **second** point, namely, the interpretative context of the provisions engaged by the Court's questions and ancillary issues that may require determination.

13.20. Questions (c) – (g) in paragraph 35 of PO6 address the interpretation and application of Paragraphs 8(a), (c), (d), (e) and (f) of Annexure D of the Treaty. The *chapeau* of paragraph 35 also references "the overall interpretation or application of Article III of the Treaty", and Paragraph 8 of Annexure D in general terms. This is the sharp focus of these proceedings.

13.21. As will be apparent from this Memorial, however, these provisions cannot be construed in a vacuum. Other provisions of the Treaty are closely engaged, not just for purposes of construing the three bargains at the heart of the Treaty—the Treaty's object and purpose—but because those other provisions have a direct bearing on the interpretation and application of the provisions that are the primary focus of the Court's attention. By way of example, definitional provisions of the Treaty—such as Article I(15) and Paragraph 2 of Annexure D—are critical to a reading of Article III and Paragraph 8 of Annexure D. A developed appreciation of the meaning and reach of other provisions in Part 3 of Annexure D will be fundamental to the interpretation and application of the Paragraph 8 provisions. An example is Paragraph 15 of Annexure D, which establishes important constraints regarding the operation of a Plant. Another example is Paragraph 8(b), an understanding of the application of which is necessary for purposes of interpreting Paragraph 8(a). Elements of Annexure E are relevant to the interpretation and application of Annexure D.

13.22. That the interpretation of provisions other than headline provisions in dispute may be necessary is commonplace and expressly warranted by the general rule of treaty interpretation reflected in Article 31, VCLT. Article 31(2) VCLT makes clear, for example, that the interpretative "context" includes the treaty as a whole, not just the provisions that are in sharp focus in the dispute. The point is simple but important. As the Court pursues its task, it cannot limit itself to the interpretation of only those provisions that are expressly identified in the questions posed in paragraph 35 of PO6 or in Pakistan's Arbitration Request. It must address all the issues that need to be addressed, whether directly engaged or ancillary, that are necessary for it to resolve the dispute of which it is seised.

13.23. Turning to the **third** point, the scope of the interpretative findings warranted from the Court, there are issues of interpretation and application of the Treaty addressed in this Memorial that, in Pakistan's submission, warrant statements of interpretative finding by the Court in the operative part of its award that go more broadly than the questions posed in PO6. This is particularly so as it is evident that the Parties are sharply divided and that the unhappy legacy of the flawed methodology of the *Baglihar* Determination has been a millstone around the neck of the Treaty, precluding its sound operation, since 2007.

13.24. Given this, Pakistan considers that a statement of interpretative finding by the Court on the nature and character of the Treaty, and the bargains reflected in the Treaty—as addressed in **Chapter 7**—is warranted. In so saying, Pakistan does not insist on the language of its characterisation of these issues. The relevant point that requires emphasis is the cornerstone character of the Treaty in relations between Pakistan and India and that the Treaty is neither a transactional or contractual instrument nor an instrument the terms of which were intended to have an ambulatory character, evolving at the insistence of one Party to the Treaty alone. It is a treaty of peace and a boundary agreement in everything but name, and falls to be construed as such.

13.25. A second issue that warrants an interpretative finding by the Court is the relationship, for interpretative purposes, between headline obligations, such as those contained in Article III(1), the *chapeau* to Article III(2) and Article III(4) of the Treaty, and exceptions thereto, such as those contained in Article III(2)(d) and Part 3 of Annexure D. Since the *Baglihar* Determination in 2007, the tail has been wagging the dog—India's construction of the exceptions has threatened to overwhelm the rule. The headline rules of let flow, non-interference and no storage have become prey to India's voracious programme of HEP construction on the Western Rivers. Pakistan's lifeblood, the subject of an agreed bargain in

1960, is being drained away. The proper interpretative relationship between headline rules and exceptions thereto needs to be re-established.

13.26. The Court's Question (b) enquires about resort to "non-Treaty-based design and operational practices". Significantly, the Treaty does not lay down design and operational *practices*. It prescribes design **criteria** and operational **constraints**. The critical question is whether engineering "best practices" can, and indeed must, be used for purposes of complying with those criteria and constraints or whether "best practices" can be used to circumvent the requirements of the Treaty. It is not, therefore, so much a question of what can be taken into account as a question of the purpose for which it can be taken into account, namely, to better enable compliance with the Treaty or to erode the Treaty's headline provisions and constraints. It is this prism that Pakistan urges upon the Court.

13.27. Pakistan similarly considers that the Court, when addressing its question (a), concerning the binding or otherwise controlling effect of the decisions of past dispute resolution bodies, should not limit itself to an analysis of these issues but should complete that analysis with *dispositif* findings in terms addressed by Pakistan in **Chapter 8** of this Memorial.

13.28. Pakistan's responses to the Court's Questions (c) – (g), and the analysis underpinning those responses, are given in **Chapter 10** (addressing Questions (e), (f) and (g)), **Chapter 11** (addressing Question (d)), and **Chapter 12** (addressing Question (c)). Given the scope of the questions in PO6, and the explanatory nature of the responses that the questions required, the analysis and conclusions in these Chapters do not lend themselves to summary formulation. As addressed above, Pakistan therefore requests that the Court sets out its findings on the issues engaged by these questions in a narrative *dispositif* that will allow it to address in detail and in prescriptive terms what is required for purposes of compliance with the design criteria of Paragraph 8 of Annexure D of the Treaty and related provisions of the Treaty that are relevant for this purpose.

13C FINAL SUBMISSIONS

13.29. Having regard to the preceding, and the submissions advanced in this Memorial, Pakistan respectfully requests the Court:

A. To set out its findings on the issues engaged by this Phase of the proceedings in a narrative *dispositif* that elaborates in detail and in prescriptive terms the overall interpretation and application of Article III and Paragraph 8 of the Treaty, and in particular what is required for purposes of compliance with the design criteria of Paragraph 8 of Annexure D and other relevant and related provisions of the Treaty;

B. Having regard to the facts, evidence and law adduced in this Memorial, its associated Appendices, and accompanying exhibits and annexes, to adjudge and declare:

(i) the nature and character of the Treaty, and the bargains reflected in the Treaty in terms addressed in **Chapter 7** of, and elsewhere in, this Memorial;

(ii) the binding or otherwise controlling effect of the decisions of past dispute resolution bodies in terms addressed in **Chapter 8** of, and elsewhere in, this Memorial, with respect to:

(a) the Parties;

(b) the present proceedings before the Court;

(c) the present proceedings before the Neutral Expert; and

(d) future proceedings before a court of arbitration or a neutral expert;

(iii) the relationship, for interpretative purposes, between (a) the headline obligations contained in Article III(1), the *chapeau* to Article III(2) and Article III(4) of the Treaty, and (b) the exception thereto contained in Article III(2)(d) and Part 3 of Annexure D, in terms addressed in **Chapters 8** and **9** of, and elsewhere in, this Memorial;

(iv) that engineering "best practices" can and must be used for purposes of complying with the design criteria and operational constraints in Part 3 of Annexure D of the Treaty, but that "best practices" cannot be relied upon to circumvent the requirements of the Treaty, in terms addressed in **Chapter 9** of, and elsewhere in, this Memorial;

(v) with respect to the interpretation and application of Paragraph 8(d) of Annexure D of the Treaty, what is to be taken into account, and what is to be excluded, for purposes of designing low-level sediment and other outlets for an Annexure D.3 HEP in terms addressed in **Chapter 10** of, and elsewhere in, this Memorial;

(vi) with respect to the interpretation and application of Paragraph 8(e) of Annexure D of the Treaty, what is to be taken into account, and what is to be excluded, for purposes of designing gated spillways for an Annexure D.3 HEP in terms addressed in **Chapter 10** of, and elsewhere in, this Memorial;

(vii) with respect to the interpretation and application of Paragraph 8(f) of Annexure D of the Treaty, what is to be taken into account, and what is to be excluded, for purposes of designing power intakes for an Annexure D.3 HEP in terms addressed in **Chapter 10** of, and elsewhere in, this Memorial;

(viii) with respect to the interpretation and application of Paragraph 8(c) of Annexure D of the Treaty, what is to be taken into account, and what is to be excluded, for purposes of calculating maximum Pondage for an Annexure D.3 HEP in terms addressed in **Chapter 11** of, and elsewhere in, this Memorial;

(ix) with respect to the interpretation and application of Paragraph 8(a) of Annexure D of the Treaty, what is to be taken into account, and what is to be excluded, for purposes of designing the freeboard for an Annexure D.4 HEP in terms addressed in **Chapter 12** of, and elsewhere in, this Memorial;

(x) any other findings as the Court may consider to be necessary or warranted for purposes of providing controlling guidance on the interpretation and application of, and relationship between:

(a) Article III of the Treaty;

(b) Paragraph 8(a) of Annexure D of the Treaty;

(c) Paragraph 8(c) of Annexure D of the Treaty;

(d) Paragraph 8(d) of Annexure D of the Treaty;

(e) Paragraph 8(e) of Annexure D of the Treaty;

(f) Paragraph 8(f) of Annexure D of the Treaty; and

(xi) such other findings as the Court may consider to be necessary or warranted.

13.30. Pakistan further requests the Court:

A. To convene a case management conference of the Parties for purposes of considering:

(i) the status of the parallel proceedings before the Neutral Expert;

(ii) what engagement, if any, the Court should undertake with the respect to the Neutral Expert and his proceedings, having regard in particular to the general duty of mutual respect and comity applicable to both the proceedings before the Court and the proceedings before the Neutral Expert;

(iii) the need for directions for the conduct of further phases of these proceedings;

B. To give such directions as may be necessary and warranted for the scheduling and conduct of further phases of the proceedings before the Court;

C. To reserve any issue of costs in respect of the present phase of the proceedings for decision by the Court in due course;

D. To remain seised of the dispute.

Respectfully submitted,

(AHMAD IRFAN ASLAM)
Agent of the Islamic Republic of Pakistan

LIST OF VOLUMES

VOLUME 1 – PAKISTAN'S MEMORIAL

VOLUME 2 – APPENDICES

VOLUME 3 – FACTUAL EXHIBITS

No.	Title	Date
	Factual Exhibits submitted with Pakistan's Response - 24 March 2023	
P-0001	Letter No. Y-18012/1/2020-Indus enclosing an Explanatory Note (Enclosure 'A') (the "**21 December 2022 Letter**" and the "**21 December 2022 Explanatory Note**", respectively)	21 December 2022
P-0002	Letter No. Y-18012/1/2020-Indus (the "**11 February 2023 Letter**")	11 February 2023
P-0003	Letter No. Y-18012/1/2020-Indus (the "**21 February 2023 Letter**")	21 February 2023

No.	Title	Date
P-0004	Jammu and Kashmir State Power Development Corporation, "Projects Under Construction" Available at: http://www.jkspdc.nic.in/beta/projects_under_construction.html (last accessed 22 March 2023)	
P-0005	Moushumi Das Gupta, "Modi govt steps up work on project that will tap Pakistani waters, J&K's UT status helps", *The Print* Available at: https://theprint.in/india/modi- govt-steps-up-work-on-projects-that-will- tap-pakistani-waters-jks-ut-statushelps/283505/ (last accessed 22 March 2023)	29 August 2019
P-0006	Moushumi Das Gupta, "Why India's unlikely to accept any interim arbitration decision on Indus Waters Treaty projects", *The Print* Available at: https://theprint.in/india/why- indias-unlikely-to-accept-any-interim- arbitration-decision-on-indus-waters-treaty- projects/1384918/ (last accessed 22 March 2023)	20 February 2023
P-0007	Dr Daniel Haines, "India and Pakistan Are Playing a Dangerous Game in the Indus Basin", *United States Institute of Peace* Available at: https://www.usip.org/publications/2023/02/india-and-pakistan- are-playing-dangerous-game-indus-basin (last accessed 22 March 2023)	23 February 2023
P-0008	Letter from the World Bank to Pakistan	12 December 2016
P-0009	Letter from the World Bank to the Parties	19 September 2022
P-0010	Letter No. WT(132)/(7493-A)/PCIW (with enclosure)	3 July 2015
P-0011	Letter No. WT(132)/(7495-A)/PCIW	13 July 2015
P-0012	Letter No. Y-20014/1/2015-16/2152	16 July 2015
P-0013	Letter No. WT(132)/(7497-98-A)/PCIW (with enclosure)	24 July 2015
P-0014	Letter No. WT(132)/(7496-A)/PCIW	24 July 2015
P-0015	Note Verbale No. ISL/112/1/2015	23 November 2015

No.	Title	Date
P-0016	Letter No. Y-11017/2/2015-IT/2155	21 August 2015
P-0017	Letter No. Y-20017/2/2014-IT/2159	1 September 2015
P-0018	Letter No. WT(132)/(7505-A)/PCIW	11 September 2015
P-0019	Letter No. Y-11017/2/2015-IT/2162	13 October 2015
P-0020	Letter No. WT(132)/(7513-A)/PCIW	4 November 2015
P-0021	Letter No. Y-11017/2/2015-IT/2169	27 November 2015
P-0022	Letter No. WT(132)/(7523-A)/PCIW	5 February 2016
P-0023	Letter No. WT(132)/(7531-A)/PCIW (with enclosure)	25 February 2016
P-0024	Record of the 110th Meeting of the Permanent Indus Commission, 23-27 August 2014	1 February 2015
P-0025	Record of the 111th Meeting of the Permanent Indus Commission, 31 January-4 February 2015	31 May 2015
P-0026	Letter No. WT(47)/(7464-A)/PCIW	30 January 2015
P-0027	Letter No. Y-11017/2/2015-IT/2181	14 March 2016
P-0028	Note Verbale No. KA(II)-2/11/16	29 March 2016
P-0029	Note Verbale No. ISL/112/1/2016	28 April 2016
P-0030	Note Verbale No. ISL/112/1/2016	28 June 2016
P-0031	Minutes of Secretary Level Meeting on Kishenganga and Ratle Hydroelectric Plants held in New Delhi, 14-15 July 2016	15 July 2016
P-0032	Letter No. Y-11017/2/2015-IT/2202 (with enclosure)	11 August 2016
P-0033	Letter No. Y-11017/2/2015-IT/2203	12 August 2016

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P-0034	Note Verbale No. KA(II)-2/11/2016 (without enclosures) [serving Pakistan's Request for Arbitration on India]	19 August 2016
P-0035	Letter No. WT(132)/(7563-A)/PCIW	22 August 2016
P-0036	Note Verbale No. ISL/112/1/2016	30 August 2016
P-0037	Letter No. Y-11017/2/2015-IT/2206	6 September 2016
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P-0039	Neutral Expert First Meeting (*Indus Waters*), 27-28 February 2023, Pakistan's Hearing Bundle (Index only) [amended to include cross-references to exhibit numbers]	27-28 February 2023
P-0040	(Draft) Transcript, Neutral Expert First Meeting (*Indus Waters*), Day 1	27 February 2023
P-0040(C)	(Corrected) Transcript, Neutral Expert First Meeting (*Indus Waters*), Day 1	27 February 2023
P-0041	(Draft) Transcript, Neutral Expert First Meeting (*Indus Waters*), Day 2	28 February 2023
P-0041(C)	(Corrected) Transcript, Neutral Expert First Meeting (*Indus Waters*), Day 2	28 February 2023
P-0042	"Kishenganga and Ratle HEP Matters", Presentation by Shri AK Pal, Commissioner (Indus), Department of Water Resources, River Development & Ganja Rejuvenation, at the Neutral Expert First Meeting (*Indus Waters*)	27 February 2023
P-0043	"Kishenganga Hydroelectric Project", Presentation by Mr Kushvinder Vohra, Chairman, Central Water Commission, at the Neutral Expert First Meeting (*Indus Waters*)	27 February 2023
P-0044	"Ratle Hydroelectric Project", Presentation by Mr Kushvinder Vohra, Chairman, Central Water Commission, at the Neutral Expert First Meeting (*Indus Waters*)	27 February 2023
P-0045	Letter from Pakistan to the Neutral Expert	1 December 2022
P-0046	Letter from Pakistan to the Neutral Expert	10 January 2023
P-0047	Letter No. 3(7)/82-IT/708 (with enclosures)	2 June 1994

No.	Title	Date
P-0048	Letter No. WT(132)/(5446-A)/PCIW	8 September 1994
P-0049	Letter No. WT(132)/(6023-A)/PCIW	11 October 1997
P-0050	Letter No. 9(3)/98-IT/909	21 May 1999
P-0051	Record of the 92nd Meeting of the Permanent Indus Commission, 27-29 November 2004	29 November 2004
P-0052	Letter No. WT(132)/(6662-A)/PCIW	7 February 2006
P-0053	Letter No. WT(132)/(6665-A)/PCIW (with enclosure)	26 March 2006
P-0054	Letter No. 3/7/82-IT/1216	20 April 2006
P-0055	Letter No. 3/7/82-IT/1228 (with enclosures)	19 June 2006
P-0056	Letter No. WT(132)/(6713-A)/PCIW (with enclosures)	24 August 2006
P-0057	Letter No. 3/7/82-IT/1369 (with enclosure)	25 May 2007
P-0058	Record of the 99th Meeting of the Permanent Indus Commission, 30 May-4 June 2007	4 June 2007
P-0059	Letter No. WT(132)/(6839-A)/PCIW	4 February 2008
P-0060	Record of the 100th Meeting of the Permanent Indus Commission, 31 May-4 June 2008	4 June 2008
P-0061	Record of the 101st Meeting of the Permanent Indus Commission, 25-28 July 2008	28 July 2008
P-0062	Letter No. WT(132)/(412/413)/PCIW (with enclosure)	11 March 2009
P-0063	Letter No. WT(132)/(6981-A)/PCIW (with enclosures)	11 March 2009
P-0064	Letter No. WT(132)/(7002-7003-A) (with enclosure)	11 May 2009
P-0065	Note Verbale No. J/112/3/2008	19 May 2009
P-0066	Record of the 103rd Meeting of the Permanent Indus Commission, 31 May-5 June 2009	5 June 2009

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P-0067	Note Verbale No. Dir (India)-1/7/2009	10 July 2009
P-0068	Note Verbale No. J/112/03/2009	20 August 2009
P-0069	Letter No. WT(132)/(7330-A)/PCIW	6 March 2013
P-0070	Record of the 108th Meeting of the Permanent Indus Commission, 24-25 March 2013 *[Note: the meeting was held on 24-25 March 2013 as stated on p. 2 of the Record. The dates shown in the title of the Record – 23- 26 March 2013 – include the date on which the Parties travelled to the meeting.]*	24 September 2013
P-0071	Letter No. 3/7/82-IT/1999	15 April 2013
P-0072	Letter No. WT(150)/(7335-A)/PCIW	20 March 2013
P-0073	Letter No. WT(51)/(7394-A)/PCIW	10 January 2014
P-0074	Letter No. WT(132)/(7411-A)/PCIW (with enclosure)	31 March 2014
P-0075	Letter No. 9/7/2013-IT/2061	6 February 2014
P-0076	Record of the 112th Meeting of the Permanent Indus Commission, 30-31 May 2015	31 May 2015
P-0077	Letter No. 3/5/2007-IT/1947 (with enclosures)	16 August 2012
P-0078	Letter No. WT(150)/(7314-A)/PCIW (with enclosure)	26 November 2012
P-0079	Letter No. 3/5/2007-IT/1974 (with enclosure)	11 January 2013
P-0080	Letter No. 9/3/2013-IT/1994	22 March 2013
P-0081	Letter No. WT(51)/(7337-A)/PCIW (with enclosures)	25 March 2013
P-0082	Letter No. 3/5/1007-IT/2043 (with enclosures)	11 September 2013

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P-0083	Record of the 109th Meeting of the Permanent Indus Commission, 22-25 September 2013	14 July 2014
P-0084	Letter No. WT(51)/(7388-A)/PCIW	5 December 2013
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P-0086	Letter No. WT(9)/(7446-A)/PCIW	3 October 2014
P-0087	Letter No. WT(9)/(7511-A)/PCIW	20 October 2015
P-0088	Letter No. Y-20016/1/2014-IT/2129	20 March 2015
P-0089	Letter No. Y-20014/1/2015-IT/2140	13 May 2015
P-0090	Letter No. WT(51)/(7480-A)/PCIW	13 May 2015
P-0091	Letter No. Y-20014/1/2015-IT/2142	15 May 2015
P-0092	Letter No. WT(51)/(7482-A)/PCIW	18 May 2015
P-0093	Note Verbale No. KA(II)-2/11/2015	12 November 2015
P-0094	Note Verbale No. ISL/112/1/2015	2 December 2015
P-0095	Letter No. Y-11017/2/2015-IT/2177	1 March 2016
P-0096	Letter No. Y-11017/2/2015-IT/2178	8 March 2016
P-0097	Letter No. WT(132)/(7535-A)/PCIW	11 March 2016
P-0098	Note Verbale No. KA (II)-2/11/2015	4 March 2016
P-0099	Note Verbale No. ISL/112/1/2016	21 March 2016
P-0100	Note Verbale No. KA (II)-2/11/2016	19 May 2016
P-0101	Note Verbale No. ISL/112/1/2016	8 June 2016
P-0102	Note Verbale No. KA (II)-2/11/2016	1 July 2016

No.	Title	Date
P-0103	Record of the 113th Meeting of the Permanent Indus Commission, 20-21 March 2017	29 March 2018
P-0104	K. Bhattacherjee, "Pakistan to take river dispute back to court", *The Hindu*, 17 July 2016 Available at: http://www.thehindu.com/news/national/pak istan-to-take-river-dispute-back-to- court/article8860799.ece (last accessed 22 March 2023)	17 July 2016
P-0105	Letter Y-11017/2/2015-IT/2209 (with enclosure)	6 September 2016
P-0106	Letter from the World Bank to the Parties	31 August 2016
P-0107	Letter from the World Bank to the Parties	3 November 2016
P-0108	Letter from the World Bank to the Parties	10 November 2016
P-0109	Letter from the World Bank to the Parties (with Annexes)	11 November 2016
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P-0111	Letter from Pakistan to the World Bank	22 November 2016
P-0112	First Letter from Pakistan to the World Bank	28 November 2016
P-0113	Second Letter from Pakistan to the World Bank	28 November 2016
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P-0119	Letter from Pakistan to the World Bank	13 July 2017
P-0120	Letter from the World Bank to the Parties (with Annex)	31 March 2022
P-0121	World Bank Group Archives, Indus Basin Negotiations Inventory List Available at: https://thedocs.worldbank.org/en/doc/30b6e86fe9d76caf7085ec8cd168bf52-0240022021/original/Archives-mediation- exhibit-Indus-folder-list-with-hyperlinks.pdf (last accessed 22 March 2023)	
P-0122	Pakistan's Memorial (*Kishenganga* arbitration)	27 May 2011
P-0123	India's Counter-Memorial (*Kishenganga* arbitration)	23 November 2011
P-0124	Pakistan's Reply (*Kishenganga* arbitration)	21 February 2012
P-0125	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 3	22 August 2012
P-0126	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 4	23 August 2012
P-0127	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 8	29 August 2012
P-0128	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 9	30 August 2012
P-0129	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 10	31 August 2012
P-0130	Proposal by the International Bank Representative for a Plan for the Development and Use of the Indus Basin Waters (the "**1954 Proposal**") [IWT-02615][958]	5 February 1954
P-0131	International Bank for Reconstruction and Development, Aide Memoire of 21 May 1956 (the "**1956 Aide Memoire**") [IWT-03923]	21 May 1956

[958] References to IWT-##### are to the documents as sourced from the World Bank archives (see Appendix C to the Response of Pakistan).

No.	Title	Date
P-0132	Preliminary Tentative Draft (Indian) [IWT-00306]	10 August 1959
P-0133	Rough Draft (Pakistan) [IWT-00312]	10 August 1959
P-0134	Letter from Mr Mueenuddin to Mr W. A. Sheikh [Annex PK-11][959]	15 September 1959
P-0135	Indus Waters, Heads of Agreement for an International Water Treaty: Memorandum by the Bank Representative [IWT-04914]	15 September 1959
P-0136	Indus Waters, Heads of Agreement (“**Heads of Agreement 1959**”) [IWT-04917, IWT-04918, IWT-04932, IWT-04934 and IWT-04938]	15 September 1959
P-0137	Indus Waters Treaty draft (for circulation within the working group only) [without Annexures] (“**November 1959 draft**”) [IWT-00236]	24 November 1959
P-0138	World Bank – list of riders proposed by India and Pakistan respectively for inclusion in the draft treaty text dated 24 November 1959 [IWT-00224]	24 November 1959
P-0139	Indus Waters Treaty 1960 draft of 9 December 1959 [without Annexures] (“**December 1959 draft**”) [IWT-00121]	9 December 1959
P-0140	Letter from Mr Mueenuddin to Mr W.A. Shaikh [Annex PK-13]	15 December 1959

[959] References to “Annex PK-XX” are to exhibits provided as part of Volume 4 to Pakistan’s Memorial, *Kishenganga* arbitration.

No.	Title	Date
P-0141	Comparative Table of Provisions of the Heads of Agreement of 15 September 1959 and the Draft Indus Waters Treaty of 9 December 1959 (originally enclosed with the letter from G. Mueenuddin to W.A. Shaikh (Secretary to the Government of Pakistan (Ministry of Works, Irrigation & Power)) of 15 December 1959) ("**Comparative Table of Provisions, 15 December 1959**") [Annex PK-14]	15 December 1959
P-0142	Decisions of the Cabinet Committee on the Draft of the Indus Waters Treaty, Meeting of 15 February 1960 ("**Cabinet Committee Decisions, 15 February 1960**") [Annex PK-17]	15 February 1960
P-0143	Indus Waters Treaty 1960 draft of 20 April 1960 [without Annexures] ("**April 1960 draft**") [IWT-00144]	20 April 1960
P-0144	Indus Waters Treaty 1960 (Draft of December 9, 1959): List of Amendments dated April 20, 1960 [IWT-00199]	20 April 1960
P-0145	Annexure G – Settlement of Differences by a Neutral Expert (Article IX(2)), Draft [IWT-00188]	22 April 1960
P-0146	Annexure H – Court of Arbitration (Article IX(5)), Draft [IWT-00191]	22 April 1960
P-0147	Indus Waters Treaty 1960 – Annexure F, Neutral Expert (Article IX(2)), Draft [IWT-00101]	6 June 1960
P-0148	Indus Waters Treaty 1960 – Annexure G, Court of Arbitration (Article IX(5)), Draft [IWT-00109]	6 June 1960
P-0149	Indus Waters Treaty 1960 – Annexure F (Draft dated 6th June, 1960) – Amendments proposed by Pakistan [IWT-00044]	[Undated]

No.	Title	Date
P-0150	Indus Waters Treaty 1960 – Annexure F (Draft dated 6th June, 1960) – Amendments proposed by India [IWT-00055]	[Undated]
P-0151	Indus Waters Treaty 1960, Draft of 8th June 1960 [without Annexures] (“**June 1960 draft**”) [IWT-00014]	8 June 1960
P-0152	Annexures C-F – Second list of amendments proposed by India [IWT-00008]	25 August 1960
P-0153	Indus Waters Treaty – President’s Report and Recommendations [IWT-05173]	6 September 1960
P-0154	World Bank Press Release no. 650 (confirming the signature of the Indus Waters Treaty 1960) (“**World Bank Press Release, 19 September 1960**”) Available at: https://documents1.worldbank.org/curated/ar/127721589378651773/pdf/Announcement- of-Indus-Water-Treaty-Signed-on- September-19-1960.pdf (last accessed 22 March 2023)	19 September 1960
P-0155	Email from the Neutral Expert to the World Bank (regarding India’s comments on the summary of the hand-over meeting with the Neutral Expert held on 21 November 2022)	31 January 2023
P-0156	India’s Request for the Appointment of a Neutral Expert (“**Neutral Expert Request**”)	4 October 2016

Factual Exhibits submitted by Pakistan prior to the Hearing on Competence - 9 May 2023

P-0157	Letter No. Y-20014/1/2014-IT/2110	9 October 2014
P-0158	Letter No. WT(51)/(7450-A)/PCIW	29 October 2014
P-0159	Letter No. Y-20017/2/2014-IT/2115	14 November 2014
P-0160	Letter No. Y-20017/2/2014-IT/2117	24 November 2014

No.	Title	Date
P-0161	Letter No. WT(9)/(7467-A)/PCIW	13 March 2015
P-0162	Letter No. WT(9)/(7471-A)/PCIW	7 April 2015
P-0163	Letter No. Y-20017/2/2014-IT/2131	9 April 2015
P-0164	Letter No. Y-20017/2/2014-IT/2137	6 May 2015
P-0165	Letter No. WT(9)/(7479-A)/PCIW	13 May 2015
P-0166	Letter No. WT(9)/7487-A/PCIW	16 June 2015
P-0167	Letter No. Y-20017/2/2014-IT/2148	26 June 2015
P-0168	Letter No. WT(9)/(7501-A)/PCIW	11 August 2015
P-0169	Letter No. WT(9)/(7506-A)/PCIW	21 September 2015
P-0170	Letter No. Y-20017/2/2014-IT/2166	3 November 2015
P-0171	Note Verbale No. KA(II)-2/11/2015	16 November 2015
P-0172	Letter No. WT(132)/(7526-A)/PCIW	9 February 2016
P-0173	Letter No. WT(9)/(7541-A)/PCIW	8 April 2016
P-0174	Letter No. WT(9)/(7569-A)/PCIW	19 October 2016
P-0175	Letter No. WT(9)/(7622-A)/PCIW	8 September 2017
P-0176	Letter No. WT(9)/(7648-A)/PCIW	19 February 2018
P-0177	Letter No. WT(51)/(7653-A)/PCIW	19 March 2018
P-0178	Letter No. Y-20017/1/2018-IT/2261	20 March 2018
P-0179	Letter No. Y-20017/1/2018-IT/2263	23 March 2018
P-0180	Record of the 114th Meeting of the Permanent Indus Commission, 29-30 March 2018	31 March 2018
P-0181	Letter No. WT(9)/(7658-A)/PCIW	9 April 2018
P-0182	Letter No. WT(51)/(7662-A)/PCIW	28 April 2018

No.	Title	Date
P-0183	Letter No. Y-20017/2/2018-IT/2267	11 May 2018
P-0184	Letter No. WT(51)/(7666-A)/PCIW	5 June 2018
P-0185	Letter No. WT(51)/(7669-A)/PCIW	9 July 2018
P-0186	Letter No. Y-20017/2/2018-IT/2275	31 July 2018
P-0187	Letter No. WT(51)/(7675-A)/PCIW	8 August 2018
P-0188	Record of the 115th Meeting of the Permanent Indus Commission, 29-30 August 2018	30 August 2018
P-0189	Letter No. Y-20017/3/2018-IT/2282	7 September 2018
P-0190	Letter No. Y-20017/3/2018-IT/2285	20 September 2018
P-0191	Letter No. WT(9)/(7683-A)/PCIW	28 September 2018
P-0192	Letter No. WT(45)/(7682-A)/PCIW	28 September 2018
P-0193	Letter No. Y-20017/3/2018-IT/2287	16 October 2018
P-0194	Letter No. WT(45)/(7694-A)/PCIW	24 November 2018
P-0195	Letter No. WT(45)/(7698-A)/PCIW	24 December 2018
P-0196	Letter No. Y-20017/3/2018-IT/2295	9 January 2019
P-0197	Letter No. WT(9)/(7701-A)/PCIW	12 January 2019
P-0198	Letter No. Y-20017/3/2018-IT/2298	16 January 2019
P-0199	Letter No. WT(9)/(7702-A)/PCIW	17 January 2019
P-0200	Letter No. Y-20017/3/2018-IT/2299	22 January 2019
P-0201	Record of the 119th General Tour of Inspection by the Permanent Indus Commission, 27 January–1 February 2019	1 February 2019
P-0202	Letter No. WT(9)/(7722-A)/PCIW	30 May 2019
P-0203	Letter No. WT(9)/(7729-A)/PCIW	23 July 2019

No.	Title	Date
P-0204	Letter No. WT(51)/(7750-A)/PCIW	8 October 2019
P-0205	Letter No. WT(51)/(7753-A)/PCIW	25 October 2019
P-0206	Letter No. WT(51)/(7764-A)/PCIW	4 December 2019
P-0207	Letter No. WT(51)/(7767-A)/PCIW	27 December 2019
P-0208	Letter No. WT(9)/(7788-A)/PCIW	12 June 2020
P-0209	Letter No. WT(9)/(7860-A)/PCIW	18 March 2021
P-0210	Letter No. WT(9)/(7898-A)/PCIW	10 June 2021
P-0211	Letter No. WT(9)/(7917-A)/PCIW	6 July 2021
P-0212	Letter No. WT(9)/(7946-A)/PCIW	12 August 2021
P-0213	Letter No. WT(9)/(7977-A)/PCIW	29 September 2021
P-0214	Letter No. WT(9)/(8045-A)/PCIW	22 February 2022
P-0215	Record of the 116th Meeting of the Permanent Indus Commission, 23–24 March 2021	3 March 2022
P-0216	Record of the 117th Meeting of the Permanent Indus Commission, 1–3 March 2022	3 March 2022
P-0217	Letter No. WT(132)/(8086-A)/PCIW (with enclosures)	17 June 2022
P-0218	Letter No. WT(51)/(8094-A)/PCIW	27 July 2022
P-0219	Letter No. WT(51)/(8099-A)/PCIW	8 September 2022
P-0220	Letter No. WT(51)/(8110-A)/PCIW	18 November 2022
P-0221	Letter No. Y-20017/3/2007-IT/2423	25 January 2023
P-0222	Letter No. WT(150)/(8121-A)/PCIW	8 February 2023
P-0223	Letter No. WT(150)/(8124-A)/PCIW	24 February 2023
P-0224	Letter No. WT(150)/(8126(A)-A)/PCIW	24 March 2023

No.	Title	Date
P-0225	Letter No. WT(132)/(6997-A)/PCIW	29 April 2009
P-0226	Note Verbale No. KA (II)-2/2/2010	9 April 2010
P-0227	India's Rejoinder (*Kishenganga* arbitration)	21 May 2012

Factual Exhibits submitted by Pakistan at the Hearing on Competence - 13 May 2023

P-0228	Letter No. WT(127)/(6410-A)/PCIW (with enclosure)	8 May 2003
P-0229	Letter No. WT(127)/(6420-21 A)/PCIW (with enclosure)	20 June 2003
P-0230	Letter No. WT(127)/(21)/PCIW	15 January 2005
P-0231	Letter No. 16/4/2004-FB.II	21 April 2005

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P-0232	Tennessee Valley Authority, "Our History" Available at: https://www.tva.com/about-tva/our-history (last accessed 18 March 2024)	
P-0233	D. E. Lilienthal, "Another 'Korea' in the Making?", *Collier's Magazine* ("**Lilienthal, 1951**") [IWT-01645]	4 August 1951
P-0234	A. A. Michel, *The Indus Rivers: A Study of the Effects of Partition* (Yale University Press) ("**Michel, 1967**") [Extracts, pp. 195−267]	1967
P-0235	Embassy of Pakistan (Washington, D.C.), Press Release No. 34 "India's Stoppage of Canal Water Leads to Mass Evacuation From Affected Areas. Millions of Acres Turned Desert visited by Journalists"	14 June 1958
P-0236	Embassy of Pakistan (Washington, D.C.), Press Release No. 35 "Stoppage of Canal Waters New Threat to Pakistan's Lifelines" [IWT-03436]	18 June 1958

No.	Title	Date
P-0237	Letter from Prime Minister Nehru to Prime Minister Khan Noon [IWT-04404]	10 June 1958
P-0238	Letter from Mr Sivasankar, Embassy of India to the United States, to Mr Iliff, enclosing Letter from Prime Minister Khan Noon to Prime Minister Nehru, 16 June 1958 [IWT-04453]	20 June 1958
P-0239	Letter from Mr Iliff to Mr Shoaib [IWT-05046]	5 February 1960
P-0240	Letter from Mr Iliff to Mr Mueenuddin [IWT-05096]	2 April 1960
P-0241	*Indus Waters Kishenganga Arbitration (Pakistan v India)*, Pakistan's Request for Arbitration ("***Kishenganga* arbitration, Pakistan's Request for Arbitration**")	17 May 2010
P-0242	Ministry of External Affairs, Government of India, "Matters pertaining to the Indus Waters Treaty" Available at: https://www.mea.gov.in/press-releases.htm?dtl/36761/Matters+pertaining+to+the+Indus+Waters+Treaty (last accessed 18 March 2024)	6 July 2023
P-0243	Ministry of External Affairs, Government of India, "Meeting of Neutral Expert proceedings on the Indus Waters Treaty" Available at: https://www.mea.gov.in/press-releases.htm?dtl/37133/Meeting+of+Neutral+Expert+proceedings+on+the+Indus+Waters+Treaty#:~:text=Ministry%20of%20External%20Affairs%20Government%20of%20India&text=The%20meeting%20was%20convened%20by,representatives%20of%20India%20and%20Pakistan. (last accessed 18 March 2024)	21 September 2023
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P-0245	U. Z. Alam, "Water Rationality: Mediating the Indus Waters Treaty", Ph.D. Thesis, Geography Department, University of Durham ("**Alam, 1998**") [Extracts, pp. 28−38, 174−182]	September 1998

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P-0247	K. Frenken (ed.), "Irrigation in Southern and Eastern Asia in figures", AQUASTAT Survey – 2011, FAO Water Reports (37) [Extracts, pp. 264−272, 376−387]	2011
P-0248	L. Lytton and others, "Groundwater in Pakistan's Indus Basin: Present and Future Prospects", Water Global Practice, World Bank Group, Washington DC [Extracts, pp. xiii-xiv, 1−30] Available at: https://documents1.worldbank.org/curated/en/501941611237298661/pdf/Groundwater-in-Pakistan-s-Indus-Basin-Present-and-Future-Prospects.pdf (last accessed 18 March 2024)	2021
P-0249	W. J. Young and others, "Pakistan: Getting More from Water", (2019) Water Security Diagnostic, World Bank Group, Washington DC [Extract, pp. 1−11] Available at: https://openknowledge.worldbank.org/entities/publication/0a0d81f4-614e-531c-8023-15a9e8db5a13 (last accessed 18 March 2024)	1 January 2019
P-0250	USAID Sustainable Water Partnership, Country Profile – India (2021) Available at: https://www.globalwaters.org/resources/assets/india-water-resources-profile (last accessed 18 March 2024)	10 August 2021
P-0251	Ministry of Water Resources, Government of India, "River Basin Atlas of India" (2012) Available at: www.indiawris.gov.in/wris/#/atlas (last accessed 18 March 2024)	
P-0252	World Bank, "Average precipitation in depth (mm per year) – Pakistan, India" (*World Bank*) Available at: https://data.worldbank.org/indicator/AG.LND.PRCP.MM?end=2020&locations=PK-IN&most_recent_value_desc=true&start=1961&view=chart (last accessed 18 March 2024)	2021

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P-0254	Pakistan Meteorological Department's Normal Annual Rainfall Map of Pakistan	1981-2010
P-0255	India-Water Resource Information System (WRIS) Average Annual Rainfall Map Available at: https://indiawris.gov.in/downloads/Average%20Annual%20Rainfall.pdf (last accessed 18 March 2024)	1971-2005
P-0256	A. N. Laghari and others, "The Indus basin in the framework of current and future water resources management" (2012) 16(4) *Hydrology and Earth System Sciences* Available at: https://hess.copernicus.org/articles/16/1063/2012/hess-16-1063-2012.pdf (last accessed 18 March 2024)	2 April 2012
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P-0258	Pakistan Bureau of Statistics, Government of Pakistan "7th Population & Housing Census 2023" Available at: https://www.pbs.gov.pk/content/announcement-results-7th-population-and-housing-census-2023-digital-census (see https://www.pbs.gov.pk/sites/default/files/population/2023/Pakistan.pdf) (last accessed 18 March 2024)	2023
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P-0277	World Bank, “Indus Waters Settlement Plan” Available at: https://documents1.worldbank.org/curated/zh/855531468078531004/pdf/multi0page.pdf (last accessed 18 March 2024)	18 April 1960

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P-0279	L. Lytton and B. Saeed, "Managing Groundwater Resources in Pakistan's Indus Basin" (*World Bank*)	25 March 2021
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P-0286	Private Power and Infrastructure Board, Ministry of Energy (Power Division), Government of Pakistan, “Hydropower Resources of Pakistan” [Extract, p. 9]	July 2022
P-0287	J. Thakur, “Exploring the Hydropower Potential in India’s Northeast”, (March 2020) *ORF Issue Brief*, Issue No. 341	March 2020
P-0288	“Abysmally low water storage capacity in country” *DAWN* (Karachi) Available at: https://www.dawn.com/news/1523069 (last accessed 18 March 2024)	19 December 2019
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P-0319	G. L. Morris, "Classification of Management Alternatives to Combat Reservoir Sedimentation", *Water* (12(3))	19 March 2020
P-0320	"India's Grand Plan for Kashmir Dams", *The Diplomat* Available at: https://thediplomat.com/2022/10/indias-grand-plan-for-kashmir-dams/ (last accessed 18 March 2024)	15 October 2022
P-0321	"India hastens hydropower projects in Jammu and Kashmir", *The Third Pole* Available at: https://www.thethirdpole.net/en/energy/india-hastens-hydropower-projects-in-jammu-and-kashmir/ (last accessed 18 March 2024)	24 July 2017
P-0322	"India fast-tracks Kashmir hydro projects that could affect Pakistan water supplies", *The Guardian* Available at: https://www.theguardian.com/world/2017/mar/16/india-fast-tracks-kashmir-hydro-projects-that-could-affect-pakistan-water-supplies (last accessed 18 March 2024)	16 March 2017
P-0323	"Kishtwar in J-K set to become major power generation hub of north India", *Economic Times* Available at: https://energy.economictimes.indiatimes.com/news/power/kishtwar-in-j-k-set-to-become-major-power-generation-hub-of-north-india/93764939 (last accessed 18 March 2024)	25 August 2022
P-0324	"J&K's Kishtwar will become north India's major 'power hub': Jitendra Singh", *Business Standard* Available at: https://www.business-standard.com/india-news/j-k-s-kishtwar-will-become-north-india-s-major-power-hub-says-union-minister-jitendra-singh-123060300718_1.html (last accessed 18 March 2024)	3 June 2023
P-0325	J. Briscoe, "War or peace on the Indus?", *The News International* Available at: https://johnbriscoe.seas.harvard.edu/files/johnbriscoe/files/108._john_briscoe_war_or_peace_on_the_indus_201004.pdf (last accessed 18 March 2024)	3 April 2010

No.	Title	Date
P-0326	J. Briscoe, "Troubled Waters: Can a Bridge be Built over the Indus?" (2010) 45(50) Economic and Political Weekly 28	11 December 2010
P-0327	Indian Independence Act, 1947 ("**1947 Independence Act**")	18 July 1947
P-0328	Letter No. WT(51)/(8130-A)/PCIW	17 May 2023
P-0329	Letter No. WT(51)/(8155-A)/PCIW	20 February 2024
P-0330	Record of the 104th Meeting of the Permanent Indus Commission, 27-31 March 2010	31 May 2010
P-0331	Record of the 72nd Meeting of the Permanent Indus Commission, 19-22 May 1989 with Annexure (1989 Agreement (on the communication of information about flood flows))	22 May 1989
P-0332	Letter No. WT (61)/(7717-A)/PCIW	3 May 2019
P-0333	Letter No. WT(61)/(7726-A)/PCIW	1 July 2019
P-0334	Letter No. WT(61)/(7730-A)/PCIW	25 July 2019
P-0335	Letter No. WT(61)(7785-A)/PCIW	2 June 2020
P-0336	Letter No. WT(61)/(7886-A)/PCIW (with enclosure)	7 June 2021
P-0337	Letter No. WT(61)/(7913-A)/PCIW (with enclosure)	1 July 2021
P-0338	Letter No. WT(61)/(8091-A)/PCIW	1 July 2022
P-0339	Letter No. WT(61)/(8134-A)/PCIW	7 June 2023
P-0340	Letter No. WT(61)/(8139-A)/PCIW	6 July 2023
P-0341	Letter No. WT(61)(8141-A)/PCIW	17 July 2023
P-0342	Letter No. Y-20014/1/2018-IT/2317	26 July 2019
P-0343	Letter No. Y-20014/1/2018-IT/2319	20 August 2019
P-0344	Letter No. WT(61)/(7739-A)/PCIW	1 August 2019
P-0345	Record of the 118th Meeting of the Permanent Indus Commission, 30-31 May 2022	31 May 2022

No.	Title	Date
P-0346	Letter No. WT(61)/(7797-A)/PCIW	3 July 2020
P-0347	D. Gilmartin, *Blood and Water: The Indus River Basin in Modern History* (University of California Press) [Extract, pp. 144–181]	2020
P-0348	R. B. Buckley, *The Irrigation Works of India and Their Financial Results, being a Brief History and Description of the Irrigation Works of India, and of the Profits and Losses Which They Have Caused the State* (WH Allen) [Extract, pp. 129–171]	1880
P-0349	Draft Agreement between the Punjab and Sind regarding the Sharing of the Waters of the Indus and Five Punjab Rivers ("**1945 Draft Agreement**") [Extract, draft agreement without accompanying tables]	28 September 1945
P-0350	Government of Pakistan, "The Indus Basin Irrigation Water Dispute" [IWT-00897]	8 December 1952
P-0351	D. Haines, *Rivers Divided: Indus Basin Waters and the Making of India and Pakistan* (Hurst) [Extracts, pp. 40–59, 106–109]	2017
P-0352	K. Reitzler, "Fluid Boundaries in the Divisible College: The International Law Association and the Indus Waters Dispute in the 1950s", in M. M. Payk and K. C. Priemel (*eds*.), *Crafting the International Order* (OUP, 2021) [Extract, pp. 224–228]	2021
P-0353	D. Haines, "(Inter)Nationalist rivers?: cooperative development in David Lilienthal's plan for the Indus Basin, 1951", 6 *Water Hist* 133	2014
P-0354	Letter from Mr Black to Prime Minister Khan [IWT-00572]	6 September 1951
P-0355	Letter from Mr Black to Prime Minister Nehru [IWT-00577]	6 September 1951
P-0356	Letter from Mr Black to Prime Minister Nazimuddin [IWT-00409]	8 November 1951

No.	Title	Date
P-0357	Letter from Mr Black to Prime Minister Nehru [IWT-00406]	8 November 1951
P-0358	Letter from Mr Lilienthal to Dr Khosla [IWT-01015]	13 December 1951
P-0359	World Bank, Notes for Mr Black's Party, "India-Pakistan Water Rights" [IWT-01044]	23 January 1952
P-0360	Letter from Mr Black to Prime Minister Nazimuddin [IWT-00414]	13 March 1952
P-0361	Letter from Mr Black to Prime Minister Mohammed Ali [Annex PK-3]	8 February 1954
P-0362	Letter from Mr Iliff to Mr Mueenuddin (with enclosure) (Annex setting out some suggestions for 'Heads of Agreement' ("**May 1957 Heads of Agreement**")) [IWT-04094]	13 May 1957
P-0363	Pakistan's Memorandum [Annex PK-6]	14 June 1957
P-0364	Letter from Mr Gulhati to Mr Iliff (with enclosure) [Annex PK-7]	25 July 1957
P-0365	Letter from Mr Mueenuddin to Mr W. A. Sheikh (with enclosures)	17 August 1959
P-0366	Letter from Mr Ahmad, Embassy of Pakistan to the United States, to Mr Laylin (with enclosure) [Annex PK-9]	27 August 1959
P-0367	Letter from Mr Iliff to Finance Minister Shoaib	6 February 1960

No.	Title	Date
P-0368	"India completely stops Ravi river water flow to Pakistan. Historical context and significance", *The Economic Times* (Mumbai) Available at: https://economictimes.indiatimes.com/news/india/india-completely-stops-ravi-river-water-flow-to-pakistan-historical-context-and-significance/articleshow/107980936.cms (last accessed 18 March 2024)	26 February 2024
P-0369	"Flow of Ravi water to Pakistan fully stopped: Report", *The Times of India* (Mumbai) Available at: https://timesofindia.indiatimes.com/india/flow-of-ravi-water-to-pakistan-fully-stopped-report/articleshow/107970921.cms (last accessed 18 Mach 2024)	26 February 2024
P-0370	Register of the Raymond Albert Wheeler papers, 1898-1977, Collection Number 78062, Hoover Institution Library and Archives (annotated by counsel for Pakistan)	
P-0371	"Gen. Raymond Wheeler Dead; Led Army Corps of Engineers", *The New York Times*	10 February 1974
P-0372	M. R. Patterson, "Raymond Albert Wheeler – Lieutenant General, United States Army", *Arlington National Cemetery* Available at: https://www.arlingtoncemetery.net/rawheel.htm (last accessed 18 March 2024)	18 December 2023
P-0373	Note from Neil Bass to Files, "Indus Basin Conference" [IWT-03706−03714]	7 May 1952
P-0374	World Bank Press Release No. 289 [IWT-03717]	1 May 1952
P-0375	"The Indus Basin Waters Dispute, A Report by the Bank Representatives and Associates" [Wheeler, Box 52, Folder 1, pp. 107−161]	8 February 1954
P-0376	"The Development and Use of the Indus River and Tributaries in India and Pakistan, A Report by the Bank Representative and Associates" [IWT-00345 up to and including IWT-00416]	26 February 1954

No.	Title	Date
P-0377	Letter from Dr Khosla to Gen. R. A. Wheeler [IWT-01878]	25 March 1954
P-0378	Letter from Mr Iliff to Mr Black (with enclosures) [IWT-04949, IWT-04950 and IWT-04951]	24 August 1959
P-0379	Indus Waters Treaty 1960, Annexure D (Draft dated 6^{th} June, 1960), Amendments proposed by India [IWT-00048]	
P-0380	Indus Waters Treaty 1960, Annexure D (Draft dated 6^{th} June, 1960), Amendments proposed by Pakistan [IWT-00041]	
P-0381	General Wheeler, Memorandum to Files [IWT-00487]	3 February 1954
P-0382	Letter No. F. 24/54/60 from Prime Minister Mohammed Ali to Mr Black [IWT-01924 to 01926]	14 May 1954
P-0383	Letter from Foreign Minister Zafrulla Khan to Mr Black [IWT-01940]	28 July 1954
P-0384	Letter from Mr Garner to Prime Minister Nehru [IWT-01939 and IWT-01940]	28 July 1954
P-0385	Letter from Mr Black to Prime Minister Nehru (with enclosures) [IWT-01878]	13 August 1954
P-0386	Letter from Prime Minister Nehru to Mr Black [IWT-01878]	19 August 1954
P-0387	Letter from Foreign Minister of Pakistan to Mr Black [IWT-01878]	24 August 1954
P-0388	Letter from Malik Feroz Khan Noon to the Minister of Interior of Pakistan [IWT-04599]	20 October 1954

No.	Title	Date
P-0389	World Bank, Record of a Meeting at the World Bank, Washington, D.C. [IWT-03836]	13 March 1956
P-0390	Memorandum from Mr Iliff to Files [IWT-03922]	21 May 1956
P-0391	World Bank, Proceedings at Meeting of Executive Directors on June 6, 1956, "Indus Waters Question" [IWT-03818]	6 June 1956
P-0392	Letters from Mr Iliff to Mr Gulhati and Mr Mueenuddin [IWT-04060 and IWT-04061]	30 July 1956
P-0393	Response from Mr Mueenuddin to Mr Iliff [IWT-04066]	10 September 1956
P-0394	Response from Mr Gulhati to Mr Iliff [IWT-04070]	15 September 1956
P-0395	World Bank, Minutes of the Meeting [IWT-01125]	19 September 1956
P-0396	World Bank, Minutes of the Meeting (Pakistan Delegation) [IWT-01135]	22 October 1956
P-0397	World Bank, Minutes of the Meeting (Indian representatives) [IWT-01128]	28 September 1956
P-0398	World Bank, Minutes of Meetings (Indian Delegation) [IWT-01132]	10, 12 and 16 October 1956
P-0399	World Bank, Minutes of the Meeting (Bank only) [IWT-01133]	11 October 1956
P-0400	Tipton and Kalmbach, Inc., "Report on Irrigation Water Requirements for West Pakistan" [IWT-02524]	30 April 1957
P-0401	Letter from Mr Black to Prime Minister Suhrawardy [IWT-04072]	11 April 1957

No.	Title	Date
P-0402	Data on annual inflow volumes into Pakistan of the Indus, Jhelum, Chenab, Ravi, and Sutlej Rivers	
P-0403	Letter from Prime Minister Suhrawardy to Mr Black [IWT-04080]	20 April 1957
P-0404	Letter from Prime Minister of India to Mr Black [IWT-04077−IWT-04078]	24 April 1957
P-0405	World Bank Press Release [IWT-04085]	6 May 1957
P-0406	Letter from Mr Mueenuddin to Mr Iliff [IWT-04110]	20 May 1957
P-0407	Letter from Mr Iliff to Mr Gulhati (enclosure omitted) [IWT-04092]	13 May 1957
P-0408	Telegram from Mr Black to President Ayub [IWT-04943]	30 August 1959
P-0409	Central Board of Irrigation, *Hydro-Electric development in India* (Leaflet No. 5, Second Edition) [IWT-02799]	September 1950
P-0410	Preliminary notes and queries regarding the Annex to Mr Iliff's letter of 13 May 1957 (Pak Comments) [IWT-04102]	
P-0411	Mr Iliff, "Memorandum of Discussion on May 27 with Mr Gulhati and Dr Berber" [IWT-04105]	27 May 1957
P-0412	Summary Report of Mr Iliff's Talk with the Representatives of the Government of Pakistan – Lahore [IWT-04122]	11-14 June 1957
P-0413	Letter from Mr Iliff to Mr Mueenuddin [IWT-04150 and IWT-04151]	24 June 1957
P-0414	Letter from Mr Iliff to Mr Gulhati [IWT-04152 and IWT-04153]	24 June 1957

No.	Title	Date
P-0415	Letter from Mr Black to Prime Minister Nehru [IWT-04073]	11 April 1957
P-0416	Letter from Mr Mueenuddin to Mr Iliff [IWT-04158]	13 July 1957
P-0417	Letter from Mr Mueenuddin to Mr Iliff (with enclosure) [IWT-02672 and IWT-02675]	25 July 1957
P-0418	*Shorter Oxford English Dictionary*, (5th Edition: OUP 2003), Volume 2 [Extracts, pp. 2005, 2279, 2674, 2930 and 3197]	2003
P-0419	Letter from Mr Mueenuddin to Mr Iliff [IWT-04252 and IWT-04253]	16 August 1957
P-0420	Letter from Mr Mueenuddin to Mr Iliff (with enclosure) [IWT-04280−IWT-04285 and IWT-04286]	10 September 1957
P-0421	Letter from Mr M. S. Shaikh to Mr Sommers [IWT-04407]	31 March 1958
P-0422	Letter from Mr Sommers to Mr Iliff [IWT-04374]	31 March 1958
P-0423	Letter from H.E. M. Ali to Mr Sommers [IWT-04363]	3 April 1958
P-0424	Letter from Mr Gulhati to Mr Bengston, enclosing “Extract from the Minister’s speech” (the text of a speech given in the Lok Sabha by the Honorable Mr Patil, then Minister for Irrigation and Power, 26 March 1958) [IWT-04352 and IWT-04353]	7 April 1958
P-0425	Letter from Mr Black to Prime Minister Nehru [IWT-04336]	14 May 1958
P-0426	Letter from Prime Minister Nehru to Mr Black (with enclosure) [IWT-04311]	5 June 1958
P-0427	Letter from H.E. M. Ali to Mr Black [IWT-04327]	4 June 1958

No.	Title	Date
P-0428	Embassy of Pakistan (Washington, D.C.), Press Release No. 31 "India's Withholding of Pakistan's Share of Irrigation Water Breach of International Agreement" [IWT-03466]	7 June 1958
P-0429	Inward Telegram to Commonwealth Relations Office from UK High Commission in Pakistan [IWT-04425]	10 June 1958
P-0430	Embassy of Pakistan (Washington, D.C.), Press Release No. 34, "This Undeclared War" (*DAWN* of Karachi, 9 June 1958) [IWT-03450]	16 June 1958
P-0431	Letter from Mr Moynihan, Lahore to Mr Fowler, Karachi titled "Canal Waters" (with enclosure) [IWT-04190]	12 June 1958
P-0432	Daily Report – Foreign Radio Broadcasts: Pakistan and Afghanistan, "Canal Closure Act of Aggression—Khuro" [IWT-03445]	17 June 1958
P-0433	Daily Report, Foreign Radio Broadcasts: India, Ceylon, and Nepal, "Statement denies overuse of water" [IWT-03464]	13 June 1958
P-0434	Letter from Mr Bengston to Mr Mueenuddin (with enclosure) [IWT-03448]	17 June 1958
P-0435	U.P.I, Karachi, Pakistan [IWT-04426]	18 June 1958
P-0436	Letter from Mr Gulhati to Mr Bengston [IWT-04492]	24 June 1958
P-0437	World Bank, "Early Kharif 1958 Complaint, Summary and Conclusions" [IWT-03417 and IWT-03419]	(undated) 1958
P-0438	Note to Files from Mr Iliff [IWT-04388]	10 March 1958

No.	Title	Date
P-0439	World Bank Memorandum, “Indus Waters” [IWT-04769]	26 March 1959
P-0440	Office Memorandum, Mr Iliff to Files, “Indus Basin” [IWT-04763]	2 May 1959
P-0441	Record of meeting between representatives of the Government of India and of the World Bank [IWT-04751]	13 May 1959
P-0442	Embassy of Pakistan (Washington, D.C.), Press Release No. 16, “Pakistan Government Conveys Willingness to go forward on the basis of World Bank Plan” [IWT-04729]	25 May 1959
P-0443	World Bank, “Statement made by Chairman at Meeting of Executive Directors on May 26, 1959 regarding the Indus Waters Dispute” [IWT-04561]	26 May 1959
P-0444	Government of Pakistan, Press Information Department, “Press Statement by the World Bank”, Karachi [IWT-04747]	18 May 1959
P-0445	World Bank Memorandum, “Indus Waters” [IWT-04804 to IWT-04814]	13 July 1959
P-0446	Indus Waters Treaty, Proposed Heads of Agreement (Draft) (Secret) [IWT-00327]	26 April 1959
P-0447	Indus Waters Treaty, Proposed Heads of Agreement (Draft) (Secret) [IWT-04764]	1 May 1959
P-0448	Secret Telegram from Mr Iliff to Mr Gulhati (enclosed with Letter from Mr Iliff to the Ambassador of India to the US) [IWT-04724, IWT-04722 and IWT-04725]	27 May 1959
P-0449	Letter from President Ayub to Mr Black and Mr Iliff [IWT-04568]	18 May 1959

No.	Title	Date
P-0450	Letter from Mr Iliff to Mr Mueenuddin (with enclosure) [IWT-04837 and IWT-04839]	26 June 1959
P-0451	World Bank Office Memorandum from Mr Iliff to General Wheeler (without enclosure) [IWT-04887]	20 July 1959
P-0452	Letter from Mr Iliff to Mr Gulhati [IWT-04681]	16 June 1959
P-0453	Letter from Mr J. B. Drisko (TAMS) to Mr Iliff [IWT-04789]	13 July 1959
P-0454	World Bank, Minutes of Meeting [IWT-01232]	5 August 1959
P-0455	World Bank, Minutes of Meeting [IWT-01225]	10 August 1959
P-0456	World Bank, Minutes of Meeting (Indian representatives) [IWT-01222]	13 August 1959
P-0457	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01218]	14 August 1959
P-0458	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01217]	15 August 1959
P-0459	World Bank, Minutes of Meeting (Indian representatives) [IWT-01215]	20 August 1959
P-0460	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01214]	20 August 1959
P-0461	World Bank, Minutes of Meeting (Indian representatives) [IWT-01207]	21 August 1959
P-0462	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01209]	21 August 1959

No.	Title	Date
P-0463	World Bank, Minutes of Meeting (Indian representatives) *[Note: the Minutes record a meeting on Saturday 21 August, but the Saturday was 22 August]* [IWT-01210]	22 August 1959
P-0464	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01206]	23 August 1959
P-0465	World Bank, Minutes of Meeting (Indian representatives) [IWT-01205]	23 August 1959
P-0466	World Bank, Minutes of Meeting (Indian representatives) [IWT-01204]	24 August 1959
P-0467	World Bank, Minutes of Meeting (Indian representatives) [IWT-01203]	25 August 1959
P-0468	Message from President Ayub to Mr Black [IWT-04952]	21 August 1959
P-0469	World Bank, Minutes of Meeting [IWT-01201]	25 August 1959
P-0470	World Bank, Minutes of Meeting [IWT-01200]	27 August 1959
P-0471	World Bank, Minutes of Meeting, 10am [IWT-01199]	2 September 1959
P-0472	World Bank, Minutes of Meeting, 3pm [IWT-01198]	2 September 1959
P-0473	World Bank, Minutes of Meeting (Pakistan representatives) [IWT-01197]	3 September 1959
P-0474	World Bank, Minutes of Meeting [IWT-01195]	8 September 1959
P-0475	Letter from Mr Mueenuddin to Mr W. A. Sheikh	10 September 1959

No.	Title	Date
P-0476	Annexure D, Generation of Hydro-Electric Power by India on the Western Rivers, draft of 23 April 1960 ("**April 1960 draft of Annexure D**") [IWT-00171, IWT-00176, IWT-00177 and IWT-00179]	23 April 1960
P-0477	J. S. Gulliver and R. E. A. Arndt (*eds.*), *Hydropower Engineering Handbook* (McGraw-Hill Book Co 1991)	1991
P-0478	Indus Waters Treaty 1960, Annexure D: Generation of Hydro-Electric Power by India on the Western Rivers (Article III(2)(d)), draft of 6th June 1960 ("**June 1960 draft of Annexure D**") [IWT-00074]	6 June 1960
P-0479	Cable from Mr Iliff to Sir Kenelm Guinness (for Mr Mueenuddin) [IWT-04912]	23 September 1959
P-0480	Indus Basin Water Treaty, draft dated 10th November 1959 (with additions and changes suggested by the Pakistan Delegation) (secret)	10 November 1959
P-0481	Letter from Mr Iliff to Mr Mueenuddin, enclosing Memorandum by Bank Representative dated 11 December 1959	14 December 1959
P-0482	Letter from Finance Minister Shoaib to Mr Iliff	11 January 1960
P-0483	Memorandum from Mr Iliff to Files (with enclosure) [IWT-05099 and IWT-05017]	13 April 1960
P-0484	Cable from Ambassador Aziz Ahmed to Finance Minister Shoaib (with enclosure [incomplete])	14 April 1960
P-0485	World Bank records, Message received from Pakistan Ambassador at 12:15 pm [IWT-05103]	15 April 1960
P-0486	Office Memorandum from Mr Iliff to Files [IWT-05104]	16 April 1960
P-0487	Office Memorandum from Mr Iliff to Files [IWT-05108]	19 April 1960

No.	Title	Date
P-0488	Transcript, Hearing on the Merits (*Kishenganga* arbitration), Day 7	28 August 2012
P-0489	Annexure E, Construction of Storage Works by India on the Western Rivers, draft of 23 April 1960 [IWT-00180 and IWT-00185]	23 April 1960
P-0490	Bureau of Reclamation, *Design Standards No 14: Appurtenant Structures for Dams (Spillway and Outlet Works) Design Standards* (US Department of Interior)	October 2011
P-0491	Indus Waters Treaty 1960, Annexure E: Construction of Storage Works by India on the Western Rivers (Article III(4)) (Draft dated 6th June, 1960) [IWT-00088]	6 June 1960
P-0492	G. L. Morris and J. Fan, *Reservoir Sedimentation Handbook* (McGraw Hill 1998), [Extract, pp. 2.0−2.28]	
P-0493	Indus Waters Treaty 1960, Annexure E (Draft dated 6th June, 1960), Amendments proposed by India [IWT-00052]	
P-0494	World Bank, "Report and Recommendations of the President to the Executive Directors on a Proposed Loan to Pakistan for the Indus Basin Project" [Wheeler archives – Box 35, Folder 2]	18 April 1960
P-0495	Bank Note [IWT-05113]	27 June 1960
P-0496	Message for Prime Minister Nehru from Mr Black [IWT-05131]	8 July 1960
P-0497	World Bank, Minutes of Meeting [IWT-01241]	23 November 1959
P-0498	World Bank, Minutes of Meeting (Indian representatives) [IWT-01243]	8 December 1959
P-0499	World Bank, Minutes of Meeting (Indian representatives) [IWT-01245]	22 December 1959

No.	Title	Date
P-0500	World Bank, Minutes of Meeting (Indian representatives) [IWT-01246]	29 December 1959
P-0501	Office Memorandum from Mr Iliff to Files, "Indus Waters" enclosing "Notes from which Black spoke to Gulhati", 30 June 1960 [IWT-05122]	5 July 1960
P-0502	Office Memorandum from Mr Iliff to Files, "Indus" [IWT-05124]	5 July 1960
P-0503	Letter from Mr Iliff to H. E. Currim Chagla, Ambassador of India to the United States, (enclosing message for Prime Minister Nehru from Mr Black) [IWT-05130 and IWT-05131]	7 July 1960
P-0504	World Bank Press Release No. 626, "Indus Waters" [IWT-05074]	1 March 1959
P-0505	Office Memorandum from Mr Iliff to Files, "Indus Waters" [IWT-05127]	6 July 1960
P-0506	Note for President Ayub from Mr Black [IWT-05132]	7 July 1960
P-0507	Embassy of Pakistan, Washington D.C., Message received from President of Pakistan for Mr Black [IWT-05011]	11 July 1960
P-0508	Office Memorandum from Mr Iliff to Files, "Indus Negotiations" [IWT-05144]	25 July 1960
P-0509	Message from Mr Iliff to Mr Black [IWT-05205]	11 August 1960
P-0510	Letter from Mr Black to Prime Minister Nehru [IWT-05147]	5 August 1960
P-0511	Mr Iliff, Note of Conversation with the [Indian] Prime Minister [IWT-05154]	11 August 1960

No.	Title	Date
P-0512	Sir Kenelm Guinness, Note of Meeting on Transitional Arrangements [IWT-05158]	15 August 1960
P-0513	Message for Mr Black from Mr Iliff [IWT-05207]	15 August 1960
P-0514	Indus Waters Treaty 1960, Second List of Amendments Proposed by India [IWT-00006]	25 August 1960
P-0515	Letter from Mr Iliff to Sir Olaf Caroe [IWT-03026]	3 March 1961
P-0516	Redline of April 1960 draft as against December 1959 draft *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0517	Redline of June 1960 draft as against April 1960 draft *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0518	Redline of Indus Waters Treaty [main body] as against June 1960 draft *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0519	Redline of June 1960 draft of Annexure D as against April 1960 draft of Annexure D *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0520	Redline of Annexure D of the Indus Waters Treaty as against June 1960 draft of Annexure D *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0521	Redline of Indus Waters Treaty [main body] as against December 1959 draft *(Created by Counsel for Pakistan for the purposes of this Memorial)*	

No.	Title	Date
P-0522	Redline of Annexure D of the Indus Waters Treaty as against April 1960 draft of Annexure D *(Created by Counsel for Pakistan for the purposes of this Memorial)*	
P-0523	D. Felix and others, "Hydro-abrasive erosion of hydraulic turbines caused by sediment - a century of research and development" (2016) (49(12)) *IOP Conference Series: Earth and Environmental Science*	2016
P-0524	G. L. Morris, "Sediment Management Techniques", in G. W. Annandale and others (*eds*.), *Extending the Life of Reservoirs: Sustainable Sediment Management for Dams and Run-of-River Hydropower* (World Bank 2016)	2016
P-0525	G. L. Morris and others, "Reservoir Sedimentation", in M. H. García (*ed*.), *Sedimentation Engineering: Processes, Measurements, Modeling, and Practice* (ASCE 2007)	2007
P-0526	"Technical", *Merriam-Webster* Available at: https://www.merriam-webster.com/dictionary/technical (last accessed 18 March 2024)	
P-0527	*Shorter Oxford English Dictionary* (5th Edition: Oxford University Press 2002), Volume 1 [Extracts, pp. 653, 789]	2002
P-0528	W. E. Hager and others, *Hydraulic Engineering of Dams* (CRC Press 2021) [Extracts, pp. 516−521]	2021
P-0529	ICOLD, "Bulletin 178", *Operation of Hydraulic Structures of Dams*	2021
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