Background Paper

PERFORMANCE OF DISPUTE RESOLUTION MECHANISM OF THE INDUS WATERS TREATY

PILDAT
Pakistan Institute of Legislative Development And Transparency

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PILDAT
Pakistan Institute of Legislative Development And Transparency

Pakistan Institute of Legislative Development and Transparency - PILDAT
Islamabad Office: No. 7, 9th Avenue, F-8/1, Islamabad, Pakistan
Lahore Office: 45-A, Sector XX, 2nd Floor, Phase III Commercial Area, DHA, Lahore, Pakistan
Tel: (+92-51) 111-123-345; Fax: (+92-51) 226-3078
E-mail: info@pildat.org; Web: www.pildat.org

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Foreword

Foreword

Performance of Dispute Resolution Mechanism of the Indus Water Treaty is a briefing paper authored by **Mr. Asif Baig Mirza**, Indus Water Commissioner of Pakistan, for the 5th round of the Pakistan-India Parliamentarians Dialogue facilitated by PILDAT.

The paper highlights the dispute resolution mechanism contained in the Indus Water Treaty signed by both the countries in 1960 and talks about improving the dispute resolution mechanism defined in the treaty.

As an Independent think-tank, PILDAT believes that while diplomatic channels for Dialogue must continue, Parliamentarians from both sides should be facilitated for a greater interaction and developing a better understanding for resolving issues that lead diplomatic initiatives. It is for this objective that PILDAT has been facilitating Parliamentarians Dialogues between Pakistan and India.

Disclaimer

The views, opinions, findings and conclusions or recommendations expressed in this briefing paper are those of the author and do not necessarily reflect views of PILDAT.

Islamabad
September 2013

About the Author

Mr. Asif Baig Mirza, Indus Water Commissioner of Pakistan, is a Civil Engineer by profession with experience of 33 years in the field of water resources, hydrology and flood management. He holds a Bachelors degree in Civil Engineering from the University of Engineering & Technology, Lahore that he obtained in 1980. He obtained his Masters from the Asian Institute of Technology, Bangkok, Thailand in 1984. He has been associated with NESPAK, Pakistan's biggest engineering consultancy organization, and before being appointed as Pakistan's Commissioner for Indus Waters in 2012, he was serving as Vice President/Head of Water Resources Division.

Background

The Indus basin is one of the largest river basins of the world with areal extent of 450,000 square miles. It has an average annual inflow, including the flow of its tributaries, of 170 MAF (million acre-feet). Ravi, Sutlej and Beas are its Eastern Tributaries while Chenab, Jhelum and Kabul rivers are the Western Tributaries.

The inflows of these rivers at rim stations or the points above which water has not been diverted out of the river for irrigation (except for minor diversions in the mountainous areas) were as given in Table 1 at the time of the signing of the Treaty on the basis of the data available up to 1952.

The map of the basin is shown in Figure 1. It becomes immediately noticeable that international boundary between the two countries of India and Pakistan cuts across the rivers and canal systems and that the international and basin boundaries are different. Such drawing of the international border between the two countries led to the dispute of distribution of waters of the Indus basin between the two countries.

A closer look on the map shows that Ravi Sutlej and Beas, the eastern tributaries of the Indus River, travel significant distances in the plains before crossing over to Pakistan where again the Ravi and Sutlej rivers travel long distances before joining Chenab River near its confluence with the Indus River; the Beas joins the Sutlej River near the point of entry into Pakistan. It is also immediately noticeable that the Three Western Rivers, the Chenab, the Jhelum and the Indus leave the mountains either within Pakistan or Azad Jammu Kashmir or in close proximity of it (e.g. the Chenab River).

Such arrangement of the international boundary and physiography caused that India would not have much opportunity of tapping the water resources of the Western Rivers, except for hydropower development, as the availability of land for use of waters in the area under its control was very limited. But India had vast plains to irrigate from the Eastern Rivers and it laid the claim that India has the right to use of all the waters of the Eastern Rivers, though at that time the area that was being irrigated in Pakistan territory from the waters of the Eastern Rivers was higher than the area irrigated of the territory that became part of India.

The dispute between the two countries started in 1948 and after protracted negotiations utilizing the good offices of the World Bank, the Treaty was signed in 1960.

The Treaty

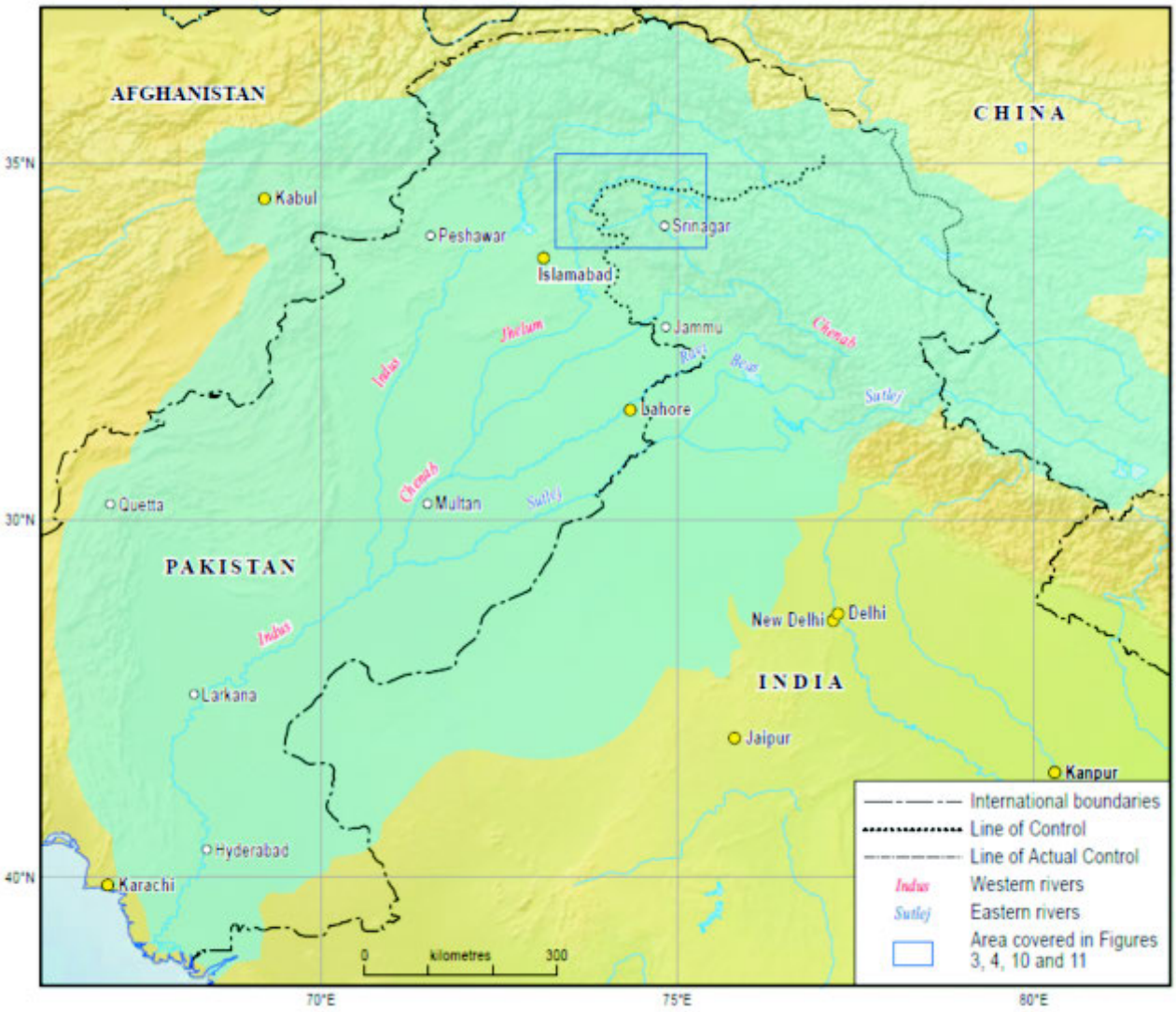
The main features of the Treaty are:

a) The waters of the three "Eastern Rivers" (Ravi, Beas and Sutlej) would be for exclusive use of India (Article I)
b) A system of Link Canals would be constructed in Pakistan to transfer water from the Western Rivers to those areas of the Eastern Rivers which before the Treaty were dependent on the supplies of the Eastern

Table 1: Inflows of the Rivers at the Time of Signing of Indus Water Treaty (1952 Data)

No.	River at Gauging Station	Average Annual Runoff (MAF)
1	Indus at Kalabagh (incudes flow of Kabul River)	90
2	Jhelum at Mangla	23
3	Chenab at Marala	23
4	Ravi at Madhopur	6.4
5	Beas at Mandi Plain	12.7
6	Sutlej at Rupar	13.5
Total		**168.6**

Figure-1: Map of Indus Basin



Rivers.

c) The waters of the three "Western Rivers" (Indus, Jhelum and Chenab) are mainly for use of Pakistan except for certain specified uses by India in the upper areas of the three Western Rivers.

d) India can utilize the waters of the Western Rivers for domestic, non-consumptive, agricultural, hydropower generation. The agricultural use is limited to 701,000 acres (400,000 acres in Jhelum basin, 231,000 acres from Chenab Rive and 70,000 acres from the Indus River). This includes areas that India can bring under cultivation both from the flow and from the water released from conservations storages (Annexure C).

e) Without the use of storage water, India is allowed to bring under cultivation areas 150,000 acres from the Jhelum and 50,000 acres from the Chenab, i.e., total of 200,000 acres (Annexure C).

f) The upper limit of the total storage that India can construct on the Western River is 2.85 MAF. It may be noted that no storage is allowed on the Jhelum Main (Annexure E)

g) India can use storage works for hydropower

generation; the filling and release criteria of the storage works is specified in the Treaty in Annexure E; the filling is allowed in the high flow season outside the period in which Kharif sowing is done in Pakistan while the release should be done in a manner that the flow in the river downstream does not fall below the natural flow rate at any point in time.

h) For hydropower generation, India can construct run-of-river projects on the Western Rivers, the design and operational criteria are given in Annexure D. The criteria are oriented towards minimizing the control over the storage. There is no bar on the number or size of the run-of-river hydroelectric projects.

i) A Transition Period has been specified in the Treaty for the construction of replacement works and during the transition period India would limit its withdrawals for Agricultural Use, limit abstractions for storages, and make deliveries to Pakistan from the Eastern Rivers. This period has ended on March 31, 1973.

j) The Treaty provides a dispute resolution mechanism, the issues are discussed first at the level of Permanent Indus Commission and if these remain unresolved the Commissioners of the two countries inform their respective Governments and the two Governments can then discuss and resolve the issues at their level. In case the issues still remain unresolved either Party can take the issue to a Neutral Expert or Court of Arbitration depending upon the nature of the dispute.

k) There are 23 specified technical questions given in Annexure F that are the domain of Neutral Expert while the disputes related to interpretation of the Treaty are the domain of Court of Arbitration.

l) Neutral Expert is required to be a highly qualified engineer in his/her field and is appointed by a consultative process between the Parties or by World Bank if the two parties do not come to an agreement in this regard.

m) The arbitration proceedings may be instituted by both the parties coming together to the Court of Arbitration or at the request of either Party. Unless otherwise agreed by the Parties the Court of Arbitration consists of seven arbitrators the four of which (two each) are nominees of the two Governments while the remaining three, the President, the legal member and the engineer member are appointed by a process clearly described in Annexure G to the Treaty.

n) Pakistan has built Mangla (5.34 MAF, now about 7.1 MAF), Tarbela (8.1 MAF, now 6.6 MAF), Chashma Barrage (0.5 MAF, now 0.25 MAF) 9 Link Canals and 6 barrages as irrigation and hydropower infrastructure.

o) The Treaty allocates all the waters of the Eastern Rivers (about 33 MAF) to India and 136 MAF (minus water for irrigating additional 0.7 million acres in Jhelum, Chenab and Indus basins) to Pakistan for developing its agriculture.

p) Pakistan has increased its irrigated agricultural area from 21 million acres in 1947 to the present value of 45 million acres while India has increased its irrigated agricultural area from 5 million acres to 21 million acres in the Indus basin, in the same period.

Indian Developments on the Western Rivers

Irrigated Agriculture

It may be noted that India has not constructed any storage dam on the Western Rivers yet and, therefore, as per paragraph 7 of Annexure C to the Treaty, its entitlements of additional area over the area on the effective date are restricted to 150,000 acres in the Jhelum basin and 50,000 acres in the Chenab basin while India has developed 107,265 acres in the Jhelum basin and 28,906 acres in the Chenab basin above the irrigated areas in these basins on the effective date. These figures are based on the data supplied by India under the treaty provisions.

Hydropower Development by India

Thus far, India has constructed 44 hydropower projects with total generation capacity of 3123 MW while 15 that are under construction would add 2915 MW to the generation capacity.

The names, location, type of the structure, and the installed capacity of the projects in each of the Chenab, Jhelum and the Indus are tabulated in Appendix I to this paper. It can be seen that major projects on the Chenab River are Salal, Baglihar, Dul Hasti, Pakal Dul, Ratle, Miyar, and Lower Kalnai. The major projects in the Jhelum Basin are Kishengana, Uri I, Uri-II and Lower Jhelum while the major projects on the Indus River are Chutak and Nimoo-Bazgo.

Table 2: Hydropower Projects of India

Sr. No.	Hydroelectric Projects of India	No. of Projects			Generation Capacity (MW)		
		Completed	Under Construction	Total	Completed	Under-Construction	Total
1	On Chenab River	15	5	20	2,009	2,533	4,542
2	On Jhelum River	17	6	23	1,013	370	1,383
3	On Indus River	12	4	16	101	12	113
	Total	**44**	**15**	**59**	**3,123**	**2,915**	**6,038**

All of these except Pakal Dul (under construction) are run-of-river projects. Pakal Dul is a storage project with live storage of 90,000 acre-feet.

Exchange of Data

Both Parties are exchanging data of stage and discharge as per requirements of Article VI of the Treaty. Pakistan is of the view that significant improvements are required in the quality and quantity of data being supplied by India. Pakistan on its part is making efforts of bringing in improvements in the data it is supplying to India.

However, taking opportunity of discussion on this occasion on exchange of data Pakistan wishes to convey its gratefulness on the supply of real time information during floods. The information is supplied by India at mutually agreed varying time steps for various categories of floods in the rivers. This is very valuable information as it becomes a flood forecast for Pakistan and helps us in providing timely flood out evacuation of the people from the areas likely to be affected. The information is supplied by India continuously for 24 hours and for all the days of a week without any holiday, throughout the flood season, whenever such situation arises.

Water Availability

It is interesting to compare the water availability of the Western Rivers before and after the Treaty. Table 2 gives average annual values for the Indus, Chenab and Jhelum while Figures 2 to 4 provide yearly values for the three rivers.

It can be seen from the figures in this paper that there is very little change in the annual flows of Chenab River which remains practically the same. The agricultural area irrigated on the Chenab River after the effective date of the

Table 3: Inflows of Western Rivers at Rim Stations in Pakistan

Sr. No.	River Stations	Annual Volume (MAF)	
		Pre - Treaty (1922 -1960)	Post - Treaty (1960 -2013)
1	Indus River at Kalabagh	91.05	88.27
2	Jhelum River at Mangla	23.16	22.21
3	Chenab River at Marala	25.52	25.38
	Total	**139.73**	**135.85**

Figure 2: Indus River at Kalabagh

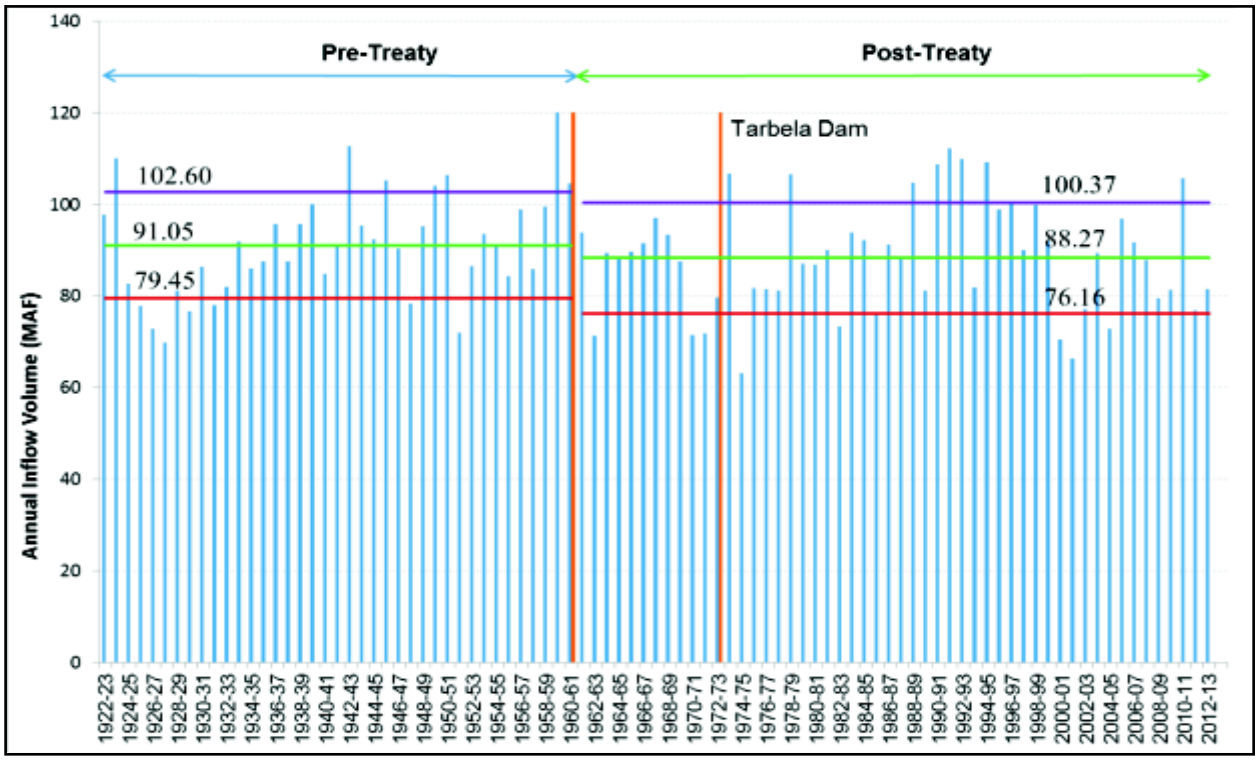


Figure 3: Jhelum River at Mangla

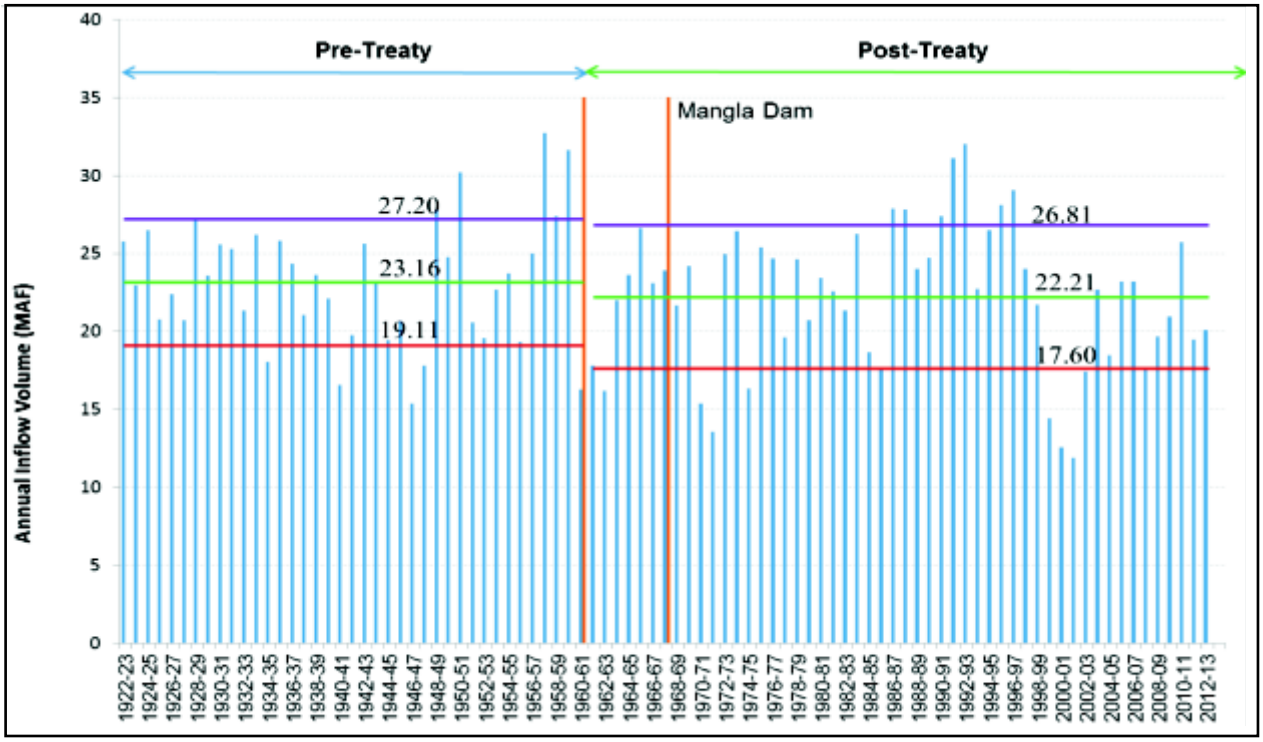
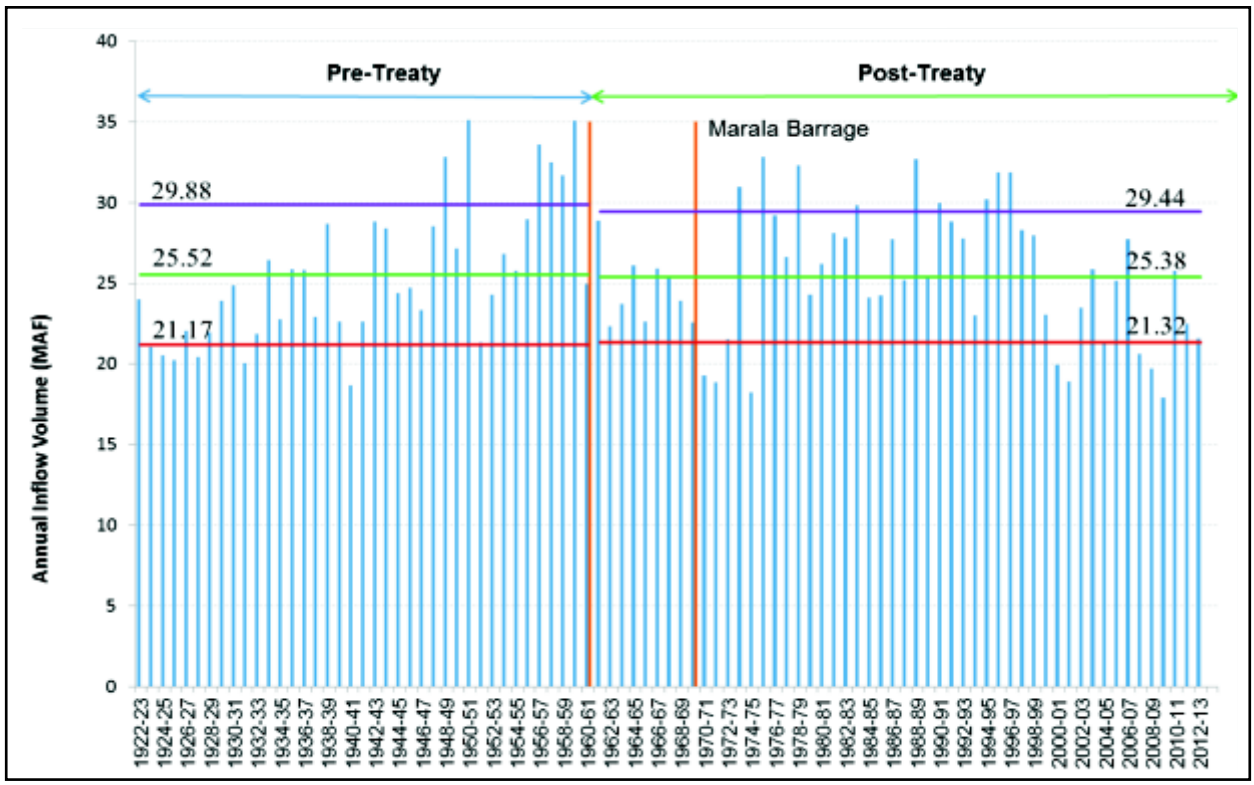


Figure 4: Chenab River at Marala



Treaty is about 29,000 acres only. The result is logical.

In case of Jhelum River at Mangla the reduction for the post Treaty period is about 1 MAF. This when compared with the increased irrigated area of Post-Treaty period of 107,000 acres seems excessive. However, a part of it may be due to change of samples (each sample is different from other) or change in measurement of inflows at Mangla. This needs to be further investigated.

The change in inflows of the Indus at Kalabagh is significant but can be attributed to upstream diversions by Warsak canals and increased utilization of water in Swat Basin.

History of Dispute Resolution

Salal Dam (345 MW + 345 MW)

The first run-of-river project on which Pakistan had differences with India was Salal Dam on the Chenab River. The design was provided to Pakistan in April 1970 and Pakistan communicated its objections on the design in July 1970. Subsequently, the discussions on the objections started but the dispute could not be resolved at the Commission level and Indian Commissioner expressed his inability to proceed further in the matter in December 1974. The matter was taken to the Government level in1975. The issue was resolved at the Government level and India agreed to plug the low level outlets provided in the design and also raised the crest level of the spillway gates by 20 ft by reducing the height of the gates from 50 ft to 30 ft. The discussions started at the Commission level in 1970 and the agreement was reached in 1978 i.e. **it took eight years in resolution.**

Wular Barrage/Tulbul Navigation Project

The second issue on which there was a dispute between the two countries was Wular Barrage/Tulbul Navigation Project, a control structure on the outlet of Wular Lake on the Jhelum River, the structure if built would have a storage capacity of 0.32 million acre-feet. The construction of the project was started without informing Pakistan in 1985 and on Pakistan's protest information about the project was provided in 1986. India agreed to suspend the construction was

suspended in 1987. The start of construction without informing Pakistan was in contravention of the Treaty. The Commission could not succeed in resolving the issue and it was taken to the Government level. Up to now 16 rounds of secretary level talks have taken place on the issue.

Pakistan considers that the structure is in clear violation of the Treaty as according to Paragraph 7 of Annexure E, dealing with storage works, India is not allowed, except for flood storage, any storage on the Jhelum Main. In case a barrage is to be built on the Jhelum Main its storage capacity should not exceed beyond 10,000 acre-ft. Pakistan considers that the storage, if constructed, would have negative impact on the flows coming to Pakistan particularly during the Kharif sowing period in the drought years. Even in normal years the demand for water in Pakistan is very high at the time of Kharif sowing and the flows available in the rivers do not match the demand. **Resolution not achieved yet**.

Baglihar Dam (450 MW + 450 MW)

The information on the design aspects of Baglihar dam started in May 1992 and Pakistan communicated its objection in August 1992. The discussions continued at the Commission level up to 2004 and could not succeed. The issue was then taken to the Government level where two rounds of talks were held but convergence could not be achieved. Pakistan then took the case to Neutral Expert in 2005 who decided on the matter in 2007. **Resolution achieved in 15 years**.

There were five parameters questioned by Pakistan, freeboard, crest level of the intake, pondage, crest level of the spillway and design flood. In his decision, the neutral Expert reduced the freeboard by 1.5 meters, raised the level of the intake by three meters, and reduced the pondage by about 5 Mm.[3]

The Neutral Expert did not change the design flood nor the crest level of the spillway. The Neutral Expert interpreted that India can lower the water level of a reservoir of a run-of-river dam below dead storage level for sediment flushing which he considered as 'maintenance' of the reservoir hence necessary. The relevant provision of the Treaty reads: '*The dead storage shall not be depleted except in an unforeseen emergency. If so depleted, it will be refilled in accordance of the conditions of its initial filling.*' Pakistan considered this interpretation a great set back as it would allow India to draw down the reservoir for flushing purposed that would adversely affect the flow pattern coming to it and negatively affect the diversions for agriculture from its barrages. Pakistan, has asked the Court of Arbitration to provide clear interpretation of this Treaty clause in Kishenganga Arbitration Case. **The final decision of the Court is expected in December 2013.**

Kishenganga Dam (330 MW)

Pakistan received reports of construction of diversion tunnel at Kishenganga dam site in November 1988 and Pakistan lodged protest in December 1988. India formally supplied information on design aspects of a storage project under Annexure E in June 1994 and Pakistan conveyed its objections in September 1994. Pakistan supplied information about Neelum-Jhelum Hydropower Project and agricultural uses in March 1990. The discussions on the project continued and India informed Pakistan in April 2006 that it is considering revisions in designs. India formally revised its project from storage to run-of-river in June 2006. In 2010, after prolonged discussions in the meetings, Pakistan determined that the Commission has failed to resolve the matter. Pakistan opted for formation of Court of Arbitration to get decision on the legality of Kishenganga Hydroelectric Project and on the question of lowering of water level of the reservoir below dead storage level. First meeting of the COA was held in January 2011 and Partial Award was announced in February 2013. Final Award of the case is expected in December 2013. **Resolution achieved in 19 years.**

Chutak Hydro-electric Plant (44 MW)

Pakistan received reports that India had started construction of the Project in 2004 without informing Pakistan. On repeated reminders, the information was supplied to Pakistan in November 2007 and Pakistan conveyed its objections on the design in February 2008 that the design of the dam did not conform to the design criteria specified in the Treaty. The issue was discussed in 103rd and 104th meeting of the Permanent Indus Commission in 2009 and 2010. The matter was again discussed in the 105th meeting of the Permanent Indus Commission and settled in 2010.

Resolution achieved in 6 years.

Possible Improvements in Dispute Resolution Mechanism

From the above history, one infers following features of the disputes and dispute resolution mechanism.

1. India starts construction without informing Pakistan.
2. The designs of the works do not conform to the design criteria given in the Treaty.
3. The dispute resolution mechanism is very slow and takes many years in resolving the issues.

Possible improvements in the above are mentioned in three aspects below:

India starts construction without informing Pakistan

Improvements can be brought in by addressing these issues. As regards providing information to Pakistan of run-of-river plants, Paragraph 9 of Annexure D requires India to provide information to Pakistan six months in advance of the start of construction of river works connected with the Plant. Similar provision exists in Annexure E as well. However, it is important to appreciate that a provision of supply of information to Pakistan also exists in Article VII in its Paragraph 2 which states;

"If either Party 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, it would 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. If a work would cause interference with the waters of any of the Rivers but would not, in the opinion of the Party planning it, affect the other Party materially, nevertheless the Party planning the work shall, on request, supply the other Party with such data regarding the nature magnitude and effect, if any, of the work as may be available."

It is clear that this provision is not superfluous in the Treaty and India should supply information to Pakistan at the planning stage. If India supplies information that is available with it at Feasibility Stage level, it would provide good basis for Pakistan to review the Project and convey to India its views on the Project. At this stage the plans are not finalized yet and India, if it considers appropriate, may incorporate the suggestion of Pakistan. This would not only preclude the possibility of starting of construction without informing Pakistan but would give the two Parties exchanging views prior to finalizations of the designs, after which the inconvenience caused by any changes in designs is rather high and natural.

The designs of the works do not conform to the design criteria given in the Treaty

The design issues that are at the root of our differences on run-of-river plants, generally the differences are on freeboard, pondage and on placement of spillways and intakes. In this context the following questions are pertinent for the designer. Refer Figure-5.

Is more than the required freeboard really required for the dams? what is the rationale if 1 m freeboard is required and 2m is provided?

Is more than the required pondage beneficial for power generation?

Would deep spillways afford flushing of sediments when water level cannot be lowered below DSL? Or are there other alternatives for sediment management?

Whether deep intakes are more beneficial than less deep or surface intakes particularly with reference to the protections of turbines from coarse sediments and overwhelming of intakes by sediment deposition?

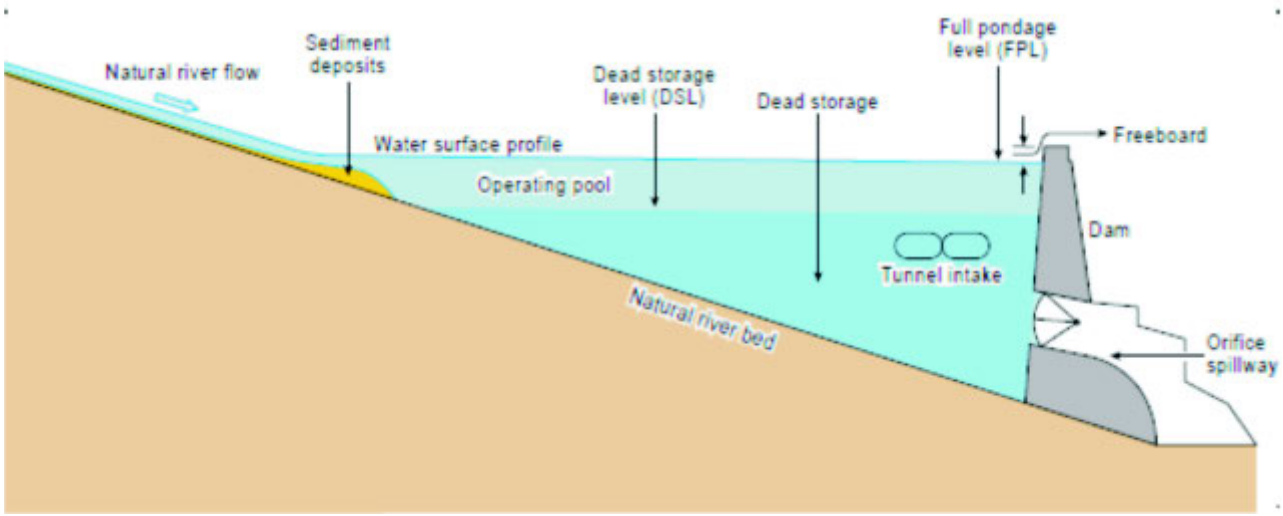
Freeboard

Excessive freeboard, which is excessive by following the accepted practice in design in the world, is not required as per Industry practice. Rather it is harmful as it is against a Treaty provision that forbids artificial raising of the water level in the operating pool as it would create the feeling in the downstream riparian that more than required pondage is being built in the design.

Pondage

On the question of pondage, it is agreed that required pondage should be there as it is required for peaking operations but when many times more is provided the

Figure 5: Schematic Drawing of Dam with Low Level Outlet



intakes are pushed further down with the result that it becomes difficult to provide surface intakes. With deeper intakes, the need of water seal arises which pushes the intake further down thus creating sediment management issues. The provision of surface intakes is the solution such that the pressure conduit starts some distance downstream of the intake mouth. The biggest advantage of this configuration is that the turbines get the least concentration of sediments and the intake is also protected from overwhelming by the progressive deposition of sediments near the intake. For surface intakes either sediment outlets can be provided just below the intake, if un-gated spillway is provided in the design or surface gated spillway alone may suffice for sediment management. In any case the requirement of deep orifice spillway for sediment management is squarely obviated.

Spillways

It is very clear that un-gated spillways is the preferred choice of the Treaty. This would generally lead to the requirement of providing sediment outlets immediately below the intake which, if properly sized, would not be objectionable. It is also obvious that these would be most effective when these are placed immediately below the intake which will bring them to the highest level, thus meeting the requirement of the relevant treaty provision.

The other spillway configuration which is consistent with the Treaty is the surface gated spillways. The Treaty requires that these can be provided if necessary but with the arrangement that bottom level of the gates, in the normal closed positions, should be located at the highest level. For various design flood situations, generally the gates are of such depth that these provide effective protection to the intake from sediments by keeping the ultimate level of the deposited sediments in the reservoir, near the intake, much lower than the intake crest/invert level.

Design Configurations Consistent with The Treaty

There are two design configurations that are consistent with the Treaty and at the same time afford maximum benefits to the owner of the run-of-river hydropower plants. These are:

i) just sufficient pondage, surface intake, sediment outlets immediately below the intake with un-gated spillway; and
ii) just sufficient pondage, surface intake, surface gated spillway

In both of these design schemes, de-silting arrangement may be provided a short distance downstream of the surface intake ahead of start of pressure conduit if the sediment loads are high.

The configurations which employ excessive pondage, deep intakes, and orifice spillways not only do not comply with the Treaty but also are disadvantageous

for the owner as these aggravate the sediment management problems which would require regular flushing of sediments by drawing drawdown the reservoir below DSL. This approach would not only causes losing 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 on account of repeated fast lowering of water level.

The dispute resolution mechanism is very slow and takes many years in resolving the issues

It is heartening that both India and Pakistan are firmly committed to following the criteria given in the Treaty. The issues that come across are the usual issues associated with the design of hydropower plants and though these seem complicated can be resolved by addressing these on merit.

If both parties sincerely address the issues, respecting the clear provisions of the Treaty, the discussions would not go beyond a few meetings and we will be able to reach either a resolution or we will accept that we could not resolve the issues and these have to be taken to the next stages of dispute resolution mechanism provided in the Treaty.

Though, it is highly desirable that the differences are resolved at the Commission level or Government level, as it can be fast and costs much less, yet if this cannot be achieved then it is much better to take the matter to the third forum instead of debating the same design/issue over several years. Even, this process of dispute resolution, i.e., of involving a third forum, after a few such cases, would provide the required clarity to the two parties on the differences in interpretation of the various provisions of the Treaty which would lead to faster resolution of the future issues.

In this regard, it is important to mention views expressed by the Court of Arbitration formulated for the Kishenganga Hydroelectric Plant case wherein in its Partial Award, the Court very clearly took the view that the differences and disputes on the design of Hydroelectric Plants and other works should be settled before the start of construction work.

While it may, in precise definition, may be the spirit of the Treaty, according to which India has to provide the design of the plant six months prior to start of construction and Pakistan has the right to object on the design within three months, if in its view the design contravenes the design criteria agreed by the parties in the Indus Waters Treaty. Logically it is very clear that the remaining period of three months is for resolving these issues before starting the construction.

Improvement in Attitudes

Nothing as mentioned above would yield results in resolution of disputes, if attitudes are not changed. Prime importance in this case is:

(i) Disregard to the rights of the other Party to which both Parties agreed at the time of signing of the Treaty.
(ii) Adopting a flexible attitudes for achieving resolutions, i.e., realizing that if we do not adjust on our own, will we will have to adjust to whatever decision comes from Neutral Expert/Court of Arbitration.
(iii) Both the Governments should oversee the performance of their Commissioners to check that they do not adopt unrealistic rigid attitudes in disputes resolution.

Appendices

Appendix - I

POWER PLANTS ON RIVER CHENAB

Sr. No.	Project	Location	Type	Installed Capacity	Status
1.	Dul Hasti	Near Kishtwar on Chenab River	Concrete gravity dam	390 MW	Completed
2.	Baglihar-I&II	On the Chenab Main about 147 Km U/S of Marala Headworks	Concrete gravity dam	450+450 MW	Completed
3.	Salal (I & II)	45 Miles U/S of Marala on Chenab River	Concrete gravity dam	690 MW	Completed
4.	Chinani (I&II)*	7 Km from Udhampur on the left bank of Jammu Tawi	Overflow type	14 MW –Stage-I 2 MW - Stage-II	Completed
5.	Thirot	On Thirot Nullah,, a Tributary of Chandara Bhaga River	Trench weir	4.50 MW	Completed
6.	Ranbir Canal*	Ranbir Canal off-taking from Chenab River at RD 84000	-	1.20 MW	Completed
7.	Badarwah*	On Haloon Nullah, a Sub Tributary of Chenab River	Overflow type	Pre-Treaty 0.6MW Upgraded 1.0MW	Completed
8.	Kishtwar*	Near Village Kishtwar on Chenab River	Overflow type	0.35 MW	Completed
9.	Killar	On Mahal Nullah, a Tributary of Chenab River	Weir	0.3 MW	Completed
10.	Shansha	On Shansha Nullah, a Tributary of Chenab River	Weir	0.2 MW	Completed
11.	Billing	On Billing Nullah, a Tributary of Bhaga River	Weir	0.1 MW	Completed
12.	Sissu	On Sissu Nallah, a Tributary of Chenab River	Weir	0.1 MW	Completed
13.	Rajouri*	On Darhali Nullah, a Sub Tributary of Chenab River	Overflow type	Pre-Treaty 0.65MW Upgraded 3.0MW	Completed
14.	Udhampur*	Tawi River, a Tributary of Chenab River	-	0.64 MW	Completed
15.	Nichalani Banihal*	Mangat Nullah, a Tributary of Chenab River	Overflow type	0.60 MW	Completed

UNDER CONSTRUCTION

Sr. No.	Project	Location	Type	Installed Capacity	Status
1.	Ranja-Ala Dunadi	On river upper kalnai nullah , a tributary of river Chenab	Trench Weir	15 MW	Under Construction
2.	Miyar	On Miyar Nallah a tributary of Chenab	Barrage	(3x40)=120 MW	Under Construction
3.	Lower Kalnai	On Lower Kalnai river a tributary of the Chenab	Concrete gravity dam	(2x24)=48 MW	Under Construction
4.	Ratle	On Chenab Main	Concrete gravity dam	(4x205)(1x30)=850MW	Under Construction
5.	PakalDul	On Marusadar river -right bank tributary of Chenab	Concrete faced Rock fill dam	1000 MW (ultimate 1500 MW)	Under Construction

* Pre–Treaty Hydroelectric Plants

Appendix - II

POWER PLANTS ON RIVER JHELUM

COMPLETED

Sr. No.	Project	Location	Type	Installed Capacity	Status
1.	Uri-I	Located at Uri Village about 16 miles D/S of Baramula on Jhelum River	Barrage	4x120 =480 MW	Completed
2.	Lower Jhelum	8 miles D/S Baramula on the Jhelum River	Barrage	3x35=105 MW	Completed
3.	Gandarbal*	On Sind River, a Tributary of Jhelum River	Weir	15 MW	Completed
4.	Karnah	On Quazi Nag Nullah, a Tributary of Kishenganga River	Trench Weir	1x2=2 MW	Completed
5.	Keran	On Keshar Katta Nullah, a Tributary of Kishenganga River	Trench Weir	0.35x2=0.70 MW	Completed
6.	Poonch*	On Betar Nallah, a Tributary of the Jhelum River	-	0.16 MW	Completed
7.	Bandipura*	On Madmatti Nallah, a Tributary of Jhelum River	-	0.03 MW	Completed
8.	Asthan Nallah	On Asthan Nallah, a tributary of Kishenganga River	Trench Weir	0.75 MW	Completed
9.	Upper Sind-II	On Wangat Nallah near Village Wangat, a Tributary of Sind River	Weir	35x3=105 MW	Completed
10.	Pahalgam*	Confluence of East Lidder and West Lidder, a Tributary of Jhelum River in Anantnag District	Weir	Pre-treaty 0.186 MW Upgraded 4.5 MW	Completed
11.	Sumbal	Near Village Sumbal on Sind River, a Tributary of Jhelum River	Weir	22 MW	Completed
12.	Kupwara*	On Pohru River, a Tributary of Jhelum River	Weir	0.15 MW	Completed
13.	Dachigam*	On Dugwan Nallah, a Tributary of Jhelum River	-	0.04 MW	Completed
14.	Matchil	On Dudhi Nullah, a Tributary of Kishenganga River	Trench Weir	0.35 MW	Completed
15.	Parnai	On Suran River, a Tributary of Punch River	Barrage	37.50 MW	Completed
16	Mohora*	On Jhelum River	-	12 MW	Destroyed in flood
17	Uri-II	Near Village Uri on Jhelum River	Concrete Dam	4x60=240 MW	Completed

UNDER CONSTRUCTION

No.	Project	Location	Type	Installed Capacity	Status
1	Kishenganga	On Kishenganga River, a Tributary of Jhelum River	Concrete Faced Rockfill Dam	330 MW	Under Construction
2	Tangmarg	On Ferozepur Nallah, a Tributary of the Jhelum River	Weir	2x5=10 MW	Under Construction
3	Brenwar	On River Doodh-Ganga, a Tributary of Jhelum River	Weir	3x2.5=7.5 MW	Under Construction
4	Athawatto	On Madmatti Nallah,a Tributary of Jhelum River.	Weir	10 MW	Under Construction
5	Kehmil Small Plant	On Kehmil Nallah,a Tributary of Jhelum River	Trench Weir	4 MW	Under Construction
6	Boniryar Small Plant	On Hapat Khai Nallah a Tributary to the Jhelum River	Weir	2x4=8 MW	Under Construction

* Pre-Treaty Hydro Electric Project

Appendix III

POWER PLANTS ON RIVER INDUS

COMPLETED

Sr. No.	Project	Location	Type	Installed Capacity	Status
1.	Kargil	On Suru River near Kargil a Tributary of Indus River	Weir	3.75 MW	Completed
2.	Dras	On Dras River, a Tributary of Indus River	Weir	0.075 MW	Completed
3.	Matayin	On Matayin Nallah, a Sub Tributary of Indus River	Open Trench Weir	0.12 MW	Completed
4.	Shaker Chicktan(Sanjak)	On Kinji Nala, a Tributary of Indus River	Trench Weir	1.26 MW	Completed
5.	Haftal I & II	On Haftal Nallah, a Sub Tributary of Indus River	Weir	2 MW	Completed
6.	Hunder Nobra	On Hunder Nallah, a Sub Tributary of Indus River	Weir	0.2x2=0.40 MW	Completed
7.	Sumoor Nobra	On Sumoor Nallah, a Sub Tributary of Indus River	Weir	0.10 MW	Completed
8.	Khardung	On Khardung Nallah, a Tributary of Indus River	Weir	0.30 MW	Completed
9.	Bazgo	On Bazgo Nallah, a Sub Tributary of Indus River	Weir	0.30 MW	Completed
10.	Stakna	At Stakna on Indus River Main	Trench Weir	3.24 MW	Completed
11.	Chutak	On Suru River, a Tributary of Indus River	Barrage	44 MW	Completed
12.	Nimo Bazgo	On Indus River Main near Alchi Town	Concrete Gravity Dam	45 MW	Completed

UNDER CONSTRUCTION

No.	Project	Location	Type	Installed Capacity	Status
1.	Dumkhar MHP	On Dumkhar Nallah, a Tributary of Indus River	Weir	0.50 MW	Under Construction
2	Marpachoo	On Sando Nallah,a Tributary of Indus River	Trench Weir	3x0.25=0.75 MW	Under Construction
3.	Dah Small HEP	On Dah Nallah ,a Tributary of Indus River	Weir	2x3=6 MW	Under Construction
4.	Hanu Small HEP	On Hanu Nallah ,a Tributary of Indus River	Weir	2x2.5=5 MW	Under Construction

***Islamabad Office*:** No. 7, 9th Avenue, F-8/1, Islamabad, Pakistan
Tel: (+92-51) 111 123 345 | Fax: (+92-51) 226-3078
***Lahore Office*:** 45-A, Sector XX, 2nd Floor, Phase III Commercial Area, DHA, Lahore
Tel: (+92-42) 111 123 345 | Fax: (+92-42) 3569 3896
E-mail: info@pildat.org | Web: www.pildat.org