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Indus Basin Water Management Under International Law

Dr. Waseem Ahmad Qureshi
Advocate Supreme Court of Pakistan

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ABSTRACT

The management of international watercourses is a prominent global issue, owing to the rapid growth of water scarcity worldwide. This issue is particularly dominant in the Indus Basin, which India and Pakistan share. Both states use the water of the Indus Basin for irrigation, hydropower generation, and multiple other purposes. However, certain Indian water management projects are threatening the current water management infrastructure in Pakistan by substantially obstructing the flow of water in the Pakistani western rivers. In this regard, the Indus Waters Treaty provides recommendations to both states for adequately managing the Indus waters. Moreover, there are several principles and conventions in international law that include provisions for transboundary watercourses management. These principles also advise states, including India and Pakistan, on how to manage the watercourses sustainably, how not to cause harm to other states, and how to adopt special water management measures to prevent depletion, pollution, and environmental degradation of watercourse basins.

*Advocate Supreme Court of Pakistan

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I. INTRODUCTION

Water scarcity is the most pressing issue of these times. Pakistan has become a water-stressed country and is rapidly becoming a water-scarce country. Therefore, it is essential to give attention to adequately managing the water resources available in Pakistan. The economy of Pakistan is reliant on agriculture, and Pakistan is dependent on the flow of water in the Indus River and its tributaries for irrigating crops. India also shares the Indus Basin. The Indus Waters Treaty is the sole legal agreement that is

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5 National Research Council of the National Academies, Climate and Social Stress: Implications for Security Analysis, 122 (John D. Steinbruner et al. eds., 2013).
binding on both states in the utilization of the waters of the Indus Basin.\textsuperscript{7}

The treaty includes recommendations on water management for both states.\textsuperscript{8} In addition to the Indus Waters Treaty, there are several obligations under international law, which include instructions for the management of transboundary water resources for states. The Berlin Rules, the United Nations Watercourses Convention, the Belgrade Rules, the Supplemental Rules on Pollution, and the Johannesburg Declaration offer instructions regarding the management of a common river basin. This paper will discuss these recommendations only for surface watercourses in general and for the management of Indus Basin; the management of groundwater and other water resources is beyond the scope of this paper.

The second section of this paper elaborates on water management in the Indus Basin region in Pakistan. The total demand for the water of the Indus Basin and the average annual flow of the water in its tributaries are discussed, as are the factors that affect this flow of water. Indian water storage projects and adverse changes in the climate are the major factors responsible for harming the natural flow and management of the water of the Indus Basin in Pakistan, which will be discussed at the end of the first section. The third section of this paper explains the provisions of the Indus Waters Treaty, which recommends the construction of water management facilities in Pakistan.

\textsuperscript{7} See BRAHMA CHELLANEY, WATER: ASIA’S NEW BATTLEGROUND, 278 (2013).

The fourth section explains international legal conventions and rules, which provide instructions to riparian states for the management of international watercourses. Different factors such as the environmental impacts of water management practices by a state, the duty not to cause harm to other states by continuing water management projects, sustainable management and development of the watercourses, and the basin-wide joint management of the watercourses are discussed in this section in relation to certain water management practices in the Indus Basin by India and Pakistan. Conclusions are drawn briefly at the end of this paper.

II. **INDUS BASIN WATER MANAGEMENT IN PAKISTAN**

This section of the paper elaborates on the water management practices in the Indus Basin in Pakistan. It explains the demand for Indus Basin water in Pakistan and the relevant annual supply or flow of that water. The Indus Basin holds key importance for water management practices in Pakistan, as it is the only major source that brings a significant amount of water to the country;\(^9\) this water is used for irrigation, hydropower generation, industrial projects, and domestic and municipal purposes.\(^{10}\) For several

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centuries it has been the major resource for irrigation in the Punjab region of Pakistan.\footnote{11}

The Indus Basin comprises the Indus River and its five tributaries, the Chenab, Jhelum, Ravi, Sutlej, and Beas Rivers.\footnote{12} Among them, the Chenab, Jhelum, and Indus Rivers were allocated for the use of Pakistan by the Indus Waters Treaty.\footnote{13} These tributaries, along with the Indus River, irrigate major portions of agricultural land in Pakistan.\footnote{14} Furthermore, several canals and barrages have also been constructed that use water from the Indus River and its tributaries to irrigate crops.\footnote{15} However, the increasing stress on water resources has raised questions

\footnote{11} Abdul Hafeez Qaiser, Current Policy Perspective on Institutional Reforms for the Irrigated Agriculture Sector, in, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MANAGING IRRIGATION FOR ENVIRONMENTALLY SUSTAINABLE AGRICULTURE IN PAKISTAN 46 (M. Badruddin et al. eds., 1996); see also DAVID GILMARTIN, BLOOD AND WATER: THE INDUS RIVER BASIN IN MODERN HISTORY 7 (2015) [hereinafter Gilmartin].

\footnote{12} See Gilmartin, supra note 11, at 14; see also APARNA PANDE, EXPLAINING PAKISTAN’S FOREIGN POLICY: ESCAPING INDIA, 43 (2011) [hereinafter ESCAPING INDIA]; see Aparna Pande, Pakistan: Issues of Self-Identity and Parity with India, in PAKISTAN’S POLITICAL LABYRINTHS: MILITARY, SOCIETY AND TERROR 1, 8 (Ravi Kalia, 2016).

\footnote{13} See ESCAPING INDIA, supra note 12, at 43.

\footnote{14} SARFRAZ MUNIR, ROLE OF SEDIMENT TRANSPORT IN OPERATION AND MAINTENANCE OF SUPPLY AND DEMAND BASED IRRIGATION CANALS: APPLICATION TO MACHAI MAIRA BRANCH CANALS, 8 (2011); see also ASMI RAZA, PAKISTAN’S QUEST FOR FOOD SECURITY, 40 (1993).

\footnote{15} John D. Rogers, The Economy: Labor Agriculture, in, PAKISTAN: A COUNTRY STUDY, Chapter 3, 173, (Peter R. Blood, ed., 1995); See also Nasim Akhtar, The Use of Irrigation System for Sustainable Fish Production in Pakistan, in, FISHERIES IN IRRIGATION SYSTEMS OF ARID SEA ASIA, Chapter 2, 19, (Tomi Petr ed., 2003); SAJID ALI NAQVI, INDUS WATERS AND SOCIAL CHANGE: THE EVOLUTION AND TRANSITION OF AGRARIAN SOCIETY IN PAKISTAN, 7-8 (2012).
regarding the efficiency of existing water management infrastructure in Pakistan.\textsuperscript{16}

A. THE DEMAND AND CONSUMPTION FOR THE INDUS BASIN WATER

Although the demand for water is growing in all sectors, the annual growth in demand for water is highest in the agriculture sector.\textsuperscript{17} According to the statistics provided by the UNDP in its 2016 report, the net crop water requirement in Pakistan is at 101.7 MAF percent out of the total water consumption in the country.\textsuperscript{18} From the 143 MAF Average Annual Flow of water, nearly 101.8 MAF is diverted to the agricultural lands through the canal networks; however, only 56 MAF reaches to crops due to the conveyance losses of 45.5 MAF.\textsuperscript{19} Therefore, around 50 MAF of groundwater is extracted to meet the shortfall, which makes the availability of water at the farmlands at 106.5

\textsuperscript{16} See generally Adrien Couton, Tackling the Water Crisis in Pakistan: What Entrepreneurial Approaches Can Add, in, WATER AND AGRICULTURE: IMPLICATIONS FOR DEVELOPMENT AND GROWTH 85, 86 (Ctr. for Strategic & Int’l Stud., 2009).

\textsuperscript{17} The demand for water in the Indus Basin has also started to increase because of the yearly increase in total population. See WINSTON YU ET AL., THE INDUS BASIN OF PAKISTAN: THE IMPACTS OF CLIMATE RISKS ON WATER AND AGRICULTURE 35, 54 (2013); see ASHOK SWAIN, UNDERSTANDING EMERGING SECURITY CHALLENGES: THREATS AND OPPORTUNITIES 40-1 (2013) (discussing the impact of population increase and the demand for water).

\textsuperscript{18} Shahid Ahmad, Water Sector of Pakistan: A Situational Analysis, in, DEVELOPMENT ADVOCATE PAKISTAN – WATER SECURITY IN PAKISTAN: ISSUES AND CHALLENGES, 5 (Maheen Hassan ed., December 2016) [hereinafter Ahmad].

\textsuperscript{19} Id., at 3-5.
MAF, which further falls to 79.9 MAF due to Field Application Losses.\textsuperscript{20} Thus, a shortfall of 21.8 MAF still exists, which mostly is met by the rainfalls.\textsuperscript{21}

The agricultural sector consumes the highest quantity of Indus water in Pakistan.\textsuperscript{22} According to an estimate, the 95 percent of irrigation in Pakistan is to be found in the Indus River basin.\textsuperscript{23} The total area of agricultural land is approximately 21 million hectares,\textsuperscript{24} and more than 45 percent of the population earns its livelihood in agriculture.\textsuperscript{25} Moreover, agriculture accounts for 25 percent of the total GDP of the country.\textsuperscript{26} Therefore, it is also regarded as the “backbone” of Pakistan’s economy.\textsuperscript{27}

On the other hand, the aforementioned net demand of 101.7 MAF by the crops is expected to rise to 116.14 MAF by 2025 forecasting a shortfall of 36.9 MAF, which highlights the need to perform stringent measures to avoid further

\textsuperscript{20} Id.
\textsuperscript{21} Id.
\textsuperscript{22} See WORLD BANK INST., STRATEGIC REFORMS FOR AGRICULTURAL GROWTH IN PAKISTAN, 87 (Masood Ahmad & Rashid Faruqee eds., 1999); see 1 ENCYCLOPEDIA OF THE DEVELOPING WORLD 874 (THOMAS M. LEONARD ED., 2013).
\textsuperscript{23} IRRIGATION IN SOUTHERN AND EASTERN ASIA IN FIGURES – AQUASTAT SURVEY 37, 135, (FAO Water Report, 2011).
\textsuperscript{24} Muhammad Zafar Khan & Ghulam Akbar, In the Indus Delta it is No More the Mighty Indus, in, RIVER CONSERVATION AND MANAGEMENT 69, 69 (Philip J. Boon & Paul J. Raven eds., 2012).
\textsuperscript{25} Mohammad Ashraf Choudhary et al., Prospects of No-Till Wheat in Rotation with Rice or Cotton in Central and South Asia, in, CONSERVATION TILLAGE: A VIABLE OPTION FOR SUSTAINABLE AGRICULTURE IN EURASIA, 125, 127 (M. Karabayev et al. eds., 2000).
\textsuperscript{26} Id.
\textsuperscript{27} Muhammad Shahbaz et al., Effect of Financial Development on Agricultural Growth in Pakistan: New Extensions from Bounds Test to Level Relationships and Granger Causality Tests, 40 INT’L J. SOC. ECON. 708 (2011),
shortfall of water for agricultural sector in Pakistan. Moreover, the quality of groundwater is unsatisfactory for irrigating crops due to the presence of certain elements that are considered harmful for soil fertility. Therefore, to depend less on groundwater, more attention should be given to extracting as much river water as possible for irrigating crops, meaning a greater intensification of demand for Indus water in Pakistan.

B. EXISTING WATER MANAGEMENT PRACTICES IN THE INDUS BASIN IN PAKISTAN

As mentioned earlier, Pakistan is largely dependent on the Indus Basin for water for agriculture and other sectors, and to meet these needs, several canals—forty-three to be exact—draw water from the Indus River and its tributaries. These canals irrigate most agricultural land in the country. In addition to the canals, barrages have also

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28 The 36.9 MAF is equal to the current 21.81 MAF shortfall plus 15.1 MAF increase in net crop water requirement. See Hassan, supra note 18, at 5.
30 See Asad Sarwar Qureshi, Hugh Turral, and Ilyas Masih, STRATEGIES FOR THE MANAGEMENT OF CONJUNCTIVE USE OF SURFACE WATER AND GROUNDWATER RESOURCES IN SEMI-ARID AREAS: A CASE STUDY FROM PAKISTAN, 1 (2004) [hereinafter Qureshi et. al.].
31 See Sohail J. Malik, et al., Agriculture, Land, and Productivity in Pakistan, in AGRICULTURE AND THE RURAL ECONOMY IN PAKISTAN: ISSUES,
been constructed in certain regions to use the water of the Indus Basin.  

32 On the Indus River alone there are fifteen barrages used for irrigation.  

The canals and barrages make Pakistan’s irrigation system one of the largest in the world.  

Approximately, 0.58 million tube-wells have been installed in the agrarian regions for irrigating crops from using the ground water.  

On the other hand, in certain regions that have a scarcity of water and have no tube-wells installed due to meager electricity available for running them, the Karez system is used for extracting groundwater.  

The system has been commonly used for several decades in these regions, prominently in Baluchistan, to meet irrigation-related needs.  

Though the system uses groundwater resources for irrigation, but the method is sustainable as

OUTLOOKS, AND POLICY PRIORITIES 41, 47 tbl.2.4 (David J. Spielman et al. eds., 2016).


34 MEHMOOD UL HASSAN & PRACHANDA PRADHAN, COORDINATED SERVICES FOR IRRIGATED AGRICULTURE IN PAKISTAN 84 (Int’l Irrigation Mgmt. Inst., Research Report No. 71, 1998); see also Nasim Akhtar, The Use of Irrigation Systems for Sustainable Fish Production in Pakistan, in, FOOD AND AGRICULTURAL ORG. OF THE UNITED NATIONS, FISHERIES IN IRRIGATION SYSTEMS OF ARID ASIA 17, 19 (Tomi Petr ed., 2003).

35 See Shah et al., supra note 29, at 7-8.


37 Id.; see also ASAD SARWAR QURESHER & MUJEEB AKHTAR, ANALYSIS OF DROUGHT COPING STRATEGIES IN BALUCHISTAN AND SINDH PROVINCES OF PAKISTAN, 23 (Int’l Water Mgmt. Inst., Working Paper No. 86, 2004).
compared to the modern techniques of extracting ground water for irrigation, because it can be adopted by poor farmers as well.38 Therefore, most regions in Baluchistan are reliant on this system to irrigate their agricultural land.39 Pertinently, the Karez system is also considered one of the oldest irrigation systems in the world,40 and this system has been considered inductive to sustainable development.41 This shows that water management practices in Pakistan have historically been sustainable and efficient.

Furthermore, there are also three large dams, and several small ones, operational in Pakistan.42 The major dams are Tarbela, Mangla, and the Chashma, which originally had storage capacities of 9 MAF, 6 MAF, and 0.8 MAF, respectively,43 implying a total storage capacity of around 15.8 MAF.44 However, this storage capacity is falling each year due to sedimentation and therefore, the three major dams now collectively store around 13.1 MAF of the annual flow of Pakistan’s rivers.45 The stored water is mostly used for hydropower generation.46 More than one third of

38 Ahmad et al., supra note 36, at 35.
39 Id.
40 Id., at 13.
41 See id.
42 Michel, supra note 33, at 91, 99.
45 Id.
the country’s electricity demand is met by the hydropower generated by these dams.47

The government of Pakistan has also started implementing its plans to construct new water storage projects on the Indus River and its tributaries.48 Work has already begun on the Neelum and Jhelum Rivers via the Neelum-Jhelum water project, and on the Indus River via the Diamir Bhasha Dam.49 Once completed, these dams will provide sufficient amount of electricity into the national power grid. For example, the Neelum-Jhelum and Diamir Bhasha Dam power projects will have the capacity to produce 969 megawatts (“MW”) and 4,500 MW of electricity, respectively.50 Together, these dams will be able to generate 5,469 MW of electricity, enough to meet the current shortfall of electricity, which is around 5,000 MW.51

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47 See id.
48 ROCKIN TH. SINGH, INDIA’S WATER RELATIONS WITH HER NEIGHBOURS, 233 (Vij Books India Pvt Ltd, 2011).
50 1 INT’L BUS. PUBL’NS USA, PAKISTAN ENERGY POLICY, LAWS AND REGULATIONS HANDBOOK: STRATEGIC INFORMATION AND BASIC LAWS 78 (2015).
51 Id. at 76; Khalid Hasnain, Electricity Shortfall Soars to 5,000MW, DAWN (April 16, 2017), www.dawn.com/news/1327253/electricity-shortfall-soars-to-5000mw.
In addition to rivers and dams, there are several man-made and natural lakes in Pakistan. The water in these lakes is used for domestic purposes, such as drinking and irrigation by the locals residing near such lakes, particularly in the region of Baluchistan, which Indus water does not reach. These lakes store small amounts of water, which are intensified when there is high rainfall in these regions. Of these lakes, the Manchar Lake, located in Sindh province, is the largest lake in Pakistan. The area of Manchar Lake fluctuates with rainfall; in rainy seasons, the water of the lake covers a land area of around 520 square kilometers, while in drier seasons the water covers only 350 square kilometers. Nonetheless, the lake is sufficient to meet the water-related needs of the local population for drinking, domestic, and agrarian purposes.

C. DOMESTIC LAWS & POLICIES FOR WATER MANAGEMENT & PREVENTION OF FLOODS

There are several federal and provincial laws in Pakistan related to the management of water resources, prevention of floods, and mitigation of adverse effects in the event of abnormal increases or decreases in river

53 Id.
54 Marc Tyler Nobleman, Pakistan, 13 (2003).
56 See M. Ahmed, supra note 52, at 250.
These laws also regulate and supervise national flood management policy. Some of these laws predate the state of Pakistan, as the laws were enacted during British colonial rule. These include the NWFP Act of 1873, the NWFP Canal and Drainage Act of 1873, the Sindh Irrigation Act of 1879, the Punjab Canal and Drainage Act of 1873, and the Punjab Irrigation Act of 1873.

Since partition, additional laws have been enacted in Pakistan, such as the Punjab Soil Reclamation Act 1952, the Water And Power Development Authority (“WAPDA”) Act 1958, the Baluchistan Ordinance 1980, the Water Users Association Ordinances 1981, the Indus River System Authority (“IRSA”) Act 1992, the Provincial Irrigation and Drainage Authority (“PIDA”) Act 1997, and the Environment Protection Act 1997. These statutes are intended to manage surplus water as well as to avoid losses during floods. Moreover, these laws also provide relief and assistance to people in flood-affected regions.

In addition to these laws, the Emergency Relief Cells (ERC) and the Provincial Relief Department have been established for dealing with the flood-related emergencies. The former has the role of coordinating between the Federal divisions and Provincial governments as well as among the semi-governmental and international and national agencies.

58 See id.
59 Id., at 6, 13.
60 Id., at 43.
61 See id.
62 Id.
63 Id., at 45.
for emergency relief related operations. On the other hand, the latter is controlled by the Relief Commissioner who establishes coordination among relevant provincial entities for meeting the emergency relief requirements. Furthermore, a separate government organization, the National Disaster Management Authority (“NDMA”), works to mitigate and prevent the adverse impacts of natural disasters, such as floods and droughts, in affected areas. The NDMA provides relief and support to people recovering from flood or droughts.

Although, there are laws and several organizations functioning to manage the distribution of water in Pakistan, but an exact framework or regulation for managing water distribution in an efficient manner is lacking in the country. In particular, there is no particular flood management policy in Pakistan; rather, the aforementioned laws indirectly provide some provisions for flood management. Pertinently, the existing flood management has relied upon the adoption of structural measures for preventing floods. For instance, the construction of flood walls, embankments, spurs, diversion structures and bypass structures, etc. have been adopted as some methods of preventing floods.

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64 Id.
65 See id., at 46-7 (The success of the aforementioned organizations and entities is arguable as some consider them as a failure due to the massive damages occurred during the 1954, 1973, and 1975 flood).
68 See Kamal et al., supra note 57, at 18.
69 Id., at 43.
70 Id., supra note 57, at 18.
71 Id.
In this regard, the construction of embankments is being particularly followed, as the embankments along all the major rivers have been constructed.\textsuperscript{72} Thus, the structural measures are implemented for flood management in Pakistan, while the existing laws do not provide a unanimous framework or legal policy for flood management.\textsuperscript{73}

D. Reduction in Average Annual Flow of Water in the Indus Basin

In Pakistan, the average annual flow of river waters is approximately 143 MAF.\textsuperscript{74} More than 80 percent of this quantity of water, i.e. 114.4 MAF,\textsuperscript{75} arrives at the river basins due to the melting of glaciers during the summer season.\textsuperscript{76} Data on the average flow of river waters indicates that the availability of water in the major Indus River tributaries has decreased substantially since 1961.\textsuperscript{77} For instance, the

\textsuperscript{72} Id.
\textsuperscript{73} Id.
\textsuperscript{74} See Ahmad, supra note 18, at 5.
\textsuperscript{75} This quantity can be calculated by multiplying 0.80 with 143 (Hint: simple mathematical formula has been used for calculating the 80% of 143 MAF i.e. percentage multiplied by the total quantity).
\textsuperscript{77} See IRSHAD AHMAD, ALLAH BAKHSH SUFI, & IMRAN TARIQ, WATER RESOURCES OF PAKISTAN 101 (Pakistan Engineering Congress Paper No.
average annual flow in the Indus River was 93 MAF in 1961, but this amount has now fallen to approximately 89 MAF.  

Similarly, in the Jhelum and Chenab Rivers, the average annual flow of water was 23 MAF and 26 MAF in 1961, which has decreased to 22 MAF and 25 MAF, respectively. Pertinently, the reduction in the average flow of water in these rivers could be the result of construction of hydropower projects on these rivers by India within its territory, which store a substantial amount of water of the Indus River tributaries, which reduces the flow of water in the Pakistani western rivers.

In addition to the Indus River and its tributaries, which flow from India to Pakistan, the Kabul River, which flows from Afghanistan, has also faced a substantial reduction of its average flow of water from 26 MAF in 1961 to 18.9 MAF in 2000 and 17.4 MAF in 2010. The decrease in the average annual flow of water in these rivers has also

711, 2012), [hereinafter Tariq et al.]; see also ALLAH BAKHSH SUFI ET. AL., INTEGRATED WATER RESOURCE MANAGEMENT IN PAKISTAN, 37 (Pakistan Engineering Congress Paper No. 286, 2009-10) [hereinafter Sufi et al.].
78 See Tariq et al., supra note 77, at 101; See also Sufi et al., supra note 77, at 37.
79 See Sh. Ahmed, supra note 76. (Note: The 89 MAF includes the quantity of Kabul River 17 MAF. If we subtract this from 89 MAF, then we will get 72 MAF, which shows the significant amount of reduction in the average annual flow of the Indus River).
80 See Sufi et al., supra note 77, at 37 tbl. 1.
81 See Sh. Ahmed, supra note 76.
82 See SHAHEEN AKHTAR, EMERGING CHALLENGES TO INDUS WATERS TREATY: ISSUES OF COMPLIANCE & TRANSBOUNDARY IMPACTS OF INDIAN HYDROPROJECTS ON THE WESTERN RIVERS, 59 (Institute of Regional Studies, 2010) [hereinafter Akhtar].
83 See Sufi et al., supra note 77, at 37 tbl. 1.
resulted in an overall decrease of the total availability and net average flow of river water in Pakistan, from 189 MAF in 1961 to 138 MAF in 2009-10.\textsuperscript{84} At present, the total average annual flow is 143 MAF,\textsuperscript{85} which is way lower than the flow of 189 MAF in 1961.\textsuperscript{86}

The per capita availability of water has also decreased substantially. In 1960 this was around 4,000 cubic meters.\textsuperscript{87} However, this amount fell to 2,100 cubic meters in 1981, 1,600 cubic meters in 1991, and 1,078 cubic meters in 2001.\textsuperscript{88} The amount of water recorded in 2010 was 1,050 cubic meters, and this is expected to fall to 877 cubic meters by 2020.\textsuperscript{89} Moreover, Pakistan’s population is increasing rapidly, which is also putting a strain on per capita water usage.\textsuperscript{90} The population in 1961 was 46 million, and it has now passed 180 million.\textsuperscript{91} In 2020, it is expected to go beyond 200 million.\textsuperscript{92} This has increased per person demand for water, but has substantially decreased the per person availability of water from 3,950 cubic meters in 1961 to less than 1,000 cubic meters\textsuperscript{93} at present; this has made Pakistan a

\textsuperscript{84} See id.
\textsuperscript{85} See Hassan, supra note 18, at 3.
\textsuperscript{86} See Sufi et al., supra note 77, at 37 tbl. 1.
\textsuperscript{88} Id.
\textsuperscript{89} See Sufi et al., supra note 77, at 41.
\textsuperscript{90} See Ahmad, supra note 87, at 114.
\textsuperscript{91} Id.
\textsuperscript{92} Id.
\textsuperscript{93} Id.
“water-stressed”\textsuperscript{94} region. This suggests that immense pressure on available water resources is being felt in Pakistan. Furthermore, by 2025 it is expected that water availability will fall below the 700-cubic meter threshold, which will mark Pakistan as a “water-scarce”\textsuperscript{95} country.\textsuperscript{96} The WWF 2012 Report on water management in Pakistan suggested that Pakistan would reach water scarcity in 2035,\textsuperscript{97} but current data indicates that Pakistan will reach that level fifteen years earlier, in 2020.\textsuperscript{98} This further illustrates the swift pace of water shortage that is occurring in Pakistan.

Unfortunately, the storage capacities of the major dams in Pakistan have also fallen significantly in recent years. For instance, the Tarbela Dam was completed in 1976 and had around 9.68 MAF of total water storage capacity at that time; this fell to 6.78 MAF in 2009 and 6.5 MAF in 2012.\textsuperscript{99} This indicates a total loss of storage capacity of around 3.18 MAF in the Tarbela Dam, which is expected to reach 4.30 MAF, to a storage capacity of 5.38 MAF, by 2025.\textsuperscript{100} The situation is similar for the Mangla Dam, which had a total capacity of around 5.34 MAF when it was completed in 1967 but over time its storage capacity has declined substantially.\textsuperscript{101} The total storage capacity of

\textsuperscript{94} Water stress is denoted for a region that has per capita availability of water from 1,000 cubic meters to 1,666.7 cubic meters. See Akhtar, \textit{supra} note 82, at 10.
\textsuperscript{95} See Akhtar, \textit{supra} note 82 at 8. Water scarce regions have per capita availability of water of less than 1,000 cubic meters; \textit{Id}., at 10.
\textsuperscript{96} See \textit{Id}. at 8; \textit{See also} Sufi et al., \textit{supra} note 17, at 41.
\textsuperscript{97} Kamal et al., \textit{supra} note 57 at 5.
\textsuperscript{98} See Ahmad, \textit{supra} note 87, at 114; \textit{see also} Sufi et al., \textit{supra} note 77, at 41.
\textsuperscript{99} \textit{Id}.
\textsuperscript{100} \textit{Id}.
\textsuperscript{101} \textit{Id.}
\textit{See Sufi et al., \textit{supra} note 77, at 38; see also} Sh. Ahmed, \textit{supra} note 76.
Mangla, Tarbela, and Chashma has fallen from 16 MAF to 14.2 MAF. Such significant decrease of the storage capacities of the major dams points toward the need for the government to take measures either to increase the storage capacities of these dams by proper maintenance or to construct new water storage dams that could store large amounts of water resources for the future to minimize the substantial annual losses of water. Furthermore, the total storage capacities of the major dams, the Tarbela, Mangla, and Chashma, are equivalent to 9.8 percent of the total average annual flow of river waters in Pakistan. This further shows that there is a meager availability of stored water in the country.

Owing to the insufficient availability of water in the near future, agricultural production is likely to decline. This can create negative effects for the economy and GDP because agricultural production constitutes approximately 25 percent of national GDP. Furthermore, the water stored in Pakistan’s major dams is primarily used for electricity generation. A large number of manufacturing firms and private businesses rely on this electricity for the functioning of their machinery. The absence of water for the Tarbela and

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102 See Sh. Ahmed, supra note 76. (Although, the total storage capacity of the three dams is 11.2 MAF, but recently the Govt. has upgraded the Mangla dam, which has taken the total storage capacity to 14.15 MAF.)

103 Id., at 1. This can be achieved by calculating the percentage of 14.15 MAF to the total average annual flow of 143 MAF. (The Govt. of Pak has made some efforts to increase the 11.4 MAF storage capacity level. The upgrading of the Mangla dam has taken the total storage capacity from 11.4 MAF to 14.15 MAF).

104 See Qureshi et al., supra note 30, at 1.

105 See Choudhary et. al, supra note 25 at 127.

Mangla Dams can result in shortages of hydropower, which will intensify the ongoing load-shedding in the country and will threaten the manufacturing sector in Pakistan. Persistent load-shedding for longer hours every day can induce foreign investors to withdraw their investment from Pakistan in favor of some other country where there is less load-shedding, resulting not only in substantial capital flight but also the closure of several businesses, eventually raising unemployment and discouraging investors from making new investment in the country.

Furthermore, owing to a significant reduction in overall production caused by the shutdown of manufacturing firms, GDP will also decline, which is a bad sign for the national economy. Hence, the shortage of water has far-reaching impacts on the economy, making Pakistan vulnerable to changes in the flow of water in its transboundary rivers. This further indicates an immediate need to deal with the factors reducing the availability of water in the rivers and negatively affecting current water management practices in the country.

109 Id.
E. FACTORS AFFECTING WATER MANAGEMENT IN PAKISTAN

Certain factors affect current water management practices in Pakistan and disturb average annual water supply in the rivers. The prominent factors are Indian water storage projects and adverse, unexpected climate change, which cause abnormal increases or decreases in annual rainfall.

1. INDIAN WATER STORAGE PROJECTS

India has started constructing mass water storage dams over the western rivers, which were allocated to Pakistan by the Indus Waters Treaty. For instance, on the Chenab River, India has built eleven dams, among which the major dams are the Baglihar and Salal Dams.110 In addition, India has also completed several hydropower projects on the Chenab River, which include the Bichari, Bursar, Karwar, Kirthi, Kiru, Gypsa, Naunat, Pakwal Dul, Ratle, Seli, Shamnot, and Raoli.111 The Bursar project is the largest producer of electricity, 1,020 MW, and Pakwal is producing 1,000 MW.112 The smallest production is the 104 MW produced by the Bichari project.113 On a similar note, on the Indus River India has constructed nine hydropower projects.114 Similarly, on the Jhelum River there are thirteen hydropower generation projects built by India, including the

110 See Akhtar, supra note 82, at 10.
111 Id., at 28.
112 Id.
113 Id., at 28–29.
114 Id.
notorious Kishanganga Dam, which has a capacity to substantially divert the water of the Neelum-Jhelum River in Kashmir, leaving the Neelum Valley of Pakistan completely deserted.\textsuperscript{115}

Notably, Pakistan has raised objections to twenty-seven Indian water projects.\textsuperscript{116} The most prominent of these have been the Baglihar Dam, the Salal project, the Dul Hasti power project, the Wullar Barrage, and Kishanganga Dam.\textsuperscript{117} We will discuss the issues pertaining to the Kishanganga Dam and the Wullar Barrage in this paper.

According to official statements by Pakistan’s former Indus Waters Commissioner, Jamaat Ali Shah, these hydropower projects have the capacity to obstruct around 43 million cubic meters of river water from entering Pakistan.\textsuperscript{118} That is why the construction of these dams and hydropower projects by India over the western rivers is worrying the already water-stressed Pakistan, which is rapidly heading toward becoming a water-scarce country.\textsuperscript{119}

Pertinently, the construction of these Indian water projects has already resulted in a substantial decrease in the average annual flow of water in the rivers in Pakistan. For instance, the water flow in the Chenab River has decreased to 6,000 cusecs from its average level of 10,000 cusecs, because India has initiated almost a dozen water storage projects on the river.\textsuperscript{120}

\textsuperscript{115} Id., at 29.
\textsuperscript{116} Id., at 15.
\textsuperscript{118} See Akhtar, supra note 82, at 30.
\textsuperscript{119} Id.
\textsuperscript{120} Abdul Rauf Iqbal, Water Shortage in Pakistan – A Crisis around the Corner, 2 ISSRA PAPERS 1, 9 (2010).
by India was the most harmful to Pakistan, resulting in blocking a substantial flow of water to the Chenab River. For instance, on October 9 and 11, 2009, the Chenab River received 19,351 cusecs and 10,700 cusecs per day, respectively, despite being expected to receive around 55,000 cusecs.\textsuperscript{121} In the event of a complete blockage of water from India to the Chenab River contrary to the Indus Waters Treaty, more than 400 canals and more than a thousand of its tributaries will have no water to irrigate the 7.35 million acres of agricultural land in Pakistan.\textsuperscript{122}

\textit{a) Kishanganga Dam}

The Kishanganga Dam constitutes significant harm to Pakistan owing to its controversial design.\textsuperscript{123} The dam is being constructed by India on the run of the Neelum and Jhelum Rivers in Kashmir.\textsuperscript{124} The Neelum River meets with the Jhelum River in the Muzaffarabad region of Azad Kashmir, inside Pakistani territory.\textsuperscript{125} However, India wants the Neelum River to meet the Jhelum River inside territory it controls, in Jammu and Kashmir, by diverting the major stream of the Neelum River away from Muzaffarabad and toward Jammu and Kashmir through its Kishanganga project.\textsuperscript{126} This can literally dry out the naturally beautiful

\textsuperscript{121} Id., at 10.
\textsuperscript{122} Id., at 9-10.
\textsuperscript{124} Id.
\textsuperscript{125} MARTINA NICOLLS, \textit{KASHMIR ON A KNIFE-EDGE} 18 (Strategic Book Publishing, 2010).
Neelum Valley in Pakistan because the main source of water for this valley is the Neelum River, which will not reach there adequately if India is successful in diverting it toward its Jammu valley. Consequently, in the event of low rainfall in the Neelum Valley the area can face drought. Furthermore, the meeting of the Neelum River with the Jhelum River in Jammu can give leverage to India in controlling the amount of flow of the Jhelum River toward Pakistan. It can use this leverage during any conflict or war in order to negotiate with Pakistan on its own terms.

b) Wullar Barrage

India aims to construct the Wullar Barrage on the Jhelum River. It will have a water storage capacity of 0.30 MAF, which is several times higher than allowed by the Indus Waters Treaty, which permits India to store 0.2 MAF in a barrage over the Jhelum River for non-consumptive use. This indicates a clear violation on the part of India in complying with the maximum amount of water to be stored for non-consumptive use. Moreover, India would be able to control the flow of water of the Jhelum River to Pakistan through the Wullar Barrage at any

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129 See Akhtar, supra note 82 at 32.
131 See Akhtar, supra note 82, at 31-34 (discussing the Pakistani stance regarding the Wullar Barrage).
time it chooses. The Wullar Barrage will use the water of the Wullar Lake, which is a major source of water for the Mangla Dam.\textsuperscript{132}

Hence, according to Pakistan, the Wullar Barrage and Kishanganga Dam give considerable leverage to India in controlling the water flow of the Jhelum River. Pakistan has expressed its fears relating to the Wullar Barrage that India can either obstruct or inundate the Jhelum River basin in Pakistan through blocking or opening the spillways of these projects.\textsuperscript{133} If the reservations of Pakistan are true, this implies that these dams have the potential to cause significant harm to Pakistan, which is against the true spirit of the Indus Waters Treaty.\textsuperscript{134}

As the Indian water storage projects have the potential to adversely affect water flows in the Pakistani rivers, they can also cause adverse effects to agriculture and, consequently, an overall reduction in crop production.\textsuperscript{135} Any damaging impact on agriculture will also result in hostile consequences for the economy.\textsuperscript{136} Therefore, certain Indian water storage projects are a direct threat to the agrarian economy of Pakistan. Importantly, they are also harming current water management facilities in Pakistan by

\begin{thebibliography}{99}
\bibitem{132} Id.
\bibitem{133} Id.
\bibitem{134} \textit{See} Naz, \textit{supra} note 123, at 105.
\bibitem{135} \textit{See} Han Dorussen et al., \textit{Any Ties that Bind? Economic Diplomacy on the Sorth Asian Subcontinent,} \textit{in, Economic Diplomacy: Economic and Political Perspectives} 164 (Martinus Nijhoff Pub., 2011); \textit{see also} Ahmed Abukhater, \textit{Introduction,} \textit{in, Water as a Catalyst for Peace: Transboundary Water Management and Conflict Resolution} 13 (Routledge, 2013).
\bibitem{136} \textit{See} Javeria Niazi, \textit{Cost of Floods on Pakistan’s Economy} 14 (Anchor Academic Pub., 2013) (discussing the historic adverse effects on Pakistan’s agriculture).
\end{thebibliography}
reducing the availability of water. Nonetheless, India has never paid attention to Pakistan’s concerns and repeated complaints.

2. **Climate Change and Rainfall**

Climate change affects water management practices to a great extent in every region. For instance, a substantial decrease in rainfall can create a shortage of water in rivers, canals, barrages, and other water management facilities. Moreover, a complete absence of rainfall for a longer time can also create drought. Hence, in Pakistan, areas with low rainfall are more vulnerable to climate change. The government’s administrative bodies have made ponds and small lakes for storing water in low-rainfall areas. These lakes and ponds are, sometimes, the only water management facilities available to residents in the event of low rainfall. However, with adverse climate change resulting in

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137 See Wirsing & Adeel, *supra* note 46, at 42.
141 See Asaf Sarwar Qureshi, Rashida Majeed, Mohammad Saleem, Shahid Ahmad, & Zahid Hussain, *Drought Mitigation in Pakistan: Current Status and Options for Future Strategies*, 17 (IWMI, 2004).
droughts, these lakes and ponds become dried up. For example, during the recent drought in Tharparkar and Dadu in Sindh province, the available water resources in these regions became dried up, which caused a significant water shortage.142

On the other hand, sometimes climate change also results in an abnormal increase in rainfall during the monsoon season, which results in amassing the flow of water in the river basins in India and in Pakistan.143 Monsoons occur during the summer season, when the melting of Himalayan glaciers takes place, which generates large flows of water that run into the Indus river basin. This melted water combines with rain water during high monsoon rainfalls.144 Consequently, India also discharges a large amount of water to Pakistani rivers to protect its own land from flooding. This sometimes results in increasing the water level in the Indus Basin beyond a sustainable level.145 Such a situation eventually results in the flooding of the basin’s nearby regions in Pakistan.146 The flood level becomes more dangerous if the amount of water discharged by India into the river basins during these situations is high and beyond the storage capacities of the river beds and canals in Pakistan. There have been several floods in the

142 Id.
145 JAMES CLARKE ET AL., ON TARGET FOR PEOPLE AND PLANET, 36 (IWMI, 2014).
146 Id.
country when a high amount of water was drained by India into the rivers in Pakistan; this quantity was higher than usually discharged by India during other years and consequently beyond what could be accommodated by the river basins in Pakistan. The floods in the 1970s, 1988, 1992, and 2010 were damaging for crops and for the residents of the flood-hit areas.\textsuperscript{147}

Prominently, in a recent example, the flood in July 2010 caused irreparable damage to the agriculture and economy of Pakistan by devastating the crops and houses of local people in the flood-affected areas.\textsuperscript{148} The 2010 flood directly affected an estimated twenty million people. More than 2,000 people died and the homes of 1.6 million people were destroyed by the flood,\textsuperscript{149} while crops were devastated over a large area. The damage to the livestock sector was estimated at 48 billion PKR (457 million USD).\textsuperscript{150} The total monetary value of the damage by the flood was estimated to be 9.8 billion USD, around six percent of GDP.\textsuperscript{151}

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\textsuperscript{147} Shahid Hassan Rizvi & Syed Iazaz Ahmad Bukhari, \textit{Impact of 2010 Floods on Pakistan’s Agriculture}, 1 \textit{J. ENVIRON. ANALYTICAL TOXICOLOGY} (2017) [hereinafter: Rizvi & Bukhari].
\textsuperscript{149} Muhammad Zafer Khan & Ghulam Akbar, \textit{In the Indus Delta it is No More the Mighty Indus}, in, \textit{RIVER CONSERVATION AND MANAGEMENT}, 75 (Paul Raven & Philip Boon, ed., Wiley & Sons, 2012).
\textsuperscript{150} Rizvi & Bukhari, \textit{supra} note 147, at 1.
\end{flushright}
Such floods cause damage to the existing water management facilities in the country. They sometimes result in collapses of barrages and dams. Moreover, the irrigation system also suffers considerable damage. This demonstrates the adverse effects that abnormal changes in climate can cause on water management practices.

3. **INCREASE IN COSTS FOR COMPLETION OF WATER MANAGEMENT WORKS**

 Certain Indian projects have resulted in increases of the cost of some of the Pakistani water management works. This is because India has also started constructing water storage works on the same river streams as those on which Pakistan had already announced the construction of their new dams. For instance, Pakistan announced the Neelum–Jhelum power project in the last decade.\(^{152}\) Soon after that, India announced its plan to build the Kishanganga Dam on the Neelum and Jhelum rivers. Both nations have made counterclaims of early announcing and starting their projects.\(^{153}\)

 Pakistan made objections to the Kishanganga Dam as it deemed that the dam would have the potential to significantly disturb the flow of water in the Jhelum and

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\(^{152}\) Bids for the project were invited in May 2005, while the work was started in February 2008. See *Government Urged to Extend Deadline for Bids: Neelum-Jhelum Hydropower Project*, DAWN, (May 23, 2005), https://www.dawn.com/news/140397; see also *Musharraf opens Neelum-Jhelum power project today*, THE NEWS INT’L (February 9, 2008), https://www.thenews.com.pk/archive/print/94668-musharraf-opens-Neelum-Jhelum-power-project-today.

\(^{153}\) See Leb et al., *supra* note 128, at 417.
Neelum Rivers,\textsuperscript{154} which will consequently affect the flow of Neelum–Jhelum river water reaching the Neelum–Jhelum power project.\textsuperscript{155} In such a situation, the functionality of the project would be questionable. Therefore, it led Pakistan to reconsider completing the Neelum–Jhelum project, which not only caused a delay in the completion of the first phase of the dam but also increased the cost of the dam to at least three times the originally perceived cost.\textsuperscript{156}

India did not address the concerns of Pakistan regarding the Kishanganga Dam, which compelled Pakistan to file a case against India in the International Court of Arbitration.\textsuperscript{157} The final verdict required India to make certain changes in the design of the dam, but it also allowed India to continue constructing it.\textsuperscript{158} The completion of the Kishanganga Dam is not favorable to Pakistan,\textsuperscript{159} so Pakistan has decided to not follow the prior-appropriation rule,


\textsuperscript{155} \textit{See} Chaturvedi, \textit{supra} note 127, at 169.


\textsuperscript{157} \textit{See} Wirsing & Adeel, \textit{supra} note 46, at 40.

\textsuperscript{158} Although the court initially ordered India to cease the construction of the Kishanganga Dam when Pakistan appealed, it gave its final decision in December 2013 when it allowed India to continue constructing the Kishanganga Dam. \textit{See} GUSTAF OLSSON, \textsc{Water and Energy: Threats and Opportunities}, 19 (IWA Publishing, 2015).

\textsuperscript{159} \textit{See} Bjorn-Oliver Magsig, \textsc{The Indus Waters Treaty: Modernizing the Normative Pillars to Build a More Resilient Future, in, Imagining Industan: Overcoming Water Insecurity In The Indus Basin} 69, 79 (Zafar Adeel & Robert G. Wirsing eds., 2016).
which argues the party that first uses a watercourse is considered the rightful owner of that water resource.\textsuperscript{160} Hence, if Pakistan is able to complete the Neelum-Jhelum power project before India’s completion of the Kishanganga Dam, Pakistan will be considered the rightful owner of the Neelum and Jhelum River streams, on which both of these projects are being pursued. Nonetheless, it would induce Pakistan to make certain changes to the Neelum–Jhelum project to complete it early, having to employ additional resources for the earlier completion of the project. This would increase the cost of the dam, which is challenging for Pakistan because of the financial constraints on the budget of its development sector.\textsuperscript{161}

Without spending additional money, it is impossible to complete the dam in time and before India’s completion of the Kishanganga Dam.\textsuperscript{162} It can be said India is disturbing Pakistan’s current and future water management plans and projects by affecting the water of the western rivers, which were originally allocated to Pakistan for its unrestricted use.

Hence, in a nutshell, we can conclude from the above discussion that the overall water-management practices in

\textsuperscript{160} Pertinently, both India and Pakistan have opted to follow the Prior Appropriation Rule related to the Kishanganga project. See Sheila Rai & Sanghamitra Patnaik, \textit{Water Disputes in South Asia}, in, \textit{WATER RESOURCE CONFLICTS AND INTERNATIONAL SECURITY: A GLOBAL PERSPECTIVE}, 108, 125 (Dhirendra K. Vajpeyi, ed., 2012).

\textsuperscript{161} Mahendra Lal Patel, \textit{Global Monitoring of Food Situation of Indian Tribes}, in, \textit{GLOBAL PERCEPTION OF TRIBAL RESEARCH IN INDIA}, 28 (Atlantic Publishers & Dist., 2002).

\textsuperscript{162} This is because the cost of the dam has already increased, and if Pakistan employs more resources on the dam then the cost of the new resources will add up into the existing high costs. See WAPDA, \textit{supra} note 156 (offering details about the increase in cost as announced by the WAPDA chairman).
Pakistan are quite systematic and well structured; however, external factors such as obstructions in the flow of water by Indian water-storage projects and abnormal climate change, which has resulted in substantial increases or decreases in rainfall, are negatively affecting the flow of water in the rivers and the water-management system in the country.

III. **INDUS WATERS TREATY & WATER MANAGEMENT IN THE INDUS BASIN**

The Indus Waters Treaty provides special recommendations for Indus water management to both parties to the treaty, India and Pakistan. The treaty has devised a mechanism to distribute the Indus River and its five tributaries by assigning the three eastern river tributaries, the Ravi, Sutlej, and Beas Rivers, to India and the three western tributaries, the Chenab, Jhelum, and Indus Rivers, to Pakistan. Articles II, III, IV, and VII relate to the management of Indus water by Pakistan and India.

A. **CONSTRUCTION OF DAMS AND BARRAGES — ARTICLE IV**

Article IV of the Indus Waters Treaty provides guidance on water-management facilities. It recommends

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water management practices to Pakistan.\(^{166}\) This article encourages Pakistan to construct new water-management facilities over western rivers to eliminate or reduce its dependence on the eastern rivers.\(^{167}\) The eastern rivers are allocated to India for unrestricted use.\(^{168}\) Article IV, Paragraph 1, states:

*Pakistan shall use its best endeavors 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.*\(^{169}\)

Furthermore, Paragraph 3 of Article IV also recommends certain water-management schemes related to drainage, sanitation, preservation of soil from erosion, and removal of sand from river beds.\(^{170}\) The provision prevents India and Pakistan from pursuing such water-management schemes that may cause harm to the other or result in consumptive use of water in the rivers allotted to the other state.\(^{171}\) The first point of Paragraph 3 of Article IV states: *[E]ach Party will avoid, as far as practicable, any material damage to the other Party*\(^{172}\)

\(^{167}\) See id.
\(^{168}\) Id.
\(^{169}\) See id. at art IV, ¶ 1.
\(^{170}\) See id. at art IV, ¶ 3.
\(^{171}\) Id.
\(^{172}\) Id.
The treaty also explicitly mentions water-management endeavors such as barrages, dams, and irrigation canals and compels both states to not cause any harm to the other in pursuing any of the aforementioned water-management works. Paragraph 9 of Article IV states:

*Each Party declares its intention to operate its storage dams, barrages and irrigation canals in such manner, consistent with the normal operations of its hydraulic systems, as to avoid, as far as feasible, material damage to the other Party.*

However, India’s current use of the western river tributaries defies this provision of the treaty because India has constructed several water-storage projects on these rivers, which have the potential to cause significant harm to Pakistan by reducing the annual average flow of water in these rivers. As set out in the previous section 1.4, the average annual flow of these rivers has already fallen in the last decade, since the initiation of construction of controversial water-storage projects, that is, the Baglihar Dam, the Ratle Dam, the Salal and Kishanganga projects, etc., by India. This reduction in the average annual flow of water presents a threat to the current agricultural infrastructure in Pakistan, which is heavily reliant on that

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173 *Id.* at art. IV, ¶ 9.
174 See Magsig, *supra* note 159, at 79 (discussing the probable harm that can be caused to Pakistan by some water management projects of India).
175 Naz, *supra* note 123, at 105 (describing the damage that the Kishanganga dam can cause to Pakistan); see Dinar et al., *supra* note 138, at 332 (detailing Pakistan’s perceptions related to the likely harm carried by the Baglihar dam); see Akhtar, *supra* note 82, at 31-32 (discussing the harm carried by Wullar Barrage).
water.\textsuperscript{176} Thus, water-management facilities in India are causing significant harm to Pakistan, which further indicates India is failing to follow the true spirit of the Indus Waters Treaty.

B. INCREASE IN THE CATCHMENT AREA OF DRAINAGE BASINS — ARTICLE IV

The fourth paragraph of Article IV of the treaty provides further guidance to Pakistan for the special case when Pakistan feels the need to increase the catchment area of either its river basins or of any natural or artificial drainage basins that receive water drained by India toward Pakistan.\textsuperscript{177} In this regard, Article IV explains that:

\begin{quote}
[S]hould Pakistan desire to increase the catchment area, beyond the area on the Effective Date, of any natural or artificial drainage or drain, which receives drainage waters from India, or, except in an emergency, to pour any waters into it in excess of the quantities received by it as on the Effective Date, Pakistan shall, before undertaking any work for these purposes, increase the capacity of that drainage or drain to the extent necessary so as not to impair its efficacy for dealing with drainage waters received from India as on the Effective Date.\textsuperscript{178}
\end{quote}


\textsuperscript{177} See Indus Waters Treaty, India-Pak., art. IV ¶ 4, 3, 6. 8, Sept 19, 1960 419 U.N.T.S. 6032.

\textsuperscript{178} Id.
The effective date, here, implies the date of the signing of the Indus Waters Treaty. Paragraph 4 of Article IV also mentions particular drainages—the Kasur Nala, the Fazilka Drain, the Hudiara Drain, and the Salimshah Drain—and recommends that Pakistan should manage them properly in such a manner that no water should reach them beyond their capacities.179 That is, Pakistan can make adjustments to the capacities of these drains so they capture an adequate flow of water India drains.180 This is particularly helpful for managing the surplus water India drains during emergencies like heavy rainfall and flood threats. The purpose of this provision is to protect Pakistani regions near these drainage basins from being inundated by surplus water.

Nonetheless, the central issue is India usually does not share accurate data related to the surplus water it intends to drain toward Pakistan, particularly when there is a prevalent sense of hostility and distrust between the states.181 Therefore, Pakistan can only make assumptions based on previous trends of water drained by India. This involves, for Pakistan, inefficacies and problems in managing the drainage basins, which, in fact, are caused by India’s uncooperative behavior.182

179 See id.
180 See id.
182 As elucidated above that India does not share the accurate current river data with Pakistan; therefore, we can conclude that Pakistan, at most of the times, may lack data for forecasting estimations regarding the upcoming flow of water discharged by India in river basins. This would create inefficacies in water management, especially in the events
C. WATER MANAGEMENT FOR PREVENTING FLOOD DAMAGES—ARTICLE IV

The Indus Waters Treaty also includes provisions to prevent the adverse effects of flooding on each riparian state. In this regard, it allows the construction of new endeavors for managing surplus water resources to prevent floods, as set out above. However, the treaty also requires each state to not cause harm to the other when constructing any scheme or project for preventing floods or managing surplus water.\textsuperscript{183} India naturally bears more responsibility because it is an upper riparian state and can divert the flow of rivers toward Pakistan to protect its own territory from being flooded during rainy seasons. Therefore, the Indus Waters Treaty specifically instructs India (Paragraph 2 of Article IV) to not cause any harm to Pakistan in carrying out its flood-management endeavors.\textsuperscript{184} The wording of the article is:

\begin{quote}
In executing any scheme of flood protection or flood control each Party will avoid, as far as 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.\textsuperscript{185}
\end{quote}

of flooding, for Pakistan. Regarding India’s noncooperation in terms of not sharing river data, see \textit{id}.

\textsuperscript{183} See Indus Waters Treaty, India-Pak., art. IV ¶ 2, 3, 6, 8, Sept 19, 1960 419 U.N.T.S. 6032.

\textsuperscript{184} See \textit{id}. art. IV ¶ 2.

\textsuperscript{185} See \textit{id}.
Here, the point of Article III is to prevent India from any consumptive diversion of Western Rivers waters, whether intended to prevent floods in its own territory or for any other reason. This is because consumptive use or diversion of the Western Rivers by India is regarded as an action causing harm to Pakistan, for it can result either in a shortage of water or flooding during abnormal decreases or increases in rainfall, respectively.

Despite the provision entailing prohibition of the consumptive use of Western Rivers, India has continued constructing new hydropower and water-storage dams on the Western Rivers within its territory, and Pakistan has repeatedly complained to India about its consumptive use of Western Rivers waters. The Wullar Barrage and Kishanganga Dam are prominent examples of this, being Indian attempts to construct on Jhelum and Neelum Rivers, respectively.

D. UNRESTRICTED USE—ARTICLES II AND III

Article II of the Indus Waters Treaty approves the unrestricted use of waters of the Eastern Rivers to India, and it allows Pakistan the use of water of these rivers for only non-consumptive purposes. This means India can construct dams or barrages and can use the water of the Eastern Rivers for any purpose. However, Pakistan can use the water of these rivers for agriculture or domestic

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186 Shyam Kishor Agarwal, Environmental Controversies 86 (2002)
187 Id.
188 See Magsig, supra note 159, at 79; see also Naz, supra note 123, at 105.
189 Id.
purposes, and for any purpose that does not result in storage or diversion of large flows of water of the Eastern Rivers.\textsuperscript{191}

On the other hand, Article III provides Pakistan with the right to the unrestricted use of the Western Rivers, but it also allows India the use of waters of the Western Rivers for domestic, agricultural, and hydropower generation, with the core restriction of not diverting or affecting their natural flow.\textsuperscript{192} Hence, both states have been restricted from the consumptive use of waters of rivers allocated to the other. However, India is not fully obeying this provision and has initiated dozens of hydropower projects that not only have the capacity to store large quantities of Pakistani Western River waters but also are intended to divert the streams of these river waters and thus have the potential for consumptive use of the water of these rivers. For instance, as set out above, the Kishanganga Dam, constructed by India on the Jhelum and Neelum Rivers, has the potential to affect the natural run of this river by either substantially reducing or inundating it, as per Indian unilateral will.\textsuperscript{193}

It is the “unrestricted use”\textsuperscript{194} of the Western Rivers allocated to Pakistan by the Indus Waters Treaty that provides legal leverage to Pakistan over the waters of these rivers to manage them in any way that serves the agrarian, domestic, hydropower, and all other water-related requirements of Pakistan.\textsuperscript{195} That is, Pakistan can manage the waters of the Western Rivers through diversion or storage of their waters or through any means. Pakistan can construct

\textsuperscript{191} Id.
\textsuperscript{192} See id. at art. III.
\textsuperscript{193} See Magsig, supra note 159, at 79.
\textsuperscript{194} See generally Indus Waters Treaty, art. III, Sept. 19, 1960.
\textsuperscript{195} See id. at art III ¶ 2 & 3.
new dams, barrages, or canals for agriculture and electricity generation purposes. However, such water-management endeavors of Pakistan on these rivers can be affected adversely if Indian water-storage projects continue to obstruct water flow in the Western Rivers, leading to a decline in the amount of water available for dams, canals, barrages, and other water-management ventures in Pakistan.

E. CONSTRUCTION OF ENGINEERING WORKS ON THE INDUS BASIN—ARTICLE VII

Although both of the two states can initiate engineering works on the Indus Basin for any beneficial purpose, the water of the Indus Basin is the shared property of both states and does not belong solely to either, so Article VII of the Indus Waters Treaty compels each state to inform the other of plans for constructing any engineering work in the Indus Basin that will use the basin’s water.196 This provision means one state should not initiate engineering work in the Indus Basin without notifying the other, particularly when the engineering work could affect water availability in the other state’s part of the basin.197 Hence, neither India nor Pakistan can accomplish any water-management engineering project in the Indus Basin without sharing relevant information, including detailed plans, accurate data relating to the functioning of the project, and the size, nature, and effect of the project. Paragraph 2 of Article VII states:198

196 See id. at art. IV, ¶ 2 (implementation is required if the engineering works have the potential of affecting the other state).
197 Id.
198 See id.
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 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.\(^{199}\)

If India and Pakistan could follow this provision to its fullest, then no conflict would arise related to the distribution and use of the Indus Basin or to any water-management engineering project initiated by either state in the basin. This is because both states would inform the other of its water-management engineering works, which would induce both states to discuss the relevant objections by either side to engineering works in the Indus Basin. Consequently, if discussions remain fruitful and unaffected by past or present hostilities, both states can resolve their objections to the engineering works together.

Unfortunately, the reality is contrary to the guidelines provided in this provision of the Indus Waters Treaty because India never shares with Pakistan the information related to its water-management engineering works.\(^{200}\) India starts constructing its water-management engineering works, whether they are large-storage-capacity dams or hydropower projects or barrages, unilaterally and without notifying Pakistan.\(^{201}\) This instigates conflict in which

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199 Id.
200 See Hossain & Jones, supra note 181, at 36.
201 Id.
Pakistan has to express its reservations to the Indian water-storage project because of the controversial nature of the storage facility or functioning of the project. This has been the case for several water-management engineering works by India, including some of India’s major dams and barrages. Pakistan has not been provided adequate answers and information for twenty-seven controversial Indian water-management projects.

Overall, these provisions of the Indus Waters Treaty indicate its keenness to guide Pakistan and India in their water management endeavors. Notably, the Indus Waters Treaty is the only agreement between the two states that has stood for several years and has done so despite ongoing hostilities. It is the only treaty that has laid out a framework and scheme for the equitable distribution of their shared transboundary river waters.

Therefore, this treaty has foremost importance for both states. Its endorsement of effective water-management schemes is a marked example of a treaty guiding states to not only distribute and utilize but also

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202 See Akhtar, supra note 82.
203 Id. at 15.
204 See Marsden, supra note 164.
205 RAMESH THAKUR, NUCLEAR WEAPONS-FREE ZONES 163 (Springer, 2016); See also P.C. BANSIL, WATER MANAGEMENT IN INDIA 37 (2004).
206 Singh, supra note 48, at 108; see also R.B. MANDAL, WATER RESOURCE MANAGEMENT 51 (2006).
manage their transboundary river waters effectively through joint cooperative management of the shared river basin.208

IV. WATER MANAGEMENT IN THE INDUS BASIN IN COMPLIANCE WITH INTERNATIONAL LAW

International law guides riparian states in managing water optimally to benefit both upper and lower riparian states.209 These rules are incorporated in certain declarations and conventions, which have been endorsed and accepted by most states worldwide. The purpose of international law in guiding riparian states in managing water is to ensure transboundary waters are international water and not the private property of a particular country.210

Therefore, states that share transboundary international watercourses have an obligation to follow international water laws and relevant principles for equitably sharing and using international water resources, preferably in a way that doesn’t bring harm or injustice to other states.

208 See KISHER UPRETY, CHALLENGES, LESSONS, AND PROSPECTS FOR OPERATIONALIZING REGIONAL PROJECTS IN ASIA: LEGAL AND INSTITUTIONAL ASPECTS 47 (2014).
209 VIRPI STUCKI ET AL., WATER AND SECURITY IN CENTRAL ASIA: SOLVING A RUBIK’S CUBE (ROUTLEDGE, 2016); see also UNEP/UNDP JOINT PROJECT ON ENVIRONMENTAL LAW AND INSTITUTIONS IN AFRICA, DEVELOPMENT AND HARMONIZATION OF ENVIRONMENTAL LAWS 26 (1999). [Hereinafter: UNEP/UNDP].
210 Akunga Momanyi, Re-thinking Estuaries Ecosystem Governance in the WIO Region, in, ESTUARIES: A LIFELINE OF ECOSYSTEM SERVICES IN THE WESTERN INDIAN OCEAN 243 (Peter Scheren, Salif Diop, and, John Ferdinand Machiwa, eds., 2016).
A. ENVIRONMENTAL ASSESSMENT

International law stresses maintaining the quality of water in river basins. It also urges states to make environment assessments related to their water resources.

1. THE BERLIN RULES

In this regard, Articles 27 to 33 of the Berlin Rules strictly instruct states to take adequate measures to not only prevent pollution but also remove hazardous substances that have already been discharged into watercourses by factories and other entities. Furthermore, Article 28 explains the purpose of maintaining water quality: “States shall establish water quality standards sufficient to protect public health.”

Maintaining quality freshwater resources results in preserving health for the people who use that water resource for drinking and domestic purposes. Furthermore, improved quality of irrigation water is also essential for crops; that is, irrigating water should not contain nutrients.


212 See also UNEP/UNDP, supra note 209 at 26.


214 Id. at art. 28.

that are harmful to crops. This is applicable to both India and Pakistan. Both states are dependent on agriculture for fulfilling their demands for food and adding production value to their GDP. Because the preservation of the natural aquatic environment is the main intention of these laws, both countries must take adequate measures to prevent pollution in their shared river courses, as well as in their other freshwater resources. For this purpose, states must also review their water-management projects so as to assess their effect on the environment. This is also recommended in Article 31 of the Berlin Rules, which stresses assessment of watercourses, environments, ecosystems, human health, ecology, and other activities that may be directly affected by a water-management project. Article 29 further requires that states make assessments of their watercourses. The language of the article is as follows:

1. States shall undertake prior and continuing assessment of the impact of programs, projects, or activities that may have a significant effect on the aquatic environment or the sustainable development of waters.

2. Impacts to be assessed include, among others:
   a. Effects on human health and safety;
   b. Effects on the environment;

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216 See generally Amos Feigin et al., Irrigation with Treated Sewage Effluent 25-26, (E. Bresler et al. eds., 1991) (discussing the beneficial and harmful nutrients in the irrigation water for crops).
218 Berlin Conference, supra note 213, at art. 31.
219 See Id. at art 29.
220 Id. at art 29, ¶ 1.
Moreover, Article 8 of the Berlin Rules, which is titled “Minimization of Environmental Harm,” prohibits states from causing any harm or damage to the environment in their water-management endeavors. It reads “States shall take all appropriate measures to prevent or minimize environmental harm.” This means India must make certain arrangements to prevent or mitigate the chances of causing environmental harm to the Indus River Basin. Pertinently, India’s Kishanganga Dam is a threat to the natural aquatic environment and agrarian lands of the Neelum Valley in Pakistan’s Azad Kashmir because the dam includes a plan to divert the Neelum River water away from the Neelum Valley.

Owing to the significant environmental harm associated with the Kishanganga Dam and in accordance with the international legal obligation to not cause harm to the environment, India must either halt the controversial Kishanganga project or make substantial adjustments to its implementation plan to make it favorable enough for the natural environment of the Neelum Valley.

\[221\] Id. at art 29, ¶ 2.  
\[222\] Id. at art 8.  
\[223\] Id.  
\[224\] See Magsig, supra note 159, at 79.
2. **THE UN WATERCOURSES CONVENTION**

The preservation of the ecosystem is paramount and obligatory on all riparian states.\(^{225}\) In addition to the Berlin Rules, the UN Watercourses Convention also endorses the protection of ecosystems and related environmental life. Article 20 of the UNWC reads: “Watercourse States shall, individually and, where appropriate, jointly, protect and preserve the ecosystems of international watercourses.”\(^{226}\)

This further implies an obligation on all states to preserve and protect the natural ecosystem linked with international watercourses.\(^{227}\) However, for the natural Indus Basin, Indian endeavors to complete the controversial Kishanganga Dam that appears to be contrary to this principle.\(^{228}\) As, the construction of Kishanganda dam carried harm to the natural environment of the Neelum Valley;\(^{229}\) therefore, the construction of this dam can be regarded as a violation to the UN Watercourses Convention, which endorses protection of the natural environment of international watercourses.\(^{230}\) Hence, in accordance with Article 20 of the UN Watercourses Convention, India should assess the environmental harm of the Kishanganga Dam on

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227 See *id*.

228 As elucidated above that the Kishanganga dam entails significant harm to the natural environment of the Neelum Valley as the dam can deprive the Valley from 27% of water of Neelum River, which can cause negative effects on the existing agrarian environment of the Valley. See Chaturvedi, *supra* note 127, at 169.

229 *Id*.

the Neelum Valley. For the purposes of such an assessment, India can make joint arrangements with Pakistan. It can take suggestions from Pakistan to ensure minimum harm is caused to the Neelum Valley region from its Kishanganga Dam.

3. **Supplemental Rules on Pollution**

Article 3 of the Supplemental Rules on Pollution is relevant to the discourse of assessing the effects of the Kishanganga Dam on the Neelum Valley. Article 3 recommends that:

> in using the waters of an international drainage basin, States individually or jointly as appropriate shall ensure prior assessment of the impact of programs or projects that may have significant transboundary effect on the environment or on the sustainable use of the waters.²³¹

Nonetheless, India has not taken any measures before initiating the Kishanganga Dam to assess its environmental impacts, and Pakistan has already expressed its concerns related to its damaging environmental consequences for the Neelum Valley in Azad Kashmir.²³²

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²³¹ See The Int’l Law Ass’n, Rep. of the Sixty-Seventh Conf. Held at Helsinki 414, 1996; see also Rieu-Clarke, supra note 225, at 141.
²³² See Jasparro et al., supra note 207, at 96; see also Leb et al., supra note 128, at 417.
B. No-Harm Principle

According to the no-harm principle, one riparian state must minimize the harm to the other, and it must not cause any additional significant harm to another state through any of its water management endeavours.\(^{233}\) This principle has been endorsed by the International Law Association (ILA), the United Nations, World Commission on Dams (WCD), World Commission on Water for 21\(^{st}\) Century (WCW), and the World Water Council (WWC).\(^{234}\)

1. The UN Watercourses Convention, Article 7: Obligation not to Cause Harm

Article 7 of the UN Watercourses Convention (UNWC) has included an application of this principle, titled “obligation not to cause significant harm,” in defining a relationship between the riparian states for sharing a transboundary watercourse.\(^{235}\) Article 7 of the UNWC explicitly prevents riparian states from causing any significant harm to the other state in any manner.\(^{236}\) It reads:

*Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate*


\(^{235}\) See Article of UN Watercourses Convention 1997.

\(^{236}\) Id.
measures to prevent the causing of significant harm to other watercourse States.  

Hence, in accordance with the UN Watercourses Convention, in accomplishing its own water management endeavors India must not cause harm to other riparian states, i.e., Pakistan. This principle is similar to an article of the Belgrade Rules, as set out below.

2. **The Belgrade Rules**

   Article 1 of the Belgrade Rules on the Relationship of International Water Resources with other Natural Resources and Environmental Elements requires that:

   *States shall ensure that [t]he development and use of water resources within their jurisdiction do not cause substantial injury to the environment of other States.*

   This rule is by Article IV of the Helsinki Rules, which has a similar provision preventing states from causing any significant harm or damage to other states or to their environments.

   Nonetheless, India has not followed these principles, and its newly planned and initiated water storage projects on the western rivers are causing significant harm to Pakistan in terms of depriving it of its due share of the
western river waters. The average annual flows in the Chenab, Jhelum, and Indus Rivers have already fallen to a great extent, as set out in the introduction to this paper. If the contentious Indian projects under construction are completed, there would be a further reduction of the average annual flow of water in the western rivers, which will threaten the agricultural infrastructure in Pakistan. Such harm would be significant enough to cause a decline in agricultural production and, consequently, to the GDP and growth rate of Pakistan, because the agriculture contributes to the GDP to a great extent in Pakistan.

C. JOINT WATER MANAGEMENT OR BASIN-WIDE JOINT MANAGEMENT

Joint water management is becoming popular in the international discourse of water management because it is considered the most effective way of managing

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240 For details about Pakistan’s perceptions related to the likely harm carried by the Baglihar dam see Dinar et al., supra note 138, at 332; see also the details about Pakistan’s concerns related to the harm carried by the Kishanganga Dam see Magsig, supra note 159, at 79; For detailed discussion regarding the harm carried by Wullar Barrage see Akhtar, supra note 82, at 31-32.
241 See Sufi et al., supra note 77, at 2.
242 Qureshi et al., supra note 30, at 1.
243 See Choudhary et. al, supra note 25 at 127.
transboundary watercourses. It endorses equitable utilization, sustainable development, and integrated management of water resources. Moreover, it also ensures the mutual benefit of all parties that take part in the joint management of common water resources.

This technique can be adopted by India and Pakistan for collaboratively managing and developing the Indus Basin and incurring mutual benefits from it. The possibility of implementing the joint water-management schemes for the Indus Basin can prevent disputes relating to water resources between the two countries, because every water-management project on the Indus Basin will be

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implemented with mutual consultation, consent, and cooperation through joint-management mechanisms.  

Provisions in international law govern certain aspects of basin-wide joint management.  

Here we will explore the Berlin Rules, the UN Watercourses Convention, and the Rules on the Regulation of the Flow of International Watercourses, specifically focusing on their provisions on basin-wide joint management at the international level.

1. Berlin Rules, Articles 64, 65, and 67

Article 64 of the Berlin Rules endorses the joint management of a transboundary river basin in the following words: “[w]hen appropriate, basin States shall establish other joint mechanisms for the management of waters.”

Article 65 of the Berlin Rules also details aspects that can be covered by joint management mechanisms: it recommends collaboration from both sides on technical and scientific expertise and research programs related to the development, upgrade, and optimal utilization of the shared

250 Flavia Rocha Loures, History and Status of the Community-of-Interests Doctrine, 2 A HIST. OF WATER SER. NO. 3: SOVEREIGNTY AND INT’L WATER L., 212, 225 (2015); see also Ziganshina, supra note 245.


253 Id. at (XI) art. 65.
basin from both sides. Article 65 further recommends signing a formal agreement between the parties to finalize arrangements related to joint expense management, the legal sphere of the joint collaboration, the functioning of the joint mechanisms, the duration of the joint endeavors, the roles and authorities of joint bodies, and the key objectives of joint management of the shared river basin.

Pertinently, these things being finalized before the establishment of a joint-management system for the Indus Basin would help India and Pakistan collaborate without raising conflicts in the management, utilization, and development of the Indus Basin. Both will be able to resolve their differences and put their joint efforts for upgrading of the Indus Basin to reap mutual benefits.

2. **The UN Watercourses Convention**

The UN Watercourses Convention has endorsements for the establishment of joint mechanisms for developing and using international watercourses. Article 24 of the Convention sets out its support for the joint management of transboundary watercourses:

*Watercourse States shall, at the request of any of them, enter into consultations concerning the management of an international watercourse, which may include the establishment of a joint management mechanism.*

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254 *Id.*
255 *Id.*
The management of international watercourses is also defined in the text of this article:\[258\]

*Management refers, in particular, to:*

* a) Planning the sustainable development of an international watercourse and providing for the implementation of any plans adopted; and*

* b) Otherwise promoting the rational and optimal utilization, protection and control of the watercourse.*\[259\]

Thus, the management of an international watercourse is related to the planning, sustainable development, protection, and optimal utilization of water resources.

This implies if either of the two rival states, India and Pakistan, wants to initiate a joint mechanism for Indus water management through mutual bilateral support and collaboration and also sends a formal request to the other state, the state receiving the request would be required to facilitate collaboration and consultation with the other to establish the joint water-management mechanism. This can ensure a purposeful orientation of consultation between the states and, if such consultations are successful, would build a new wave of coordination and mutual trust between the states. Furthermore, such joint management of the basin would contribute to the development, upgrading, and optimal use of the basin. The joint management would also not result in harm to either state from any water management endeavor in the Indus Basin.

\[258\] Id.

\[259\] Id.
D. SUSTAINABLE MANAGEMENT

Sustainable management of water resources is the most popular idea in the international legal arena, but achieving it is also one of the greatest current challenges related to water management.\textsuperscript{260} Sustainable management of a water resource is beneficial for its upgrading as well as preservation.\textsuperscript{261} Moreover, it results in an environmentally friendly use of the water resource.\textsuperscript{262} International law has offered tremendous support for the sustainable management of international water resources.\textsuperscript{263}

1. BERLIN RULES

Article 7 of the Berlin Rules explicitly instructs states to take substantial steps to sustainably manage water resources.\textsuperscript{264} It reads: [s]tates shall take all appropriate measures to manage waters sustainably.\textsuperscript{265} Article 40 repeats the goal.\textsuperscript{266}

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\textsuperscript{260} A. Berndardi et al., Managing Central Asia’s transboundary rivers: case studies of the Zaarafshan (Tajikistan/Uzbekistan) and Tarim (Kyrgyzstan/China) rivers, in 8 WATER RESOURCES MANAGEMENT 149, 150 (C. A. Brebbia ed., 2015).
\textsuperscript{261} RICHARD LONGSTRETH, SUSTAINABILITY & HISTORIC PRESERVATION: TOWARD A HOLISTIC VIEW, 83-93 (University of Delaware Press, 2011).
\textsuperscript{262} IMPACT SCIENCES, INC. & SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN AND SPINEFLOWER CONSERVATION PLAN: ENVIRONMENTAL IMPACT STATEMENT, 16–17 (RDMP-SCP EIS’EIR, 2010).
\textsuperscript{263} ALISTAIR RIEU-CLARKE & FLAVIA ROCHA LOURES, THE UN WATERCOURSES CONVENTION IN FORCE: STRENGTHENING INTERNATIONAL LAW FOR TRANSBOUNDARY WATER MANAGEMENT, 281 (Routledge, 2013).
\textsuperscript{264} See Berlin Conference on Water Resources, art. 7 Aug. 21, 2004, ILA.
\textsuperscript{265} Id.
\textsuperscript{266} Berlin Conference on Water Resources, art. 40 Aug. 21, 2004, ILA.
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States shall give effect to the principle of sustainability in managing aquifers, taking into account natural and artificial recharge.  

In addition to the surface water resources, the Berlin Rules also recommend states pay attention to sustainably managing groundwater resources. Article 38 of the Rules recommends states take adequate action to sustainably manage groundwater resources and aquifers.  

This principle is fully applicable to India and Pakistan, which rely heavily on the use of groundwater for irrigating crops in regions river water does not reach. Because of the excessive use of groundwater resources in these regions, groundwater levels are depleting and possibly harming the future availability of groundwater in these regions. Therefore, both states need to take adequate measures to sustainably develop and manage the river basin water to reduce their dependence on groundwater use.

2. The Johannesburg Declaration on Sustainable Development

The Johannesburg Declaration supports the sustainable development of the natural ecosystem and

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267 Id.
268 Id.
270 Id.
resources.\textsuperscript{271} It elucidates the benefits of achieving sustainable development in all fields.\textsuperscript{272} According to the declaration, sustainable development leads to improved quality of life.\textsuperscript{273} Furthermore, for achieving sustainable development, it is also essential that resources are upgraded for their long-term sustenance and protection; for instance, the water resources should be protected from pollution and degradation.\textsuperscript{274} Special measures taken for the upgrading of a water resource can lead to its sustainable development.\textsuperscript{275}

India and Pakistan both need to take such measures for the well-being, upgrading, and development of the Indus Basin to achieve sustainable development in the basin. This is required because sustainable development prevents the depletion of natural resources,\textsuperscript{276} and the Indus Basin is important enough to both states that it will be protected from becoming depleted.

\begin{itemize}
\item 272 Id.
\item 273 Meeting of Senior Officials and Ministers of health, Johannesburg Declaration on Health and Sustainable Development, 3, WHO/HDE/HID/02.8 (January 19-22, 2002).
\item 274 Id. at 8.
\item 275 Id.
\item 276 KAILASH CHANDRA BEBARTA, FOREST RESOURCES AND SUSTAINABLE DEVELOPMENT: PRINCIPLES, PERPECTIVES AND PRACTICES 104 (New Delhi Concept Publishing 2004).
\end{itemize}
V. CONCLUSION

Water management is one of the most important requirements of the agricultural economy of Pakistan. However, the adverse changes in climate and the obstruction of flow of water by the Indian water-storage works are causing issues for water management in Pakistan. The government of Pakistan has plans to construct new water-storage facilities in the country; however, certain new Indian water-storage projects are causing an increase in cost for the projects under construction in Pakistan. For instance, India’s Kishanganga Dam’s construction has induced Pakistan to complete its Neelum–Jhelum power project so as to acquire adequate water for the project from the Neelum River before India uses it for its Kishanganga Dam. This is in accordance with the prior-appropriation rule, which states the country that uses a particular water resource first is the legitimate owner of that resource. The Kishanganga Dam poses a direct threat to water availability in the Neelum Valley and for the Neelum–Jhelum project.

277 Dr. Badruddin Soomro, Inaugural Address by the Chief Guest, in, SUSTAINING SURFACE AND GROUNDWATER RESOURCES: PROCEEDINGS OF THE INTERNATIONAL WORKSHOP ON CONJUNCTIVE WATER MANAGEMENT FOR SUSTAINABLE IRRIGATED AGRICULTURE IN SOUTH ASIA 11 (Asad Sarwar Qureshi et al. eds., IWMI 2002).
278 See Akhtar, supra note 82, at 1-2,4; see also SAEID ESLAMIAN, HANDBOOK OF ENGINEERING HYDROLOGY: MODELING, CLIMATE CHANGE, AND VARIABILITY 119 (CRC Press 2014).
279 Singh, supra note 48, at 233.
280 For instance, see WAPDA, supra note 156.
282 See Magsig, supra note 159, at 79.
In addition to the Kishanganga Dam, there are several Indian water-storage projects that are threatening irrigation and water-management practices in Pakistan by reducing the flow of river waters to Pakistan.\textsuperscript{283} The average annual flow of waters in the Pakistani rivers has already declined significantly.\textsuperscript{284} Furthermore, the storage capacities of the largest water-storage facilities in Pakistan, the Tarbela, the Mangla, Chashma, and other smaller dams, have decreased to a great extent.\textsuperscript{285} This is creating a challenging situation for the existing water-management endeavors of Pakistan. Pakistan has repeatedly requested India reconsider its new water-storage projects because these projects have the potential to cause significant harm to the natural water flows, agriculture, and ecosystem in Pakistan; however, India has mostly neglected Pakistan’s concerns.\textsuperscript{286}

Negative effects on agriculture mean an adverse impact on the economy in Pakistan. This is because agriculture is an important pillar of Pakistan’s economy because it is the largest sector in terms of national GDP.\textsuperscript{287}

International law prevents such measures by India, for principles and rules of international law prohibit inflicting any significant harm to the natural environment of one state by another in fulfilling its water-management endeavors. Article 7 of the UN Watercourses Convention and Article 1 of the Belgrade Rules are focused on the

\textsuperscript{283} See Akhtar, supra note 82, at 15.
\textsuperscript{284} See Sufi et al., supra note 77, at 2.
\textsuperscript{285} Chaturvedi, supra note 127, at 141.
\textsuperscript{286} For instance, details regarding the Baglihar Dam see Dinar et al., supra note 138, at 332; See also Indian rejection of Pakistan’s stance and countering it with arguments for the Wullar Barrage in: Akhtar, Supra note 82, at 31.
\textsuperscript{287} Choudhary, supra note 25, at 127.
obligation on states to not cause any significant harm to others.\footnote{For details, see Article 7 of UN Watercourses Convention and Article 1 of the Belgrade Rules.}

Furthermore, the Berlin Rules, the UN Watercourses Convention, and the Supplemental Rules on Pollution also make it obligatory for a state to make an appropriate assessment of the environmental impacts of its water management practices within its territory as well as on neighboring states. However, India appears to be noncompliant with these conventions and rules of international law because it has not made appropriate assessments of the adverse effects on the natural environment and water habitat that its water storage works carry with them.

In addition to the international conventions and principles, the Indus Waters Treaty, which is a bilateral legal agreement between India and Pakistan, prohibits India from causing any harm in pursuing its water-management endeavors to Pakistan.\footnote{See paragraph 3 of Article IV, Indus Waters Treaty, 1960.} It prevents India from taking consumptive use of water in the western rivers.\footnote{See Article III, Indus Waters Treaty, 1960. See also Agarwal, supra note 186, at 86.} However, according to Pakistan, certain Indian water-management projects on the western rivers have caused violations of the Indus Waters Treaty because of their consumptive utilization of the waters of western rivers.\footnote{See Naz, supra note 123, at 105.} For instance, the Kishanganga Dam is being constructed on the Jhelum River and has the potential to divert or substantially affect the natural flow of the Jhelum River,\footnote{See Magsig, supra note 159, at 79.} which constitutes...
consumptive use of the Jhelum River water not allowed by the Indus Waters Treaty.\textsuperscript{293}

On the other hand, the Indus Waters Treaty also includes policies and mechanisms for water management for the mutual benefit of both states.\textsuperscript{294} After equitably apportioning the Indus water between India and Pakistan, it provides recommendations to Pakistan and India for constructing their water management engineering works for efficiently utilizing and benefitting from the Indus Basin.\textsuperscript{295}

It also recommends that both states exchange data with each other on a regular basis related to the flow of water in their rivers and to their planned, under-construction, and existing water-storage works.\textsuperscript{296} This has been made obligatory by the Indus Waters Treaty so each state may know about the water-management works of the other state that are being constructed on the shared Indus Basin.\textsuperscript{297}

If India starts following the principles of the Indus Waters Treaty, international conventions, and international water laws, a great sense of cooperation for the sustainable and basin-wide joint water management between India and Pakistan can arise, which will produce mutual benefits for both states. This is because both states require the water of

\textsuperscript{293} Id.; see also Agarwal, supra note 186, at 86.
\textsuperscript{294} See Hooper supra note 163, at 196.
\textsuperscript{295} See Article VII ¶ 2, Indus Waters Treaty, 1960.
\textsuperscript{297} See Bourne, supra note 238, at 163.
the shared river basin for agriculture, hydropower generation, drinking, and domestic purposes. However, the current situation goes against this, because India has reportedly threatened to revoke or modify the Indus Waters Treaty to gain a greater share of water in the Indus Basin for its water-management endeavors, which can lead to the additional deprivation of Pakistan of its due share of water in the Indus Basin and consequently threaten its existing and planned water management schemes.

298 Regarding Indian uses of watercourses, see PUKHRAJ RAKHECHA & VIJAY P. SINGH, APPLIED HYDROMETEOROLOGY, CHAPTER 6 (Springer, 2010); Regarding Pakistan’s uses of watercourses, see R. Meinzen-Dick, Valuing the Multiple Sues of Irrigation Water, in, WATER: ECONOMICS, MANAGEMENT AND DEMAND, 50 (M. Kay, & T. Franks, CRC Press, 2002).