WATER: A TRIGGER FOR AN INDO-PAK CONFLICT: MYTH OR REALITY

A dissertation submitted to the Indian Institute of Public Administration (IIPA), New Delhi for the degree of Master's Diploma in Public Administration (MPDA) in partial fulfilment of the requirements for the 44th Advanced Professional Programme in Public Administration (APPPA)

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44TH ADVANCED PROFESSIONAL PROGRAMME IN PUBLIC ADMINISTRATION

2018-19

INDIAN INSTITUTE OF PUBLIC ADMINISTRATION

NEW DELHI

Certificate

I have the pleasure to certify that Brigadier Vikram Varma, VSM has pursued his research work and prepared the present dissertation titled "Water: A Trigger for an Indo-Pak Conflict: Myth or Reality" under my guidance and supervision. The dissertation is the result of his own research and to the best of my knowledge, no part of it has earlier comprised any other monograph, dissertation or book. This is being submitted to the Panjab University for the degree of Master of Philosophy in Social Sciences in partial fulfilment for the Advanced Professional Programme in Public Administration of Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Brigadier Vikram Varma, VSM is worthy for the consideration for the award of M. Phil degree of Panjab University, Chandigarh.

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Acknowledgement

I express my sincere thanks to my guide Prof KK Pandey, who has helped and guided me in this long journey of learning. He took a lot of effort in making me understand the fine nuances of the topic and then helped in selection and collection of the material from various sources. He has also suggested relevant changes in the report to make it more useful. I also extend my heartfelt thanks to the Programme Director, Prof Ashok Vishandass for giving me this opportunity and extending all support in this matter. I also express my gratitude to the IIPA Library staff, as also the staff of APPPA office for their support.

Brigadier Vikram Varma, VSM

Abbreviations

Serial Number	Abbreviation	Full Form
1	asl	Above Sea level
2	BCM	Billion Cubic Metres
3	CWC	Central Water Commission of India
4	CoA	Court of Arbitration, The Hague
5	cm	Centimetres
6	IWT	Indus Water Treaty 1960
7	IISD	International Institute of Sustainable Development
8	Km	Kilometres
9	MAF	Million Acre Feet
10	MOSPI	Ministry of Statistics and Program Implementation
11	m	Metres
12	Mn	Million
13	NITI	National Institute for Transforming India
14	PCRWR	Pakistan Council of Research in Water Resources
15	WAPDA	Pakistan Water & Power Development Authority
16	WWO	World Water Organisation
17	UNDP	United Nations Development Programme

Contents

List of Figures

List of Tables

List of Graphs

Executive Summary

1. On 8 June 2018 a Pakistani mainstream English paper carried the headlines “Pakistan could "run dry" by 2025 as its water shortage is reaching an alarming level” (Baloch, 2018) and nearly at the same time in India the NITI Agog released its report on water management that stated “India is currently suffering from the worst water crisis in its history” (Aayog, 2018). The writing is therefore on the wall for both countries that decades of mismanagement, uncontrolled population growth and total lack of water management planning have resulted in the per capita availability of water drastically falling from over 5000 cu m per capita at the time of independence to 860 cu m (PCRWR, 2018) & below 1500 cu m per capita (Aayog, 2018) respectively for Pakistan & India. What is more worrisome is that the predictions for both countries does not make happy reading with Pakistan expected to fall below 800 cu m per capita (PCRWR, 2018) and India to about 1340 cu m per capita by 2025 (CWC, 2017). The seriousness of the issue can be gauged when compared to the gold standard for water calculation i.e. Falkenmark Index (Falkenmark, 1992) that states that below 1700 cu m per capita a country is under “water stress”, below 1000 cu m per capita it has water scarcity and below 500 cu m per capita it has “absolute water scarcity”, which clearly indicates that while Pakistan is slipping towards absolute water scarcity, India is slowly slipping towards water scarcity.. Therefore the basic question for research was to study whether water will be a trigger for a future Indo-Pak conflict?

2. India and Pakistan were once one entity and the geography of the Himalayas has ensured that no matter what, their destinies are intertwined. While India still has multiple sources of surface water, but Pakistan is restricted to only one i.e. the Indus Water Basin comprising six rivers that flow from India and one from Afghanistan. The intertwining between the two countries can be gauged from the fact that out of the 138.4 MAF of surface water that Pakistan gets annually, 117.4 MAF comes from India, while the balance 21 MAF comes from Afghanistan (PCRWR, 2018). Its present requirements are over 180 MAF and it meets the shortfall by extracting approximately 50 MAF of ground water (PCRWR, 2018). The fall in water tables in both countries is one of the fastest in the world and with the passage of time will only get worse. To make matters worse for Pakistan, its relations with Afghanistan are at a historic low and it is in this period that Afghanistan has decided to build 12 dams on River Kabul and its distributaries (Mustafa, 2016), which if executed may result in a drop of over 5 MAF of water annually (Mustafa, 2016), which is more than the storage capacity of one

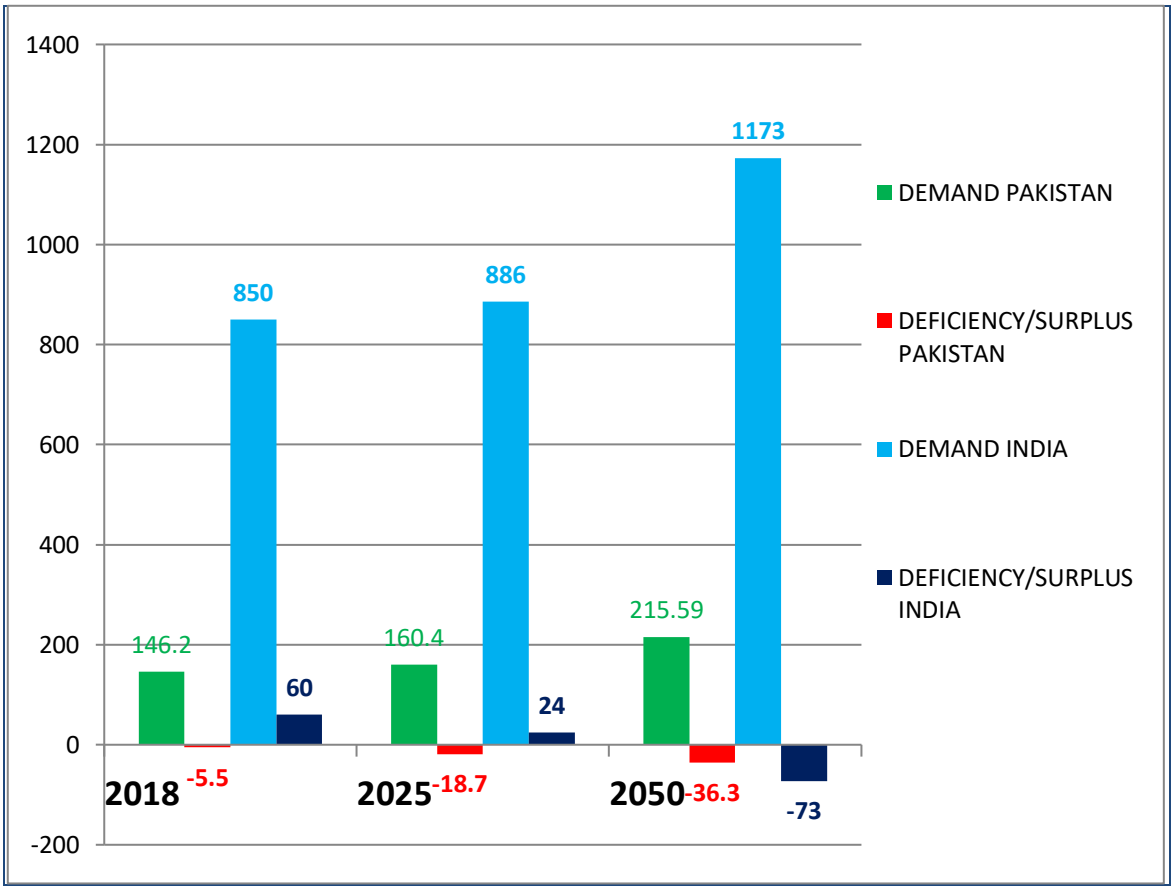
of Pakistan's biggest dams Mangla.

3. History is witness to the fact that no civilization has survived without water. As per records, till date there have been 655 conflicts related to water in history out of which 279 (42%) have taken place since 2000 out of which 42 have been in Southern Asia itself (WWO, 2018). Hence, water has been and will continue to be a source of conflict for mankind. Its forms are basically three i.e. as a trigger, as a weapon or as a casualty of the conflict. It is critical to note that water has no substitute and unlike oil where other sources of energy can be found, thirst can only be quenched by water.

4. On account of their shared past the water usage in both India & Pakistan follows a similar pattern i.e. over 90% is consumed by the agriculture sector and the balance 10% is shared between industry & domestic use. Water guzzling crops like rice and water result in major demands of water, which is further accentuated by an inefficient irrigation system and poor yield per drop. This mix of flawed priorities and inefficient water management systems has brought both these countries to a major water crisis. When times were good and water was aplenty, both countries signed a historical treaty called the Indus Water Treaty in 1960. The treaty gave the unrestricted use of the Eastern Rivers to India while gave bulk of the Western Rivers to Pakistan though with certain usage allowed for India also. It stood the test of time because nature was kind to both countries and water was never really a challenge. However, post 1990's the situation took a turn for the worse primarily on account of the exponential growth in population in both countries and the resultant pressure for feeding the millions of additional citizens. Add to this global climate change especially in terms of rise in temperatures and the present and future both look bleak to say the least. The good news is that four major studies carried out in the last 6 to 7 years have concluded that there will be no change to water availability due to climate change and the decrease due to glacial melt will be made up by increase in precipitation (Jo-Ellen Parry, 2017). However, the experts have also concluded that the rise in global temperatures will lead to an increase in demand resulting the proverbial demand and supply imbalance.

5. The situation today is worse for Pakistan vis-a-vis India because it has fewer resources and its demand in increasing at a more rapid rate. The demand supply mismatch is best highlighted in the Graph below, which in one snapshot highlights that Pakistan has very little time and by 2025 it will be staring at a major water crisis that it may not be able to manage. For India the prognosis is the same albeit in a different timeframe i.e. beyond 2040. A

recent survey (included 150 respondents each from India & Pakistan) carried out by the China University of Geosciences, Wuhan and was published in the Asia Pacific Journal of Multidisciplinary Research, Volume 3, Number 1 in February 2015 found that after Kashmir, Water was the most serious issue between the two countries (Muhammad Tayyab Sohail, 2015) i.e. more serious than Terrorism, Sir Creek and Siachen. This only highlights the sensitivities of people on both sides.



Demand & Availability of Water India & Pakistan in MAF

6. One of the major causes of friction between the two countries is that India sees great hydroelectric potential in its state of J&K. The state has a capacity of 16,475 MW out of which only 3264 MW (20%) is being harnessed (Department, 2018). India has taken up multiple projects like Kishenganga, Baglihar, Pakal Dul, and Sawalkote to bridge this 80 % gap and as per present reports; projects to harness 13076 MW are in various stages of planning, survey and implementation (J&K, 2018). While India calls them run-of-the-river projects, Pakistan is aware that there can be no project without the storage on some water. This leverage that India is slowly building up worries Pakistan on two accounts i.e. one that it will reduce its supply of water and second that India will retain the capability to regulate the flow of water

thus making it capable of using water as a weapon. If Pakistan had other sources of water, it could have leveraged them to overcome any temporary crisis, however it has none. Similarly, if this was the only bone of contention between the two countries, it could have been dealt with based on the merits of each case. The tragedy is that both countries have other major dispute, the key amongst them being Kashmir & Cross Border Terrorism that holds to ransom any chance of a peaceful negotiation between the two. The Indus Water Commission has also failed to be a good mediator and in recent years Pakistan has taken its cases to the World Bank and the Court of Arbitration at The Hague. Though it has lost both the cases i.e. Baglihar & Kishenganga, however its water crisis is so acute that it suits the establishment to blame everyone including India and the international community rather than accepting the blame. Having said this in the last year or so there has been a quantum change in how Pakistan views its water crisis. From the media to researchers and now even some in the establishment have started blaming faulty internal policies for the same. The National Water Policy of 2018 is a step in the right direction as is India's own water Policy. While this may a silver lining but the history of the two countries proves that they never miss an opportunity to blame each other and take to conflict to get their way and the Kargil conflict at the turn of the millennium only highlights the risks and challenges.

7. Therefore, to arrive at any conclusion it was important to build probable scenarios and based on past experience, global trends, history between the two countries and most importantly data to substantiate or negate the scenarios, three probable scenarios were built for testing. These three scenarios were further subdivided into three sub scenarios based on their probability i.e. Optimistic, Realistic and Pessimistic to ensure nine scenarios, which covered the entire spectrum. Three basic timelines were taken i.e. present 2018, medium term 2025 and long term 2050. The scenarios so developed are highlighted below:-

(a) **Scenario I- Status Quo**. The scenario envisaged the business as usual model with some successes for both sides in water management.

(b) **Scenario II – Climate Change**. Based on the four major studies carried out by experts in the last 6 to 7 years the data so projected was tested against various sub scenarios to arrive at findings.

(c) **Scenario III- Unilateral Actions by India**. Being the upper riparian and the alleged victim of Pakistan's thousand cuts policy, a number of Indians

believe that time has come to use water to put pressure on Pakistan and hence three such scenarios were analysed.

8. The outcomes of the nine scenarios developed and game played are best displayed in the table below:-

Water a Trigger	Scenario I – Status Quo			Scenario II – Climate Change			Scenario III – Unilateral Action by India		
	Optimistic	Realistic	Pessimistic	Optimistic	Realistic	Pessimistic	Optimistic	Realistic	Pessimistic
Medium Term 2025	NO	NO	YES	NO	YES	YES	YES	YES	YES
Long Term 2050	NO	NO	YES	NO	YES	YES	YES	YES	YES

Possibility of Water being a Trigger Based on Probable Scenarios

9. **Findings**. Based on the data from each scenario, the key findings are as under:-

(a) **Scenario I**. In the status quo scenario, water is unlikely to be a trigger in the short to medium term, however unless both countries focus on water management, it has the potential to be a trigger in the long term.

(b) **Scenario II**. In the climate change scenario, the demands of water of Pakistan increase substantially and with static availability the normal principles of demand and supply loose equilibrium. Thus it is imperative that both in the medium term and long term water could be a trigger.

(c) **Scenario III**. In the unilateral action by India scenario, it is clear that any act of water control that affects the agriculture of Pakistan has the potential to be a trigger for conflict. While India retains all the cards, however the reaction card is still with Pakistan and fine tuning this operation will be a major challenge for India and it may not be able to control the escalatory ladder.

10. **Overall Prognosis**. Based on all the analysis carried out above it clearly emerges that water will be a critical factor in all future Indo-Pak equations. The overall prognosis for the medium to long term is that *water is likely to be used as a Weapon by India, Trigger by Pakistan and will be a Casualty in any future water related conflict* based on details as under:-

(a) **Water as a Trigger**. Since India is the upper riparian state that has no dependency on Pakistan for its water, while Pakistan is dependent on India for over 80% of its surface water, any water crisis will give the upper hand to India. Based on scenarios above water is likely to be used as a Trigger by Pakistan in the medium to long term during i.e. during a major water crisis.

(b) **Water as a Weapon**. Being the upper riparian state with major disputes like Kashmir & Cross Border Terrorism, India is likely to use Water as a Weapon to settle its disputes by using means other that War. It will attempt to control the escalatory ladder; however, that is a matter for greater research.

(c) **Water as a Casualty**. Historically neither India nor Pakistan has ever targeted each other's water resources during their four wars. However, since water will either be a trigger or a weapon in the conflict, this is likely to change and more likely than not Pakistan will attempt to capture/breech water reservoirs close to the International Boundary/ Line of Control during a conflict, to ensure flow of water along the rivers.

11. **Likely Manifestation**. The most likely manifestation of water as a Trigger, Weapon and Casualty based on scenarios developed above are explained below:-

(a) The timeline being discussed is between 2025 and 2035.

(b) India has completed its projects on the Western rivers especially the large ones like Pakal Dul & Sawalkote and is now capable of storing over 5 MAF of water in all reservoirs combined along these rivers. On its Eastern Rivers, India has completed the Shahpurkandi dam and reduced the flow to Pakistan to zero. Pakistan has been able to increase its storage capacity by 5 MAF through

construction of new dams but its water scarcity remains critical with per capita availability dropping below 800 cu m per capita. On the Eastern borders, Afghanistan has completed its 12 dams and is now capable of holding at least 5 MAF of water to tide over lean periods.

(c) On the political front status quo in terms of ongoing disputes especially Kashmir and cross border terrorism persist.

(d) The El Nino effect drastically affects the annual monsoon and the average rainfall comes down drastically in the catchment areas reducing the overall availability of water. The same was predicted by the Indian Metrological Department and hence India decides that it will ensure maximum storage of its reservoirs along both Western & Eastern Rivers to tide over the crisis.

(e) As a result of the above, there is not only a delay in release of water to Pakistan but there is also a drop in the total water reaching Pakistan. Against the annual average of between 101 to 110 MAF in the Kharif season, it now drops to approximately 85 to 90 MAF. This results in a major uproar in Pakistan because the farmers are feeling the shortage for their rice sowing season. While Pakistan protests in the Indus Water Commission, India attributes the drop to the poor monsoons. Pakistan naturally approaches the World Bank and seeks arbitration, which is resisted by India. A similar picture emerges between Pakistan & Afghanistan.

(f) To overcome the shortage of water for its farmers, Pakistan releases water from its reservoirs bringing down its storage from 19 MAF to 10 MAF. This drop in reservoirs results in a drop in hydroelectricity generation causing discomfort to the locals, who blame the Government for the crisis.

(g) Despite the crisis and both countries blaming each other, the Kharif season is completed with a 20% drop in production in Pakistan, which is causing an agrarian crisis. However, with some international support, Pakistan is able to tide over the crisis but blames India for the situation. Its reservoirs are now at an all time low and it expects that the winter precipitation will make up the deficiency.

(h) However, the winter precipitation also is slightly below normal and

reservoirs continue to fall to all time low levels and to make matters worse, the Rabi season sowing season has arrived. Wheat is ready to be sowed but India decided to use water as a tool to get Pakistan to stop cross border terrorism and decides to delay the release of water from the western rivers by 20 days. This causes a major crisis in Pakistan because it is incapable of releasing any more water from its reservoirs, which will all shut down if water levels come down any further. Farmers are in severe crisis as wheat is the main crop and with the poor produce in the Kharif season, most are debt ridden. Major national protests break out in Pakistan with farmers on the street asking for water and power. Given the weather situation, even in India the farmers are agitating for more water and the Government in under severe stress in the media to decide whether it wants to release water to Pakistan or save its own people and farmers.

(i) The overall deficiency for Pakistan based on the developing situation is given below that highlights the challenge to the Government:-

(i) Kharif Season. 85 MAF against annual average of 105 MAF i.e. deficiency of 20 MAF. Even with enhanced storage capacity of 19 MAF compared to 14 MAF presently, Pakistan will be unable to meet its requirements. The delay in release of water by India for 15 to 20 days will put additional pressure.

(ii) Rabi Season. 10 MAF against an annual average of 25 MAF i.e. deficiency of 15 MAF. Given the sensitivity of wheat to farmers any delay or drop in availability will be very serious.

(iii) Total Shortage of Water. Pakistan will get 95 MAF of water that compares with its low average in the year 2000-01, when it was 97.6 MAF. However, its demand will have gone upto 165 MAF (Jo-Ellen Parry, 2017). Out of this deficiency ground water will make up 40 MAF leaving an overall deficiency of about 30 MAF resulting in per capita availability of just 478 cu m per capita, which as per the Falkenmark Index is “Absolute Water Scarcity”.

(j) Pakistan requests India to release water for its Western rivers; however India decides to leverage water as a tool to get Pakistan to agree to stop cross

border terrorism.

(k) The situation is now ripe for a major crisis. One outcome is that the Pakistani Government falls due to the farmer agitation, however the situation remains the same for the next Government also and hence its options are limited. The only option left with Pakistan is to declare India's actions as an act of War and use the water crisis as a trigger to launch a conflict.

(l) This unfolding story can easily become a reality after 2025 unless both countries take drastic actions to improve their water management, reduce wastages, increase efficiency, enhance storage to tide over seasonal variations, minimise carbon footprint to delay the climate change due to global warming and begin to recycle this precious resource.

12. **Recommendations**. Having arrived at this conclusion, the following actions if taken will not only increase the threshold to pull the trigger but will also delay it.

(a) Pakistan has huge inefficiencies in its water management system. Some of the key ones that it can improve include additional storage capacity to prevent wastage of water that flows into the Arabian Sea (20 MAF).

(b) The canal system in Pakistan is generally unlined that results in seepage/evaporation of 46.7 MAF of water (PCRWR, 2018), which is unacceptable for a water deficient country. This can be addressed through multiple means like lined canals, pipelines, high efficiency irrigation systems etc.

(c) Similarly India looses 53% of its surface water to evaporation (Aayog, 2018), which can easily be improved through better canal systems, water harvesting techniques and better irrigation technology.

(d) Over usage of ground water is likely to cause a major crisis for both countries. Free or cheap power to farmers is the primary cause. For long term sustenance it is imperative that farmers in both countries move towards sustainable exploitation with the shortfall being made up through greater efficiency at the farm level.

(e) Climate change is a reality and though studies indicate no major changes in water availability till 2050 (Jo-Ellen Parry, 2017), however, it is incumbent on this generation to think of the future ones too and hence both countries need to study the hydro graphics of the basin together and ensure minimum degradation due to climate change.

(f) The IWT meets Pakistan's requirements but is perceived in India to be detrimental to its growth. It will continue to be a cause of dispute between the two countries till it is linked with other disputes like Kashmir and cross border terrorism. Once delinked from these issues, there is a possibility of both countries amicably meeting their needs.

(g) Agriculture is the primary consumer of water in both countries i.e. in excess of 90%. It is this sector that needs special focus in terms of low water consuming crops, shift to other crops from water guzzlers like rice and sugarcane. If agriculture sector in both countries can bring in even 10% greater efficiency, the over availability of water will jump manifold.

(h) A very large percentage of water in both countries is lost to pollution and unlike developed countries where technology is being used to recycle water, the same is found lacking in both India and Pakistan. Special emphasis on the issue will ameliorate the problem to a great degree.

(i) Overall the time has come for both countries especially Pakistan to look at water as a strategic resource that needs a national effort to conserve and protect. Once this is understood, a lot of things will automatically fall into place.

(j) The prognosis in the medium to long term is grim and unless drastic steps are taken on a war footing the possibility of water being the nemesis of both nations cannot be wished away.

CHAPTER 1: INTRODUCTION, RESEARCH METHODOLOGY AND LITERATURE REVIEW

"blood & water can't flow together at the same time"

PM Narendra Modi, Sep 2016

1. India and Pakistan have fought four major wars and are presently engaged in an ongoing proxy war that is centred on Kashmir. However, despite their hostilities towards each other, nature has intertwined the two nations geographically by linking their source of water through a common source i.e. the mighty Himalayas and a common water basis i.e. Indus Water Basin. In 1960, both nations signed the Indus Water Treaty (IWT, 1960), which has ensured peaceful sharing of waters for over 50 years despite the wars between the two nations. This arrangement has now been put under strain for a number of reasons including population explosion and its resultant pressure on increased water requirements for domestic, agricultural, power generation & industrial use, which is further accentuated by poor water management by both nations. This severe crisis of water when coupled with ongoing tensions on terrorism makes a heady mix that has the potential to spiral out of control. A leading Pakistani paper The News in its lead article on 8 June 2018 stated that ***"Pakistan could "run dry" by 2025*** (Baloch, 2018) ***as its water shortage is reaching an alarming level".*** Pakistan's water availability per capita has declined from 5260 cu m per year in 1951 to 1000 cu m in 2016 and is likely to fall to 860 cu m by 2025, marking its transition from a "water stressed" country to a "water scarce" (PCRWR, 2018) country. The overall dependence of Pakistan's water requirements from rivers flowing from India can be gauged from the fact that out of the 188.4 Million Acre Feet (MAF) of water resources annually, Pakistan receives 117.4 MAF from rivers in India i.e. 62.3% of its annual resources including groundwater and 85% of its surface water resources. *Similarly NITI Aayog in its report on water management stated that* "***India is currently suffering from the worst water crisis in its history***" (Aayog, 2018). India has also seen a drastic degradation in its water availability with the per capita availability falling from 5178 cu m in 1951 to 1441 cu m in 2015 (CWC, 2017). The seriousness of the issue is illustrated in the Figure 1 below, which clearly shows that both India and Pakistan are likely to face major water crisis by 2040.

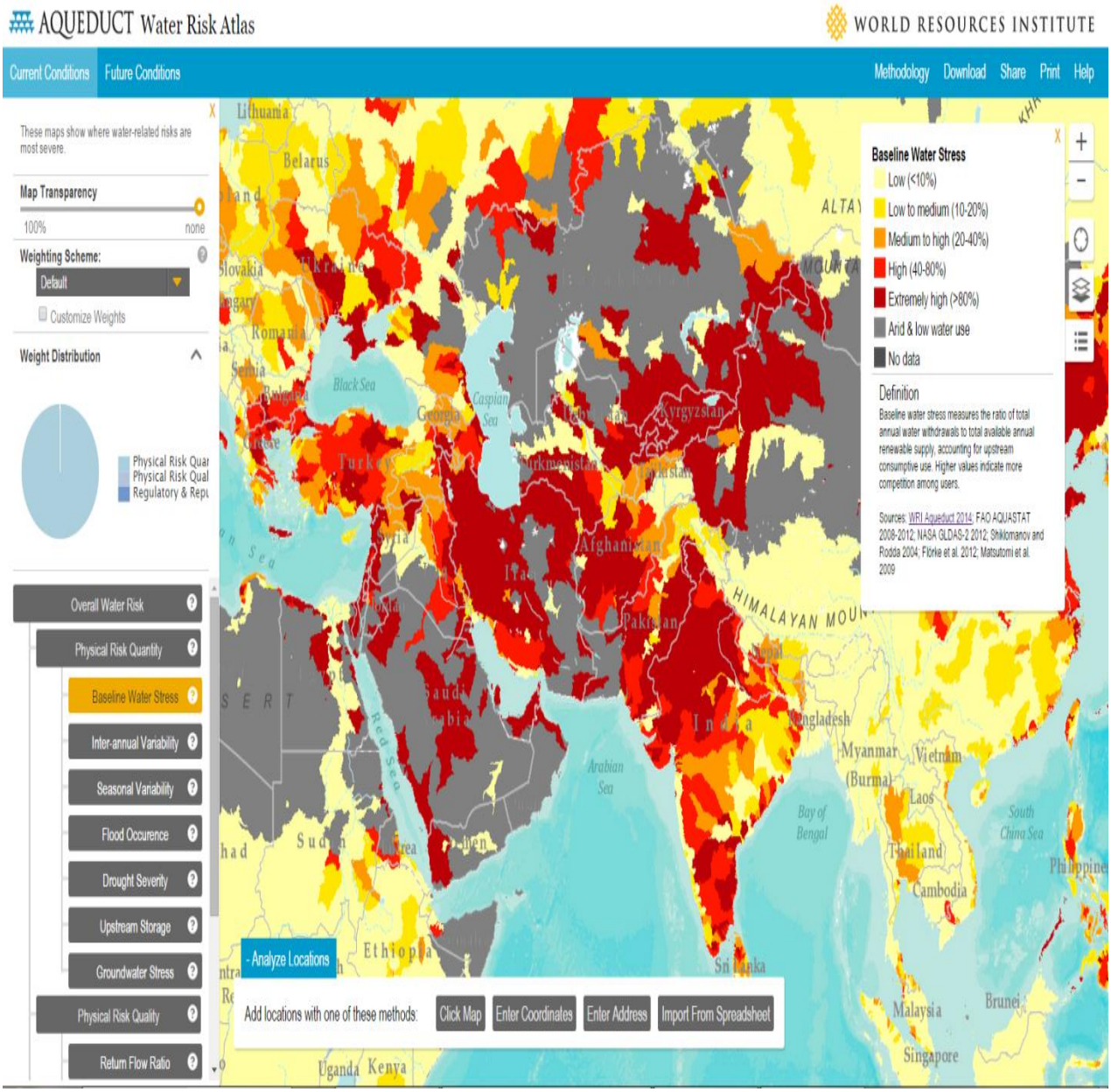


Figure 1 - Map Showing Water Stress in South Asia (Institutes, 2014)

2. History is replete with conflicts over water has been used as a weapon between states to achieve politico-strategic-military aims. As per World Water Organisation, 551 conflicts (WWO, 2018) have been fought by humans in recorded history. Civilizations like the Sumerian civilization 4000 BCE and Maya civilization 800 BCE are said to have disappeared primarily on account of water shortages (Chellaney, Water, Peace and War, 2014). In India the famous Mughal capital of Fatehpur Sikri was occupied in 1573, however had to be abandoned in 1585 (only 12 years from occupation) due to scarcity of water (Chellaney, Water, Peace and War, 2014). Whereas the 20th century was characterized as the century of oil wars, the 21st century is likely to be one of water wars. However, it is also true that not all nations that have

mutual disputes over water choose conflict as a means of resolution of the issue. Hence, it is imperative to study the historical context to arrive at a prognosis. Also the IWT has stood the test of time for over half a century and it is critical to analyse the same in today's context to see if it can meet current requirements or is susceptible to fail. Economic growth has added a new dimension to water requirements especially for agriculture, power and industry, which has forced India to construct new power projects in J&K (Baglihar, Kishenganga, Uri I & II etc), which have become a source of conflict between the two countries. India sees a potential of 16,457 MW of power from the western rivers in J&K, out of which only 3,263 MW are presently being produced and work is in progress for 1,935 MW (Times, 2018). Thus there is a lot of potential that remains unexploited; however, this is causing a major upheaval in Pakistan as it views it as a breach of the IWT (NewsDesk, 2018). Does this change the status quo, and is it a source of conflict needs deeper analysis.

3. A lot has changed in the perspective on water between India and Pakistan in the last 3 to 4 years. While PM Narendra Modi post the Uri terrorist attacks in 2016 stated that "*blood & water can't flow together at the same time",* however, will the shedding of blood due to terrorist activities in both countries be accentuated by the change in status quo on flow of water or will it be a source of peace that will reduce the shedding of blood is the key research problem that is proposed to be analysed.

Statement of Problem

4. India and Pakistan are agrarian economies with very high population densities. Geographically both are interlinked by one of the World's largest water basins i.e. Indus Water Basin. With ever increasing demands on account of growing populations, climate change and poor water management, the water situation in both countries is deteriorating at an alarming rate with the passage of time. Water is an irreplaceable source for life in any country and given the fact that India is the upper riparian state in the Indus Water Basin from where Pakistan draws 85% (PCRWR, 2018) of its annual resources and in light of the findings of Government of Pakistan that per capita availability of water is likely to fall to 860 cu m by 2025 (PCRWR, 2018), chances of water being a source of tensions cannot be ruled out. However, will these tensions over water result in conflict between these nuclear armed states are a matter for analysis?

Research Objectives

5. The objective of the study is to analyse the water requirements of Pakistan and Western India (J&K, Punjab and Rajasthan) against the water availability. To study the implications of any water crisis caused between the two countries either due to environmental factors (successive droughts/floods/poor water management) or on account of unilateral actions by either country. To evaluate the impact of such water stress on the relations between the two countries. To build scenarios based on water crisis, and analyse the results of such scenarios i.e. status quo or source of conflict. To make certain recommendations based on analysis to mitigate the crisis.

Research Design

6. The research will be descriptive and exploratory by studying various secondary sources i.e. books, research papers, newspaper articles and data on water from various studies by organisations like UNDP, UNICEF, World Bank, Food & Agricultural Organisation and Government agencies. Since conflict is a result of certain thresholds that are crossed by one or both parties, it is imperative to analyse various scenarios against probable threshold to at relevant conclusions. The overall design is enumerated in the Figure 2 below:-

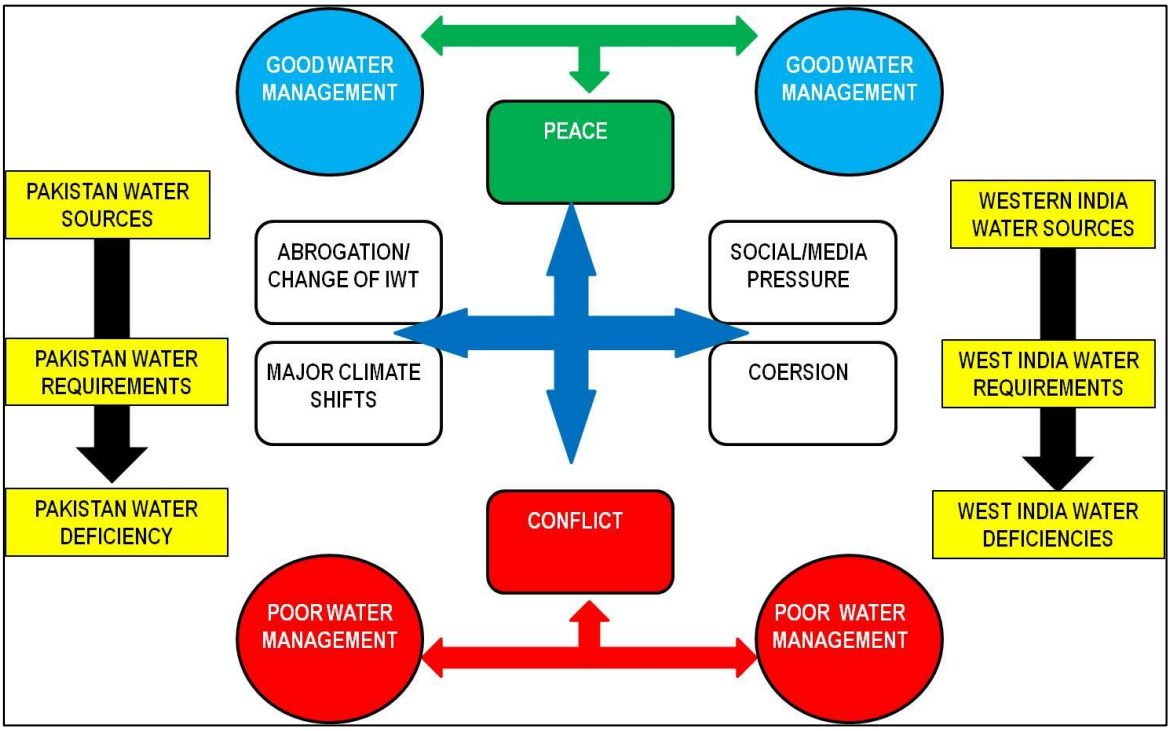


Figure 2 - Overall Research Design

Rationale

6. In 1960 India signed the Indus Water Treaty with Pakistan with the hope that its benevolence of providing 80% of the water of the Indus Basin to Pakistan will ensure lasting peace between the neighbours. However, in 1965 Pakistan launched Op GIBRALTAR to annex J&K from India. Hence, the greatest generosity in human history (Chellaney, Water: Asia's New Battleground, 2011) failed to meet its objective. A lot of water has flown under the bridge since then and today both countries are facing acute water crisis, with the severity in Pakistan a lot more than India (as enumerated at Paragraph 1 above). Some of the drivers that have caused this change include population explosion, increased area under irrigation, overexploitation of groundwater, increased demand of power to drive growing economies and climate change etc. It goes without saying that the availability of water is fixed and the factor that is changing at a rapid rate is the demand. This demand and supply mismatch is resulting in human suffering on both sides, leading to intra-state tensions, resulting in social turmoil, which finally results in shifting the blame to trans-border reasons by the ruling establishment. This in turn causes a media hype, which further raises social unrest and national fervour, finally resulting in an open blame game. When seen against the backdrop of a history of hostilities between the two sides and ongoing tensions on account of Kashmir and cross border terrorism, it is prudent to analyse if water can trigger a drastic meltdown of relations. On the other hand not all nations who have water crisis and are fighting with their neighbours. Good water management, exploitation of technology, long term investment in water security can mitigate the oncoming crisis, which is common to both nations. Hence, one could argue that water could easily become a source of peace rather than conflict. Also, while nature will take its own course, which is normally a slow process, however, any unilateral action by India to change the status quo on the IWT has the possibility of causing a major crisis in Pakistan. Hence, use of water as a weapon cannot be ruled out especially by India given its superior geographic location. . Therefore, it is imperative to study which of the two i.e. peace or conflict is a likely scenario.

Research Questions

7. In view of the above stated statement of problem, the research will analyse and attempt to answer the following questions:-

(a) Will India and Pakistan maintain peace over water sharing through better water management?

(b) Will either country use water as a weapon to achieve its strategic/political aims?

(c) Will scarcity of water be a trigger for an Indo-Pak conflict?

Limitations

8. The primary limitation is that global climate patterns are hard to predict and hence studies already carried out by specialist agencies will have to be relied upon. The next limitation is that scenario building is a complex exercise and involved a number of factors. However, for the purposes of the research it will focus primarily on water. The last limitation is that there are other countries that are part of the Indus basin like China and Afghanistan; however, for the research the focus will be on India and Pakistan only.

Review of Literature

9. While a lot of research has been carried out in both countries on how to overcome their respective water crisis, including by various UN agencies, however, there are no conclusive studies that establish clear correlations (triggers, timelines and manifestations) between the water crisis in both countries and the possibility of it leading to a conflict or being used as a weapon for coercion. Some of the literature that is proposed to be reviewed is given in succeeding paragraphs.

10. *Lieutenant Colonel Hammad Quadir* (Quadir, 2008) states that water will be a major source of crisis in South Asia. He also concludes that these are likely to lead to conflict. However, since the author has covered all countries of South Asia including China and Afghanistan, he has not focussed on any two countries in particular and has also not elaborated on causes that may lead to conflict between India and Pakistan. Hence, the research gap is the triggers, timelines and manifestations of such findings.

11. *Mohammad Nasrullah Mirza* (Mirza, 2006) in his PHD thesis enumerates the evolution of the IWT and elaborates on the ongoing disputes with special focus on building of dams by India in J&K. The findings state that Kashmir is a water issue and hence there is a need for a Kashmir Water Commission as part of the IWT. The author concludes that if India agrees to amend the IWT, water can bring peace between the two countries. The research gap is that while the research concluded that water is a source of dispute, yet the conclusions drawn are that it will lead to peace. This dichotomy needs further analysis.

12. *Brahma Chellaney* (Chellaney, Water: Asia's New Battleground, 2011) states that water disputes will be a source of conflict in Asia. It is highlighted that other issues notwithstanding, Kashmir and Tibet are basically water issues. Certain measures have been enumerated to avoid such conflicts. However, the triggers that can lead to conflict or peace between India and Pakistan have not been elucidated by the author and hence remain a research gap.

13. *The Centre for Naval Studies* (CNA, 2017), USA states water is becoming a source of conflict in the entire spectrum i.e. from local civil unrest to interstate conflicts. The study primarily focuses on Africa and Middle East, where key water issues are discussed. In the Indo-Pak context the conclusions drawn by the study are that both countries are vulnerable to conflict, however here again specific triggers or timelines are not elaborated on and hence requires further research

14. *The Atlantic Council* (Ahmed S. , 2017), a think tank states that Pakistan is likely to face a major water crisis in the near term and given the fact that its primary source of water is from the Indus water basin, it is in Pakistan’s interest to ensure that the IWT continues in its present form. The issues of water stress for India are also discussed in brief. The study gives out some policy changes to overcome the water crisis, however, does not build on possibilities if either or both countries fail to successfully implement these policy changes. Hence, there is a gap in the research, which is proposed to be analysed.

15. *Vishal Murada* (Murada, 2016), states that water will be a major security challenge for India in the near future. The key issues related to water disputes with neighbouring countries are highlighted. The author concludes by saying that the IWT is likely to subsist unless the status of Kashmir, inter-alia water shortage or unilateral abrogation by India against cross border terrorism. However, will water trigger the change in status of issues

highlighted above have not been elaborated by the author and hence are research gaps that need to be studied.

16. **Other Literature on Water Crisis**. In addition to the above, the following literature on the subject was referred to:-

(a) Report on Composite Water Management Index. New Delhi: NITI Aayog, 2018.

(b) Baloch, S. M. (2018, June 8). Water Crisis: Why is Pakistan Running dry? The News, p. 1.

(c) Chellaney, B. (2014). Water, Peace and War. New Delhi: Oxford University Press.

(d) CWC. (2017). Reassessment Of Water Availability In India Using Space Inputs. New Delhi: Central Water Commission.

(e) FAO. (2018). FAO. Retrieved 2018, from Aquasat: https//www.fao/org/nr/aquasat

(f) GOI. (2018). Ministry of water resources. Retrieved 2018, from https://www.mowr.gov.in

(g) IDSA. (2010). Water Security for India: The External Dynamics. New Delhi: IDSA.

(h) Institutes, W. R. (2014). World Risk Atlas. Retrieved 2018, from https://www.wri.org/applications/maps/aqueduct-atlas

(i) IWMI. (2018). IWMI. Retrieved 2018, from CGIAR: https://www.iwmi.cgiar.org/

(j) IWT. (1960). INDUS WATER TREATY. Karachi: WORLD BANK.

(k) Khalid, M. (2016, June 5). India Out to Damage Pakistan's Water Interests. The News, p. 1.

(l) NewsDesk. (2018, May 20). Pakistan to Discuss India's violations of Indus Water Treaty with WB President. The Express Tribune, p. 2.

(m) PCRWR. (2018). National Water Policy. Islamabad: Government of Pakistan.

(n) Qamar, J. B. (2005). PAKISTAN'S WATER ECONOMY RUNNING DRY. Islamabad: WORLD BANK.

(o) Singh, H. (2017). Water Availability in Pakistan. Indian Defence Review Vol II, 3.

(p) Times, E. (2018, Jan 10). J&K has hydro power potential of 16,475 MW: J&K Gov. The Economics Times, p. 1.

(q) UNDP. (2017). The Vulnerability of Pakistan's Water Sector to the Impacts of Climate Change: Identification of gaps and recommendations for action. Islamabad: IISD.

(r) Wasif, S. (2016, May 30). Pakistan may run dry by 2025 : study. The Express Tribune, p. 1.

Chapterisation

17. **Chapter 1**: Introduction, Research Methodology & Literature Review.

18. **Chapter 2**: History of Water Conflicts & its Use as a Weapon**.**

19. **Chapter 3**: Water Needs of India & Pakistan**.**

20. **Chapter 4**: Pakistan's Water Disputes Within India and its Implications**.**

21. **Chapter 5**: Scenario Building, Analysis, Prognosis & Recommendations**.**

22. **Chapter 6**: Conclusions**.**

CHAPTER 2 : HISTORY OF WATER CONFLICTS & ITS USE AS A WEAPON

"The wars of the twenty-first century will be fought over water."

Ismail Serageldin

23. Water is a commodity that has no substitute. One can manage our water resources through better utilisation, better conservation, and using technology to produce more with less water; however, we cannot replace water with any other substitute. Hence, water was and will remain a precious resource and thus will be a source of conflict for times to come. Some thinkers call water the "new oil", however, it is pertinent to highlight that oil will have substitutes in years to come like electric, nuclear, hydrogen etc, but mankind is yet to find a substitute for water. History is replete with conflicts over water. Some are intra-state while others are inter-state. The Pacific Institute maintains chronology of water conflicts in history and as per its latest figures there have been 551 (WWO, 2018) conflicts over water in history. While the figure may not look alarming since the evolution of mankind, however the increasing frequency of conflicts in recent years only highlights the seriousness of the issue. The same has been depicted in the chart below:-

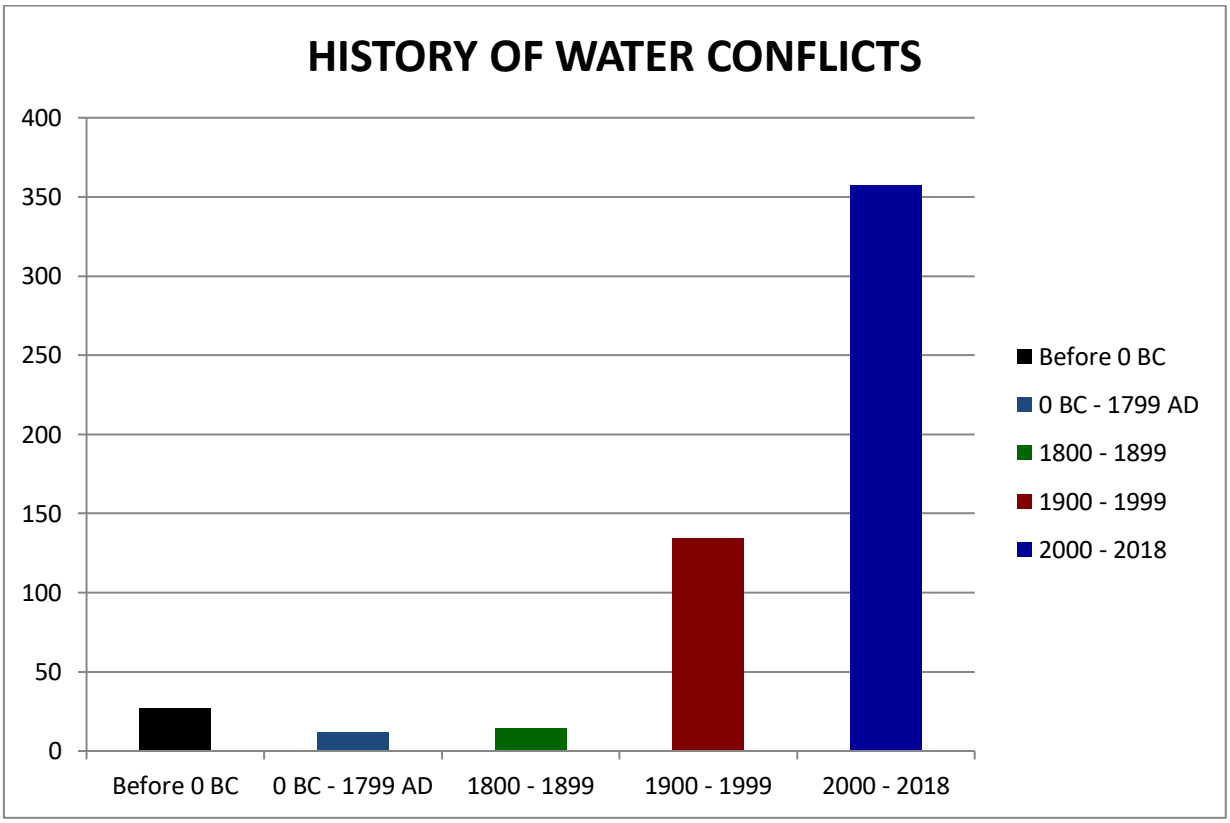


Figure 3 - Analysis of Historical Conflicts over Water (WWO, 2018)

24. The chart above clearly indicates that as pressure on water resources are increasing due to the exponential growth in global population so are the conflicts related to water. As per the figures given by UN Population Division, the world's population rose from approximately 1 billion in 1804 to 7.6 billion today and is likely to rise to 8.6 billion by 2030 (Division, 2017). Thus in 12 years we will add the complete global population as existing in 1804, which is scary when one considers that water sources have remained constant if not reduced over the last 300 years. In the sub-continent, the population of Pakistan has increased from 40 million in 1955 to 202 million in 2018 (five times increase), while that of India has increased from 409 million in 1955 to 1.35 billion in 2018 (three times increase) (worldometers, 2018). Apart from other issues, growth in population and the resultant pressure on water supplies leading to increasing conflicts can be clearly seen.

25. While Figure 3 above highlights the total number of water conflicts in the World; however, we also need to analyse the types of conflicts i.e. inter-state vs intra-state. Peter H. Gleick and Matthew Heberger in their article on Water and Conflict had carried out this analysis based on available data. The same has been shown in Figure 4 below and the trends clearly indicate that while there is an increase in both, intra-state conflicts are clearly increasing at a more rapid rate. In the India issues like SYL canal between Haryana & Punjab, Cauvery dispute between Karnataka & Tamil Nadu and the Narmada water dispute between Gujarat & Madhya Pradesh are only some of the ongoing disputes that lead to violence at times. In Pakistan the dispute over the Indus waters between Punjab & Sind is legendary. Thus, it would not be wrong to assume that these intra-state water disputes lead to internal conflict and finally may lead to inter-state conflicts as the resources are limited and for India & Pakistan come from the Great Himalayan Water Basin.

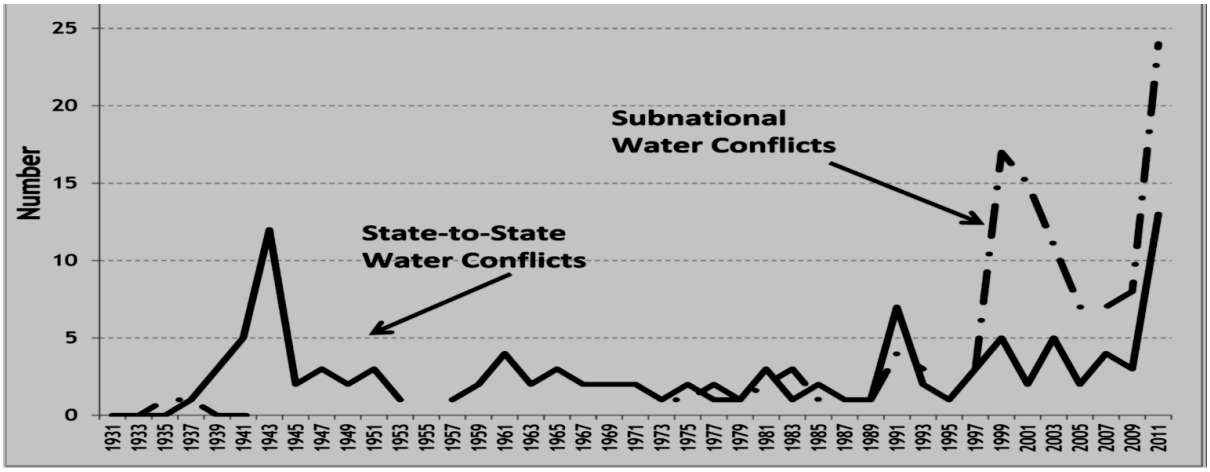


Figure 4 - Trends Inter-State & Intra-State Conflicts over Water (Heberger, 2014)

Role of Water in Conflicts.

26. Water could be the source, trigger or the victim of a conflict. It is critical to evaluate conflicts from a perspective of how water played a part in the same. The Pacific Institute has done some pioneering work on the same over the years and has defined terms that make it easy for better understanding of water conflicts. The same have been illustrated below and data on the same has been collated (2000 to date) and shown at Figure 4 above:-

(a) **Forms of Conflict**. Based on use, impact and effect forms of water conflict are broadly defined in three categories by the Pacific Institute (Institute, 2018) as under:-

(i) **Trigger**: Water as a trigger or root cause of conflict, where there is a dispute over the control of water or water systems or where economic or physical access to water, or scarcity of water, triggers violence.

(ii) **Weapon**: Water as a weapon of conflict, where water resources, or water systems themselves, are used as a tool or weapon in a violent conflict.

(iii) **Casualty**: Water resources or water systems as a casualty of conflict, where water resources, or water systems, are intentional or incidental casualties or targets of violence.

(b) **Levels of Conflict**. Warfare is fought at three distinct levels i.e. Strategic, Operational & Tactical and for the purposes of water conflict, it will be appropriate to use the same levels. Strategic levels will deal with conflicts between nations at a macro level like abrogation of Indus Water Treaty, creating new dams with the dual aim of economic growth as well as a coercive instrument or Targeting of Dams in conflicts. Operational level use of water will involve flooding of large tracts of land by opening the gates of reservoirs in the intended area. Tactical levels may involve local actions like creating local flooding schemes, poisoning water sources to deny their use to the enemy etc.

(c) **Manifestation of Forms of Conflict**. Analysis of data from 2000 to date shows that there have been 357 conflicts related to water. Their forms as shown in Figure 5 below clearly highlight that water is a Trigger in nearly 50% of water related conflicts, which highlights the seriousness of the issue.

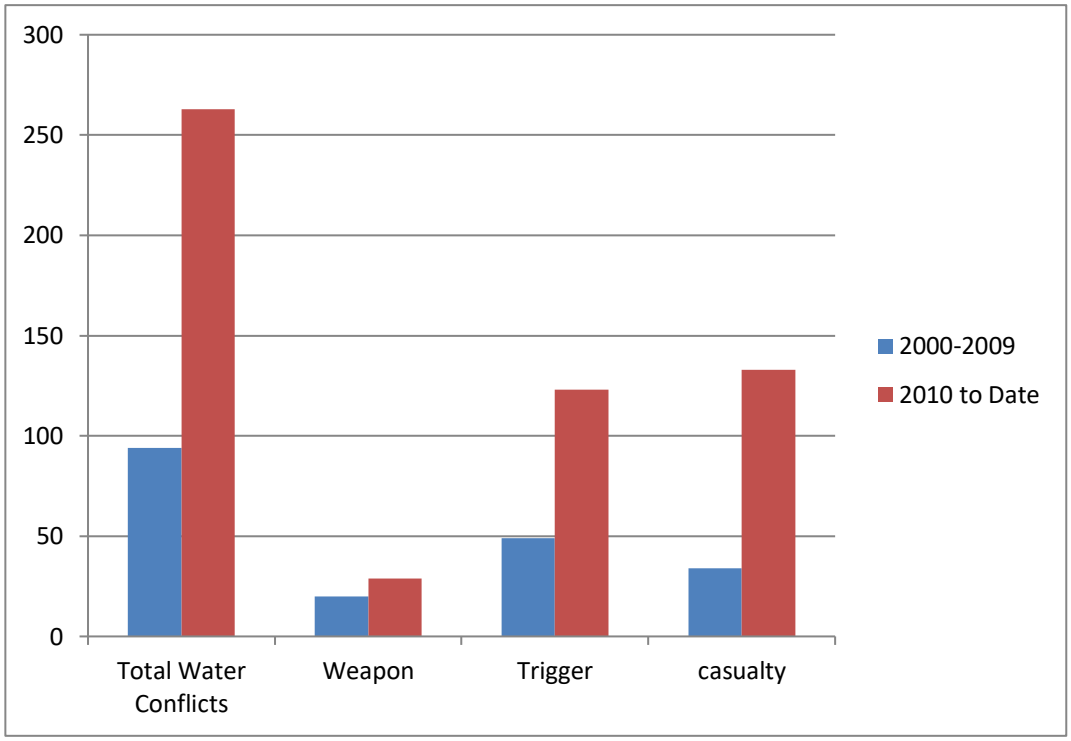


Figure 5 - Water Conflicts since 2000 based on Forms of Conflict

Prominent Water Related Conflicts in History.

27. Water has been a critical resource around which civilizations have flourished. As per the recent count by the Pacific Institute, there have been 551 reported conflicts (Institute, 2018) on account of water. However, some of the prominent conflicts that merit highlighting are given below;-

28.

(a) **Cyrus Diverts the Euphrates in 539 BC**. As per the account of Herodotus a philosopher in the Persian Empire, Cyrus invaded Babylon but faced major resistance. He was about to abandon his assault till some soldiers came up with the brilliant idea of diverting the Euphrates North the city. Once this was done it resulted in the marching of troops along the dry riverbed and fall of the city. A classic case of use of water as a weapon.

(b) **Chiang Kai-shek floods Yellow River 1938**. To stop the advance of the Japanese Army into China in 1938, Chiang Kai-shek orders the destruction of flood-control dikes on Huang He (Yellow) River in order to flood areas. Though this delayed the advance but could not stop it. However, the floodwater killed

nearly a million Chinese, thus highlighting that use of water as a weapon can also be counter-productive.

(c) **Germans flood River Ill Valley 1944**. In 1944 when the American Army was advancing towards the River Rhine, in the famous Battle of the Bulge, the Germans flooded Ill River Valley creating an artificial lake 16 km long, 4-6 km wide and 2 meters deep, thus delaying the advance.

(d) **Turkey Constructs Ataturk Dam on River Euphrates 1990**. As part of its water security Turkey decided to dam River Euphrates and it interrupted the flow of the river in 1990 to complete the project. Lower riparian states like Syria and Iraq protested the same on the grounds that Turkey would now use it as weapon of war. Later in the mid 90s, Turkey threatened to restrict water flow to Syria unless it stopped supporting Kurdish rebels operating from its soil.

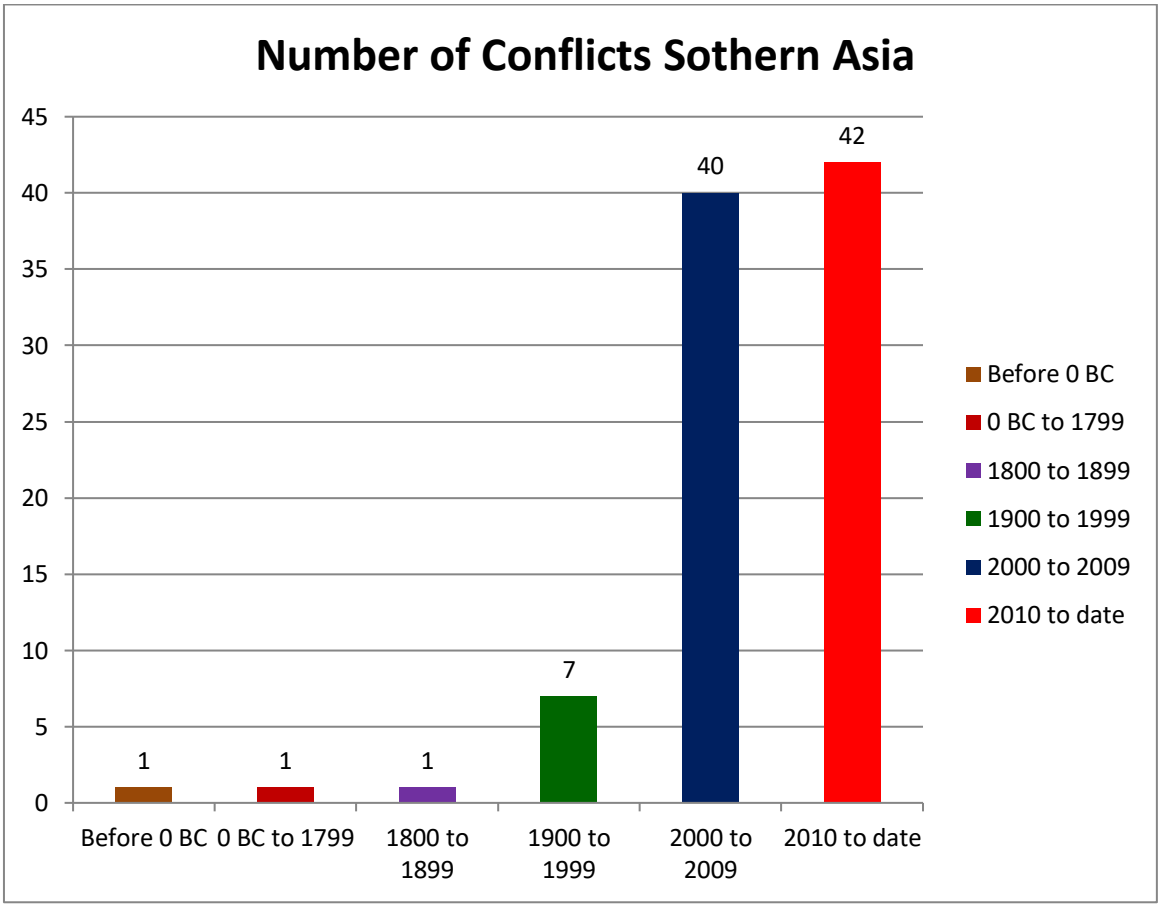
(e) **Hungary and Czechoslovakia Dispute over River Danube 1992**. In 1992, Hungary abrogated the 1977 treaty with Czechoslovakia over the construction of the Gabcikovo/Nagymaros project on economic & environmental concerns. However, Slovakia continued the construction unilaterally and diverted the waters of River Danube into a canal inside the Slovakian republic. This led to massive public protest and movement of troops by both countries. Tempers were calmed and the issue was taken to the International Court of Justice.

(f) **Battle over Mosul Dam 2014 to 2017**. On 7th August 2014, ISIS in a surprise move attacked and captured Mosul dam on River Tigris. This is Iraq's biggest dam and the threat of its being blown up by ISIS leading to flooding all the way to Baghdad was real. Despite a number of attempts, it was only on 18th August 2017 that the dam was finally recaptured.

Water Conflicts in Southern Asia.

29. Since the issue being analysed is between India & Pakistan, it is important to study the history of water conflicts in this region. As per data available, there have been 92 water related conflicts in Sothern Asia in history (Institute, 2018). Out of these 82 have taken place since 2000 (Institute, 2018), thus indicating the heavy pressure on this vital resources. While

water was the casualty in 28 out of the 40 conflicts between 2000 and 2009, however, it was the trigger in 29 out of the 42 cases since 2010. This clearly indicates that shortage of water is resulting in its becoming a trigger and this phenomenon has only been seen after 2010 i.e. when the per capita availability has reached scarcity. The Graph below clearly indicates the trend and a chronologically list of water related conflicts in Southern Asia have been given at **Appendix A** to highlight the issue.



Graph 1 – Chronological Details of Water Conflicts in Southern Asia

30. To conclude this chapter based on data above, it would be fair to state that water has and will be a source of conflict as it has no substitute. These conflicts could be intra-state or inter-state and would use water as a weapon, trigger or it could be a casualty of conflict. Given our overexploitation of limited water resources and the jump in global population, water is rapidly becoming the oil of the 21st century and as data shows conflicts have only increased since 1990 and will only increase in coming years. India and Pakistan are part of this global water crisis and they have major challenges to meet their needs.

CHAPTER 3 : WATER NEEDS OF INDIA & PAKISTAN

''As I travel around the world, people think the only place where there is potential conflict [over] water is the Middle East, but they are completely wrong. We have the problem all over the world.''

Kofi Anan

31. Water like air is essential for the human race to survive and adequate water is needed for societies/nations to thrive. India & Pakistan were blessed to have the Great Himalayas as their Northern Border, which was also their greatest water source. Moisture laden winds from the Indian Ocean/Arabian Sea/Bay of Bengal move North after the Summers bringing with them the famous "Monsoons" that not only provided precipitation but also snowfall in the Himalayas, which was the main mater source due to the melting of snow & glaciers for the rest of the year. This great geology resulted in the Indus Valley & Gangetic plains being a cradle of human civilization.

32. India and Pakistan were one entity prior to 1947 and hence water management was looked at centrally by British rulers. All irrigation canals were constructed based on the needs of people and rather than on religious basis. The lands were blessed to be part of the wider Great Himalayan Water Basin, with smaller basins like the Indus Water River Basin, the Ganga River Water Basin and the Brahmaputra river water basin providing to the needs of the people. Since the rivers and underground water know no boundaries, various nations have to resort to sharing of water in an amicable manner. This has led to various conventions and agreements which are primarily bilateral or region based. The IWT 1960 is the key water sharing arrangement between India and Pakistan as it governs the sharing of the waters of the six rivers that flow from India to Pakistan and has stood the test of time for over half a century. However, in recent years it has come under scrutiny primarily on account increasing water crisis in both countries and the ever growing demand. India too has a growing population and economy that has ever increasing needs of water for agriculture, power generation, industry and domestic use. The states of J&K, Punjab and Rajasthan border Pakistan and their individual needs of water too are growing. While J&K is the primary source for the Indus, Jhelum and Chenab Rivers, the others i.e. Ravi, Sutlej and Beas flow through Punjab. Rajasthan on the other had is a water deficient state (Chellaney, Water: Asia's New Battleground, 2011) in India and a number of canals take water from Punjab & Himachal

Pradesh to Rajasthan. Presently both countries make up their deficiencies by exploiting ground water; however the falling water tables and issue of increasing salinity put into question the sustenance of this model. Recent climatic events like El Nino have brought drastic variations in precipitation which has led to droughts at times while at others it has been floods. Hence, there is a need to analyse the needs of both countries in years to come based on the various studies carried out in both countries by agencies like World Bank, UNDP, Government of Pakistan (Ministry of Water Resources) and Government of India (NITI Aayog) and arrive at quantified figures of deficiency with timelines.

Indus Water Treaty 1960 (IWT)

33. Before embarking on the water requirements of India & Pakistan, it is important to study the historical perspective especially the IWT that has intertwined the water history and future of these two states. On partition, water became a major source of contention between the two countries as pre 1947, the irrigation projects of undivided India included infrastructure in both countries. Now with partition at most places the reservoirs were in India while canals were in Pakistan. After protracted negotiations under the auspices of the World Bank the IWT was finally signed in 1960.

34. The Indus Water Basin covers an area of approximately 1.12 million square km with four countries being part of it i.e. India, Pakistan, China & Afghanistan. The sources of water include glacier melt, snow melt and precipitation. River Indus runs a distance of approximately 2880 kms from its origins in the Kailash range and has two main tributaries i.e. Kabul River on the North and Pajnad River (combination of waters of five rivers Chenab, Jhelum, Ravi, Sutlej & Beas) to the South. :

Figure 6 - Indus Water System

35. The Indus Water Treaty (IWT) was signed in 1960 between India & Pakistan after protracted negotiations of nine years under the auspices of the World Bank. India being the upper riparian state showed great magnanimity in the agreement as it voluntarily agreed to share 80% of the water of the Indus Basin with Pakistan. There has never been any other treaty historically where an upper riparian has agreed to such adverse terms for itself and the basic reason for the same was the belief of our leaders that it would lead to peace and prosperity on both sides. However, history has proved otherwise.

36. **<u>Key Aspects of IWT</u>**. The IWT less appendices is given at **Appendix B** and key aspects of the IWT 1960 are as under:-

(a) It was signed in 1960 by JN Nehru & Md Ayub Khan in Karachi.

(b) Article I gives out the definitions to include key terms like Tributary, Indus, Eastern & Western rivers and domestic/agricultural/industrial/non consumptive use etc.

(c) Article II gives provisions for the Eastern Rivers (Sutlej, Beas & Ravi) and gives unrestricted use of the same to India.

(d) Article III gives provisions for the Western Rivers (Indus, Jhelum & Chenab) and gives unrestricted use of the same to Pakistan. India can use the waters of these rivers for Domestic use, Non-Consumptive use, Agricultural use and Generation of Hydroelectricity. The article restricts India to storing a maximum of 3.6 MAF of water. It allows India to draw waters of western rivers for irrigation of 701,000 acres. It also allows India to draw the waters of Chenab River for Ranbir & Pratap canals. The treaty also allows India to construct new 'run-of-river" projects subject to restrictions on storage, approval of design by Pakistan etc.

(e) Article IV covers key provisions like maintenance, construction of drains/canals, pollution etc.

(f) Article V covered financial provisions to include payment of 62,060,000 Pounds to Pakistan in ten equal instalments for construction of new water works in Pakistan.

(g) Article VI covers the exchange of data on discharge, withdrawals, escapages etc within three months of the month to which they relate.

(h) Article VII covers future cooperation including new constructions.

(i) Article VIII covers the setting up of a permanent Indus Commission to deal with all matters of the treaty.

(j) Article IX covers the settlement of differences and disputes including request for a neutral expert.

(k) Article X covers emergency provisions.

(l) Article XI covers general provisions related to rights and obligations of both parties.

(m) Article XII covers the final provisions including the provision to modify the treaty agreed by both governments.

(n) The treaty also has Annexure A to H that cover the details of the main text.

37. **Analysis of IWT in Present Context**. A lot of water has flown under the bridge since 1960 and despite three wars and countless skirmishes; the IWT has stood the test of time and is often taken as a great success story. However, in recent years there has been severe pressure to review the treaty and some of the key triggers for the same have been enumerated below:-

(a) **Pakistani Perspective**. Pakistan was a major beneficiary of the IWT getting 80% of the water resources. Even today it gets 137 MAF of water from its Western Rivers and 1.4 MAF from the Eastern rivers. i.e. 138.4 MAF (73.4%) out of its total of 188.4 MAF total water resources (PCRWR, 2018). Thus the dependency on the IWT is clearly highlighted. When the water crisis hit Pakistan in the late 1990's, its politicians and scholars conveniently blamed India for the same stating that India was holding water through new dams in J&K. (Khalid, 2016). However, in recent years the official rhetoric has toned down and the National Water Policy 2018 refrains from any reference to India. It seems that slowly it is dawning on Pakistan that it needs to put its house in order rather than instigating India, which may result in a review of the existing treaty. The same notwithstanding there are regular news articles blaming India (Shakil, 2018). However, it is also cognisant of the crisis at hand and some have gone as far as to put water as a bigger threat than terrorism to Pakistan (Shams, 2017).

(b) **Indian Perspective**. India had hoped in 1960 that its magnanimity of giving away 80% of the water to Pakistan will ensure peace has been shattered. While the treaty has stood the test of time but Pakistan's support for cross border terrorism have left lot of Indians wondering if it's time to review or abrogate the IWT. PM Narender Modi in Sep 2016 after the Uri attacks stated that 'water and blood cannot flow at the same time'. This led to a media frenzy in India with a number of papers calling for a review of the IWT, however most major papers refrained from going that far and suggested that India has more to lose in such an option (Romshoo, 2016). However, the option remains on the table and whenever tensions rise with Pakistan, it is one of the suggested responses by hardliners. For India it is not only about water but also about power to drive its growing economy. Since 1991, India has seen an economic boom that needs power to sustain it. J&K (Rivers Indus, Chenab & Jhelum) is one major source of hydel power to meet India's requirements. The state has a capacity of

16,475 MW out of which 3264 MW (J&K, 2018) only is being harnessed. India has taken up multiple projects like Kishenganga, Baglihar, Pakal Dul etc to bridge the gap. As per latest data projects to harness 13076 MW (J&K, 2018) are in various stages of implementation and this has caused a major concern to Pakistan, who believes that it will give India the power to regulate the flow of rivers. Hence from an Indian perspective the IWT is restrictive but something it can live with provided Pakistan stops its cross border terrorism. Therefore terrorism and IWT are intertwined in the current Indian perspective.

(c) **Overall Perspective**. IWT has stood the test of time and on a purely technical point of view has the ingredients to do for time to come. Geo-politics is another ballgame altogether and when seen from the perspective of Indo-Pak tensions, the treaty could fall prey to factors well beyond water.

Water Needs of Pakistan

38. Pakistan in 1951 was a water rich country with per capita water availability of 5650 cu m (ABUBAKAR, 2016) per year of which 5260 cu m (PCRWR, 2018) was surface water. However, with its growing population and ever increasing demands against static availability, its availability today is about 865 cu m and is likely to fall to 850 cu m by 2025 (Report, 2018). This steep drop has been depicted from two sources in the Table 1 below and when compared with the Falkenmark index (Table 2) which is widely used by the UN, Pakistan is slowly moving towards chronic water shortage:-

Year	Population (Million)	Water Per Capita In Cu Metres (ABUBAKAR, 2016)	Surface Water Per Capita In Cu M (PCRWR, 2018)
1951	34	5650	5260
2010	146	1200	
2016	193	-	1000
2025	221	860	800

Table 1 - Pakistan Availability of Water

Annual renewable freshwater (m^3/pers/yr)	Level of water stress
< 500	Absolute water scarcity
500 – 1.000	Chronic water shortage
1.000 – 1.700	Regular water stress
> 1.700	Occasional or local water stress

Table 2 - Falkenmark Index **(Falkenmark, 1992)**

39. As per Pakistan's national Water Policy 2018 the availability of water in Pakistan is 188.4 MAF (PCRWR, 2018), details of which are as under:-

(a) **Surface Water**. 138.4 MAF, out of which 137 MAF is from Indus and its tributaries including 21 MAF from river Kabul and 1,4 MAF from the Eastern rivers flowing from India. This water is received from glacial melt (41%), snow melt (22%) and rainfall (27%) (PCRWR, 2018). The trends of annual flow show that the maximum flow was 207.70 MAF while minimum was 92.65 MAF (Ahmed D. S., 2016). The average flow was 147.8 MAF (Ahmed D. S., 2016) between 1937 and 2013.

(b) **Ground Water**. Pakistan is one of the highest extractors of ground water with 50 MAF (PCRWR, 2018). There are 1 million tube wells that operate in Pakistan out of which 18.5% use electricity and 81.5% use diesel (Ahmed D. S., 2016). From 1976 to 2016 the contribution of ground water to irrigation has gone up from 25.6 MAF to 50.2 MAF (Ahmed D. S., 2016).

40. The usage of water in Pakistan is broadly classified under three major categories i.e. Agriculture (91.6%), Municipalities (5.9%), and Industry (2.5%) (Ahmed D. S., 2016). When compared with the global usage i.e. Agriculture (69%), Municipalities (12%), and Industry (19%), it clearly highlights the critical role of water in agriculture. However, the inefficiency in the system can be gauged from the fact out of the 104 MAF of water at canal head works only 58.3 MAF reaches the farm gate, while the remaining 46.7MAF (PCRWR,

2018)seeps into the ground or is wasted. The water productivity of crops in Pakistan too is poor with 0.13 kg/m3 for cereals and 0.5 kg/m3 for wheat compared to 0.39 kg/m3 and 1.0 kg/m3 for India (Kumar, 2003). Even storage of water is a challenge for Pakistan as it has an installed capacity for 30 days only compared to 190 days for India and 1000 days for Egypt (desk, 2018). The seriousness of the issue is clearly indicated in Figures 7 & 8 below which compare Pakistan with the rest of the world:-

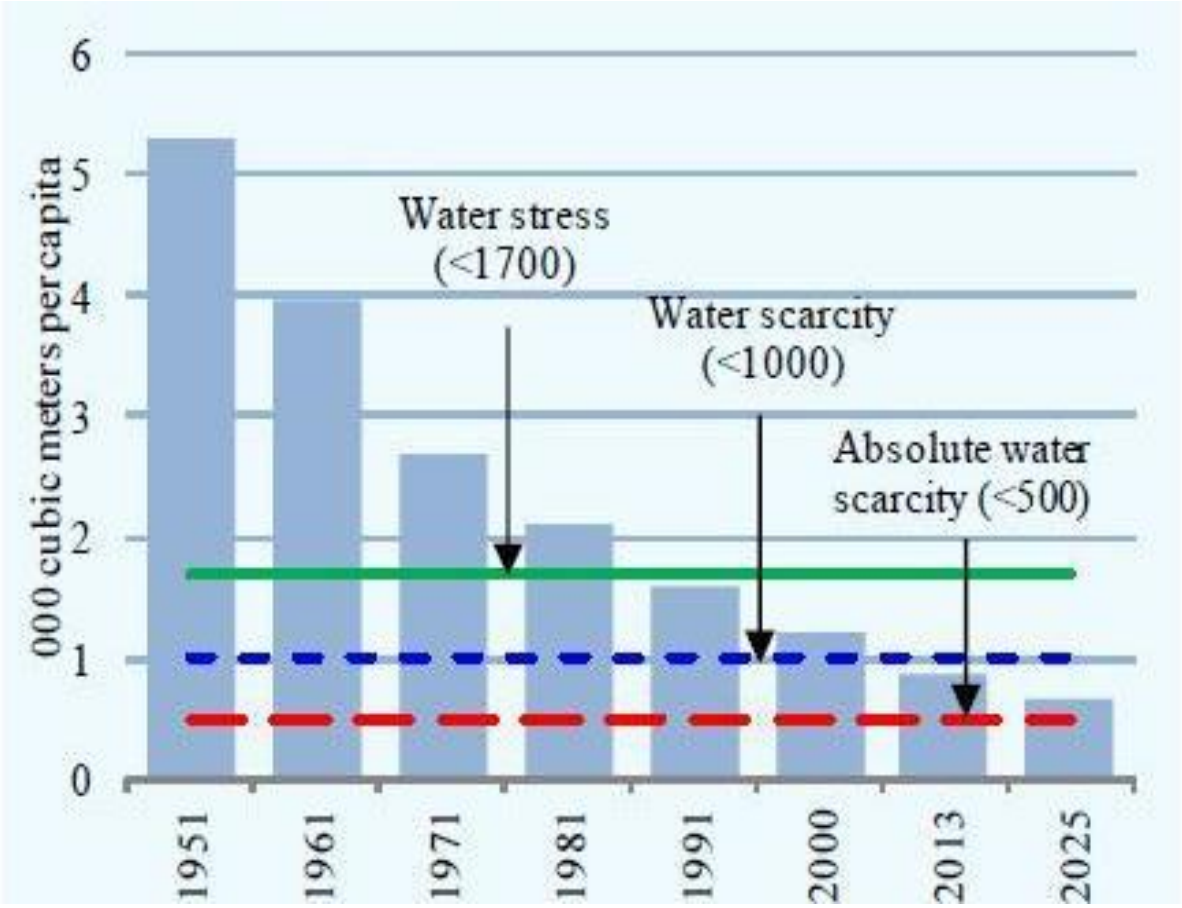


Figure 7 – Water Stress in Pakistan (PCRWR, 2018)

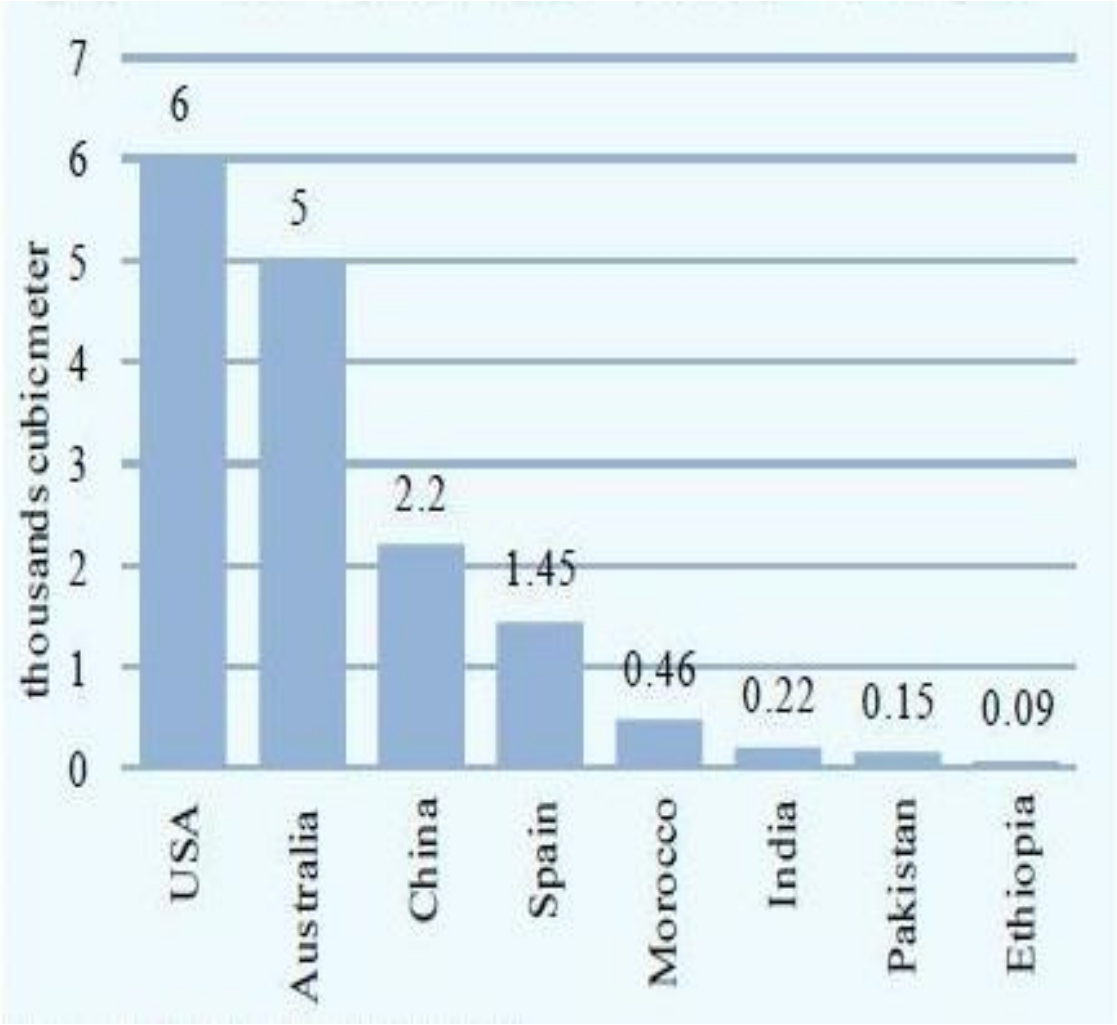


Figure 8 – Water Storage Capacity Pakistan (Pakistan S. B., 2017)

41. The critical question therefore is what is the demand & supply gap of water in Pakistan? It is also important to analyse the increase/decrease in this gap in the coming decades based on various researches carried out on the availability of water. The same has been enumerated below for each sector:-

(a) **Agriculture**. Pakistan is an agriculture based economy and the sector employs 42.3% of the workforce and contributes 18.2% of GDP (Pakistan G. o., Economic Survey 2017-18, 2018). The sector consumes 91.6% of total water in the country with 65% based on surface water and the balance 35% based on ground water (PCRWR, 2018). The over use of ground water i.e. 50 MAF with a recharge of between 40-45 MAF is also bringing down the water table especially in the Punjab aquifer (Ebrahim, 2018). Based on the existing data of the National Water Policy as well as the report by International Institute for Sustainable Development,

Canada, (Institute, 2018) the projections of water demand are given at Table 3 as under:- (Jo-Ellen Parry, 2017)

2018	2025	2050
108.3 MAF	119.85 MAF	137.76 MAF

Table 3 - Water Demand Projections for Pakistan (Jo-Ellen Parry, 2017)

(b) **Domestic Use**. While domestic users consume only a small portion of the total water of Pakistan but they are the highest priority for supply. Any increase in demand can only be met by reducing the supply to agriculture. Ground water use has also increased to make up the shortfall in cities. Lahore is a classic example where overuse has taken the water table down to between 130-140 feet and at the present rate of fall of 2.5-3 feet per year is expected to fall to 230 feet by 2025 (Ebrahim, 2018).The projections (Jo-Ellen Parry, 2017) for this sector are at Table 4 as under:-

2018	2025	2050
7.56 MAF	10.37 MAF	32.95 MAF

Table 4 - Water Demand Rate for Domestic Use Pakistan (Jo-Ellen Parry, 2017)

(c) **Industry**. Pakistan's industrial sector grew by 5.80% in 2017-18, highest in ten years (Pakistan G. o., Economic Survey 2017-18, 2018) and hence its water needs are also ever increasing. Like any other country Pakistan is trying to move from an agriculture based economy to a manufacturing & service based economy. The increase in water demand in the medium to long term (Jo-Ellen Parry, 2017) is illustrated below at Table 5:-

2018	2025	2050
2.5 MAF	3.28 MAF	6.82 MAF

Table 5 - Water Demand Rate for Industrial Use in Pakistan (Jo-Ellen Parry, 2017)

(d) **Power**. One of the key drivers of economy is availability of power. The production of power is through three sources i.e. Thermal (65%), Hydro (33%) and Nuclear (2%). However, Pakistan is unable to meet its requirements and has a major gap between demand & supply, which is illustrated at Table 6 below. This gap will only increase with time and the pressure to exploit Hydro resources being a cleaner energy will add to the water woes of the country.

DEMAND AND SUPPLY OF ELECTRICITY IN PAKISTAN

YEAR	EXPECTED AVAILABLE GENERATION	DEMAND (SUMMER PEAK)	SURPLUS/DEFICIT
2008	13146	16848	-3338
2009	16110	17868	-1758
2010	18503	19352	-849
2011	20814	20874	-60
2012	21167	22460	-1293
2013	23368	24126	-758
2014	23538	25919	-2381
2015	24408	28029	-3621
2016	25630	30223	-4593
2017	27481	35504	-8023
2018	27481	34918	-7437
2019	27481	37907	-10426
2020	27481	41132	-13651

Table 6- Demand & Supply of Electricity Pakistan (Pakistan G. o., Economic Survey 2017-18, 2018)

42. Thus it clearly emerges that since the 1990's Pakistan is slowly but steadily sliding in its water availability and from being a water rich country is becoming a water stressed country. The growing population, climate change, increasing demands and static availability is a recipe for disaster unless radical actions are taken. While Pakistan has announced a National Water Policy to address key issues, it is a matter of debate whether the implementation will

keep up with the exponential growth in demand. The coming crisis is well captured at Figures 9 & 10 below.

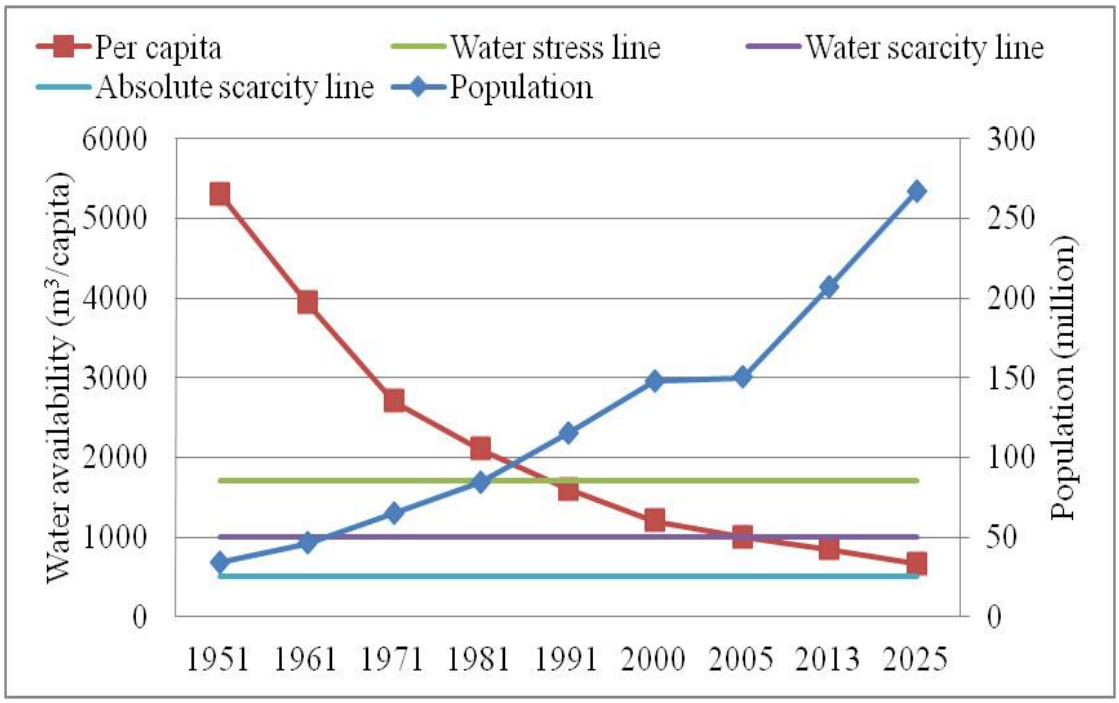


Figure 9 - Per Capita Water vs Population Pakistan (Qamar, 2005)

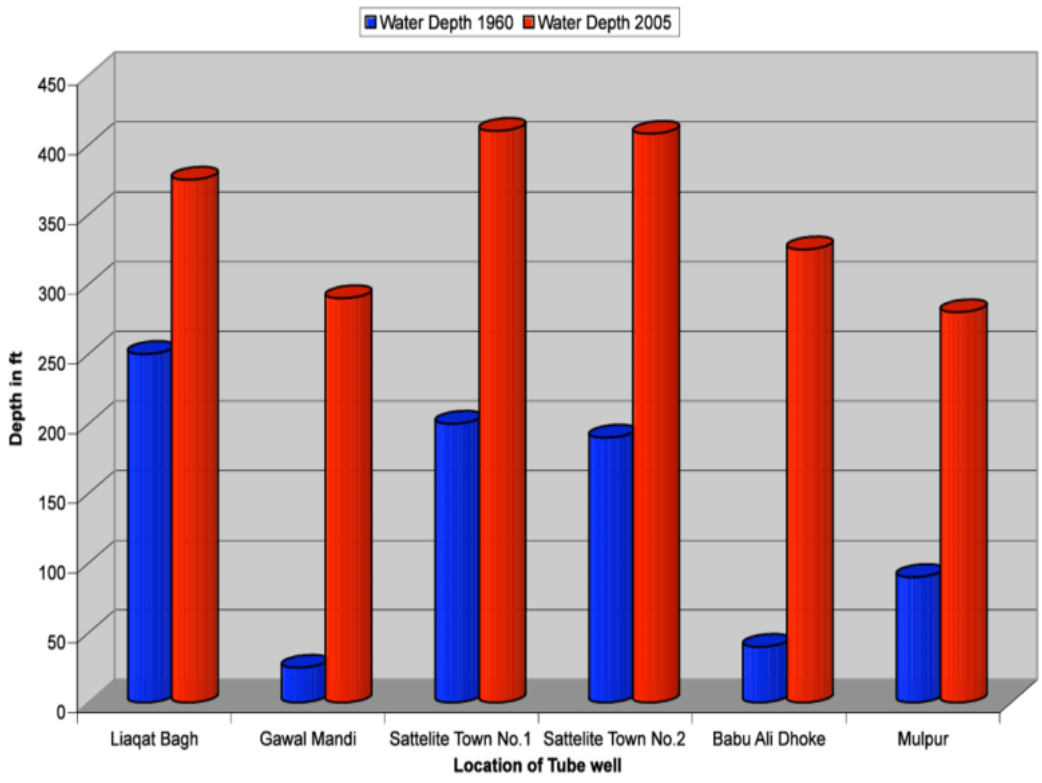
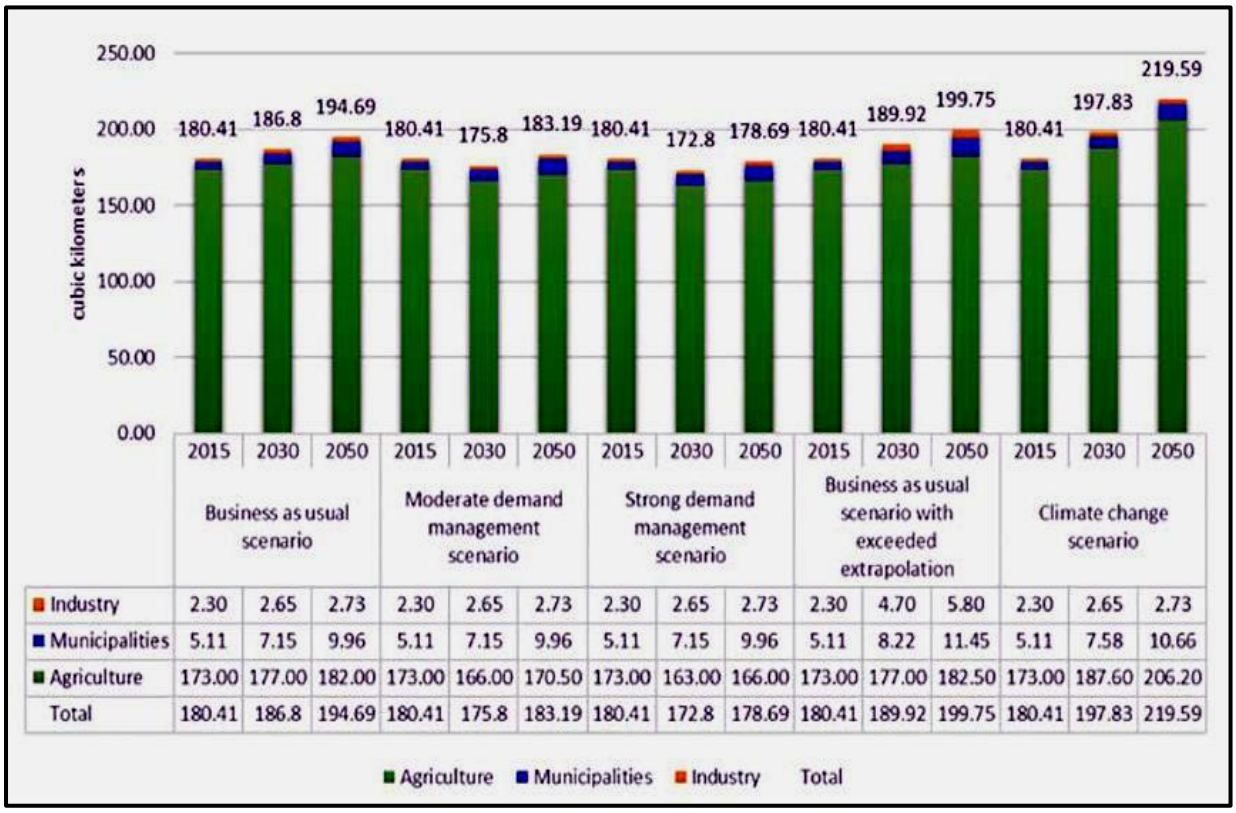


Figure 10 - Ground Water Depletion Lahore (Ebrahim, 2018)

43. The International Institute for Sustainable Development (IISD), Canada in partnership with Centre for Climate Research and Development at COMSTAT Institute of Information Technology, Islamabad was commissioned by the Pakistan Ministry of Climate Change and UNDP to analyse "The Vulnerability of Pakistan's Water Sector to the Impacts of Climate Change: Identification of gaps and recommendations for action" in July 2015 and was completed in September 2016 (Jo-Ellen Parry, 2017). The study in addition to its own research has also taken into consideration three previous studies on climate change impacts on the Indus basin i.e. a 2012 study on "The Indus basin in the framework of current and future water resources management", a 2013 study on "The Indus Basin of Pakistan-The Impacts of Climate Risks on Water and Agriculture" and a 2015 study on "The Himalayan Climate and Water Atlas: Impact of Climate Change on Water Resources in five of Asia's Major River Basins" (Jo-Ellen Parry, 2017). It's report based on the likely climate change patterns (glacial melt, precipitation, temperature change) and likely demand by various sectors has only highlighted and quantified what was always known i.e. Pakistan is facing a major water crisis, which will only accentuate in years and decades to come. A summary of the final findings of the report have been well captured in a single image as given at Figure 11 below.



	2015	2030	2050	2015	2030	2050	2015	2030	2050	2015	2030	2050	2015	2030	2050
	Business as usual scenario			Moderate demand management scenario			Strong demand management scenario			Business as usual scenario with exceeded extrapolation			Climate change scenario		
Industry	2.30	2.65	2.73	2.30	2.65	2.73	2.30	2.65	2.73	2.30	4.70	5.80	2.30	2.65	2.73
Municipalities	5.11	7.15	9.96	5.11	7.15	9.96	5.11	7.15	9.96	5.11	8.22	11.45	5.11	7.58	10.66
Agriculture	173.00	177.00	182.00	173.00	166.00	170.50	173.00	163.00	166.00	173.00	177.00	182.50	173.00	187.60	206.20
Total	180.41	186.8	194.69	180.41	175.8	183.19	180.41	172.8	178.69	180.41	189.92	199.75	180.41	197.83	219.59

Figure 11 - Water Demand Projections Pakistan (Jo-Ellen Parry, 2017)

44. It is also important to analyse historical trends of water availability to analyse any future prognosis of the same. While the annual average of surface water in Pakistan is 138.4 MAF, the record of the last 90 years as depicted at Figure 12 & Table 7 (Pakistan S. B., 2017) below shows a max availability of 186.8 MAF in 1959-60 and a minimum availability of 98.6 MAF in 2001-02, which is a variation of 88.2 MAF between maximum and minimum. It also shown a variation of plus 48.4 MAF (+35%) and negative 39.8 MAF (-29%) from the annual average. The trendline also shows a drop post 2000, which could be attributed to climate change. Another key aspect is the usage of water or to be more precise the inability to use available water. The same is depicted at Figure 13 (Pakistan S. B., 2017) below that shows the escapage of water below the Kotri Barrage, which is the last barrage before water flows into the Arabian Sea. The average of the period from 1978-2015 shows an escapage of 28 MAF against a downstream usage of 8.6 MAF thereby implying that nearly 20 MAF flows to the sea, which could have been used had there been better storage facilities.

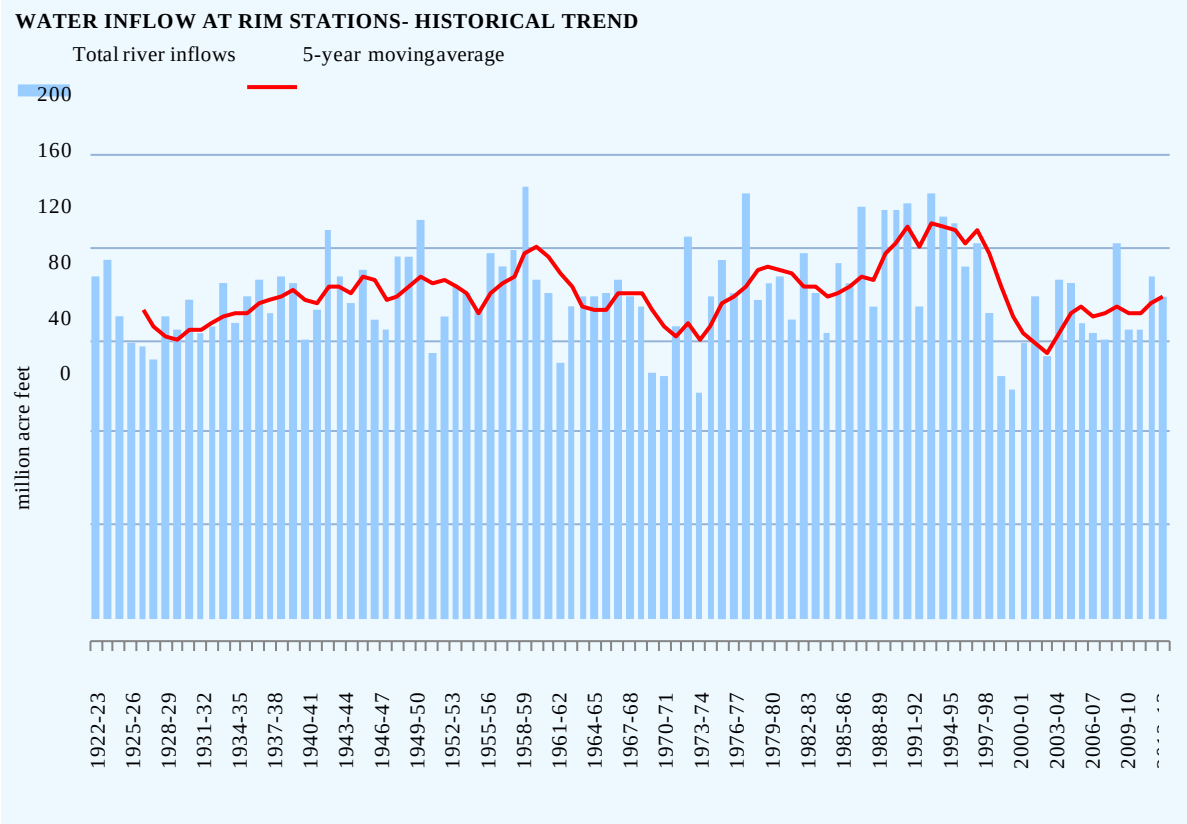


Figure 12 – Water Inflow at Rim Stations- Historical Trend (Pakistan S. B., 2017)

No.	Year	Indus River Flows (MAF)
1	1937-38	156.7
2	1940-41	130.5
3	1950-51	183.4
4	1960-61	178.2
5	1970-71	128.3
6	1980-81	134.7
7	1990-91	163.5
8	2000-01	97.6
9	2010-11	157.0
10	2012-13	121.5
Average Flows		147.8
Minimum Flows		92.65
Maximum Flows		207.70

Table 7 – Water Inflow - Historical Trend (Pakistan S. B., 2017)

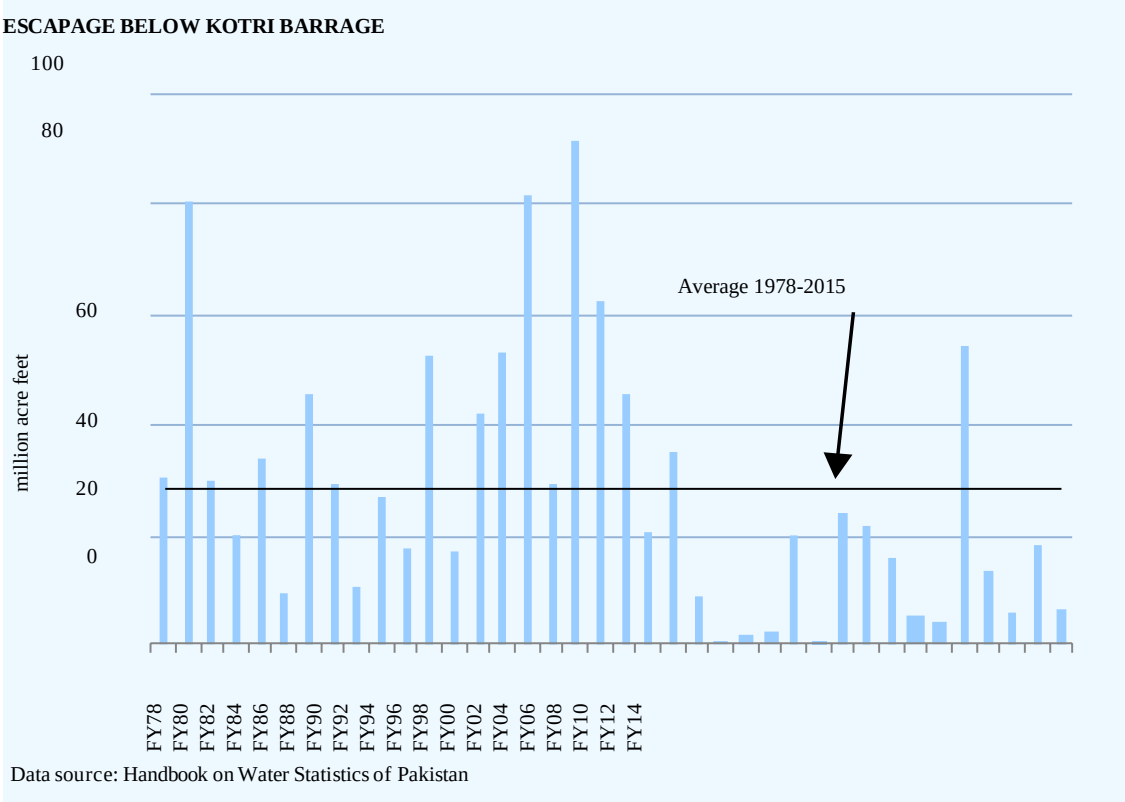


Figure 13 – Escapage Below Kotri Barrage (Pakistan S. B., 2017)

45. Historical Flow Based on Agricultural Season. Both countries have two main seasons i.e. Kharif & Rabi. While Kharif is the winter crop comprising wheat, Rabi is the summer crop consisting of rice, cotton & sugarcane. Water naturally is critical at the time of sowing but for crops like rice it is equally important for the entire period. The historical flows over the past decades are shown at Table 8 below, which clearly indicates that bulk of the water flows in the Kharif season.

	Western rivers			Eastern rivers			Gross river flows		
	Kharif	**Rabi**	**Annual**	**Kharif**	**Rabi**	**Annual**	**Kharif**	**Rabi**	**Annual**
1961-1970	114.90	21.91	136.82	19.18	2.60	23.17	132.96	24.64	159.00
1971–1980	110.17	22.07	132.24	13.68	1.92	16.34	123.85	23.99	148.59
1981–1990	114.83	26.37	141.20	5.00	2.00	7.00	119.83	28.37	148.20
1991 –2000	121.91	26.05	147.96	6.74	1.51	8.25	128.65	27.56	156.21
2001–2010	100.24	23.91	127.81	1.30	0.35	1.66	101.55	24.26	129.46
2010–2014	105.49	24.03	129.53	3.75	1.11	4.86	109.25	25.14	134.38

Table 8 - Historical Flow Levels Agricultural During Seasons in Pakistan

46. When correlated with supply the above figures tell their own story. Even if one were to assume that that supple will remain constant i.e. 188.4 MAF and take away the seepage of 46.7 MAF, the water available will be 141.7 MAF. The overall effect based on the IISD study (Jo-Ellen Parry, 2017) is highlighted below:-

(a)**Scenario I - Business as Usual**. In case Pakistan continues with its business as usual model in years to come, the projections of IISD are as at Table 9 under. The projections clearly indicate a growth in demand resulting in increasing deficiencies as time goes on.

	2018	2025	2050
Available	141.7 MAF	141.7 MAF	141.7 MAF
Projected by IISD	146.2 MAF	151.4 MAF	157.8 MAF
Deficiency	**5.5 MAF**	**9.7 MAF**	**16.1 MAF**

Table 9 - Water Availability Projections for Business as Usual in Pakistan

(b) **Scenario II – Strong Demand Management**. In case Pakistan is able to put in place its National Water Policy in letter and spirit, the net effect will be as at Table 10 below. Thus it is clear that Pakistan needs to put into place multiple water related projects to prevent a water crisis but given its past record and state of its economy, the possibility of the same fructifying are remote.

	2018	2025	2050
Available	141.7 MAF	141.7 MAF	141.7 MAF
Projected by IISD	146.2 MAF	140.1 MAF	144.8 MAF
Deficiency/Surplus	**5.5 MAF**	**+0.4 MAF**	**3.1 MAF**

Table 10- Water Availability Projections for Strong Demand in Pakistan

(c) **Scenario III – Climate Change Based**. Climate change is a reality and cannot

be wished away. Hence, any future projections of demand will have to cater for the same. The effect of climate change will not only increase demand but will also affect supply. However, for arguments sake is we only consider its effect on demand the projected scenarios are as at Table 11 under.

	2018	2025	2050
Available	141.7 MAF	141.7 MAF	141.7 MAF
Projected by IISD	146.2 MAF	160.4 MAF	178.0 MAF
Deficiency	**5.5 MAF**	**18.7 MAF**	**36.3 MAF**

Table 11 - Water Availability Projections on climate Change Basis in Pakistan

47. Thus it is clear that Pakistan will continue to face a water shortage in years to come that will vary from status quo to a maximum of 36.3 MAF. However, this is based on a constant water supply, which may be a challenge since global climate change is already affecting precipitation, snow and glacial melt in the Indus Basin and any drop in supply will further accentuate the crisis. Already there are frictions between various states in Pakistan on the distribution of water especially between Punjab & Sind, this may overflow in case of further deficiencies. Since 80% of the water of the Indus basin goes to Pakistan, it is logical to assume that any water stress will have a fallout on Indo-Pak relations with politicians on either side blaming the other for the crisis rather than accepting their own shortcomings. Hence, before arriving at any conflict scenarios it is important to analyse the water requirements of India.

India's Water Requirements

48. As per the Niti Aayog, India is suffering from the worst water crisis in its history and 600 million people are facing high to extreme water stress (Aayog, 2018). By 2030 the demand is projected to double thereby further accentuating the crisis and causing a 6% loss to the GDP (Aayog, 2018). As per projections till 2050, the requirement is expected to rise to 957 MAF, while present day availability is 563 MAF. Therefore, like its neighbour Pakistan, India too is headed for a major water crisis. It holds 4% of fresh water resources that need to feed

17.5% of the world's population (Commission, 2012), which in itself is a major challenge.

49. India receives 4000 BCM of water annually out of which 53% is lost to evaporation and the net water available is 1869 BCM (AAYOG, 2017). Out of this only 1123 BCM is usable water (690 BCM is surface water and 433 BCM is ground water) (AAYOG, 2017). The per capita availability of water was 5400 cu m in 1950, which fell to 1816 cu m in 2001, further to 1720 in 2015 and is likely to fall to 1434 cu m by 2025 (MOSPI, 2016), thus bringing India to the status of a water stressed country. Out of this available water the sector wise utilisation is agriculture (90%), domestic (5%) and industrial (5%) (MOSPI, 2016). As far as ground water is concerned agriculture uses up over 60% while the rest is used for domestic and other purposes.

50. To make up the deficiency & inefficiency in surface water Indians have been increasing their exploitation of ground water and this overexploitation in a number of states has reached a critical tipping point. India has replenishable water resources of 433 BCM and a net annual availability of 398 BCM (Board, 2014). In 2014 out of the 6607 assessment units surveyed, 1071 were overexploited, 217 were critical and 92 were saline i.e. 21% of the ground water has reached a tipping point.

51. The Indus basin in India is shared between five states i.e. J&K (60%), Himachal Pradesh (16%), Punjab (16%), Rajasthan (5%) and Haryana (3%) (Commission, 2012). While J&K and Himachal Pradesh have no major water shortages, the other three states have had to resort to massive exploitation of ground water to make up the deficiency of surface water. Punjab & Haryana are considered the food bowls of India and any water crisis in these states will have major implications on the food security of the rest of the country. In addition to these 5 states, Gujarat also shares a border with Pakistan and hence merits inclusion. The state of ground water in these six states (Board, 2014) has been highlighted at Table 12 below and it clearly emerges that at least three states i.e. Punjab, Haryana and Rajasthan are in a precarious position regarding ground water and hence in times to come when ground water begins to run out, the clamour for more surface water either from the share of other states or to get them a fair share of the Western Rivers of the IWT will gain ground and put pressure on the political leadership at both the state as well as the central levels. A map depicting the crisis in India's Western states is given at Figure 14 below.

State	Replenishable Resources (BCM)	Net Annual Availability (BCM)	Total Units	Number of Overexploited/ critical/saline units
Gujarat	18.57	17.59	223	39 (17%)
Haryana	10.78	9.79	116	**86 (74%)**
J&K	4.25	3.83	-	-
Punjab	22.53	20.32	138	**114 (83%)**
Rajasthan	11.94	10.83	243	**196 (80%)**

Table 12 - Underground Water Crisis in Western States of India

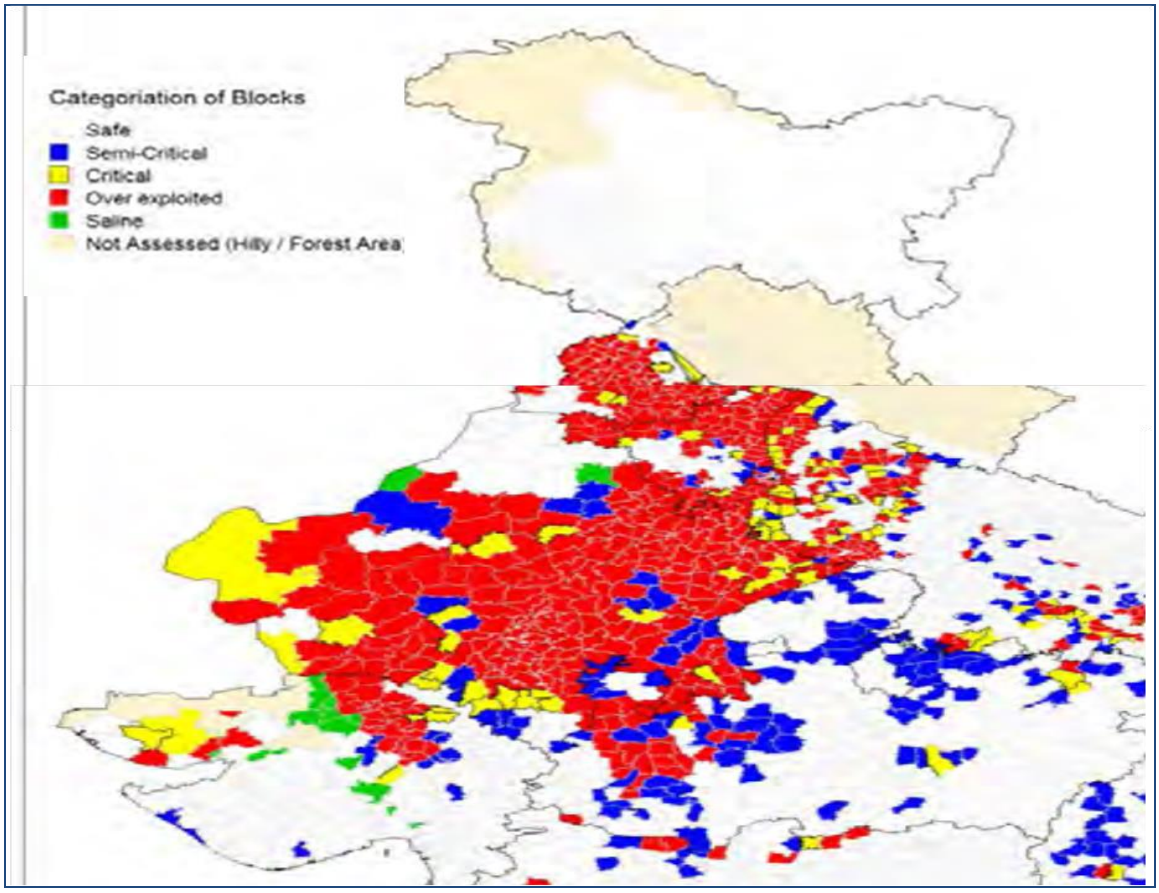


Figure 14 – District Wise State of Underground Water

52. A study carried out by the Ministry of Water Resources in India, has highlighted the increase in water demand for various sectors in a 2025 and 2050 scenario (MOSPI, 2016). The same is highlighted at Table 13 below and clearly indicates the demand will grow by 80 % in a short period of 40 years i.e. 2010 to 2050. As per the projections by 2030 demand will overtake supply which is presently 1123 BCM and it will lead not only to interstate conflicts that are already flaring up in large parts of India but will also put the IWT under strain as Pakistan takes 80% of the waters of the Indus basin and most Indians will consider this unfair.

	2010	**2025**	**2050**
SECTOR	**WATER DEMAND IN BCM**		
Irrigation	688	910	1072
Drinking Water	56	73	102
Industry	12	23	63
Energy	5	15	130
Other	52	72	80
Total	**813**	**1093**	**1447**

Table 13- Increase in Water Demand India (MOSPI, 2016)

53. Unlike Pakistan, India has invested well in its power sector with an average growth between 4 to 8% in the last decade (Power, 2018). The installed capacity is 3,46,048 MW, with the share of private sector (45%), Centre (29.8) & States (24.3%). The sources of power are Thermal (64.1%), Hydro (13.1%), Nuclear (2%) and renewable sources combined (20.8%) (Power, 2018). The total deficiency at peak load was only 2% (Power, 2018), thus ensuring that India meets its requirements. However, Thermal plants present major environmental challenges and India is keen to shift from Thermal to other renewable and environmentally stable sources like hydro, wind, solar etc. Since hydro needs gravity to run turbines, it is ideally set up in mountain regions where the natural course of the river and mountains ensure minimum dislocation of people. India has even funded projects in neighbouring countries like

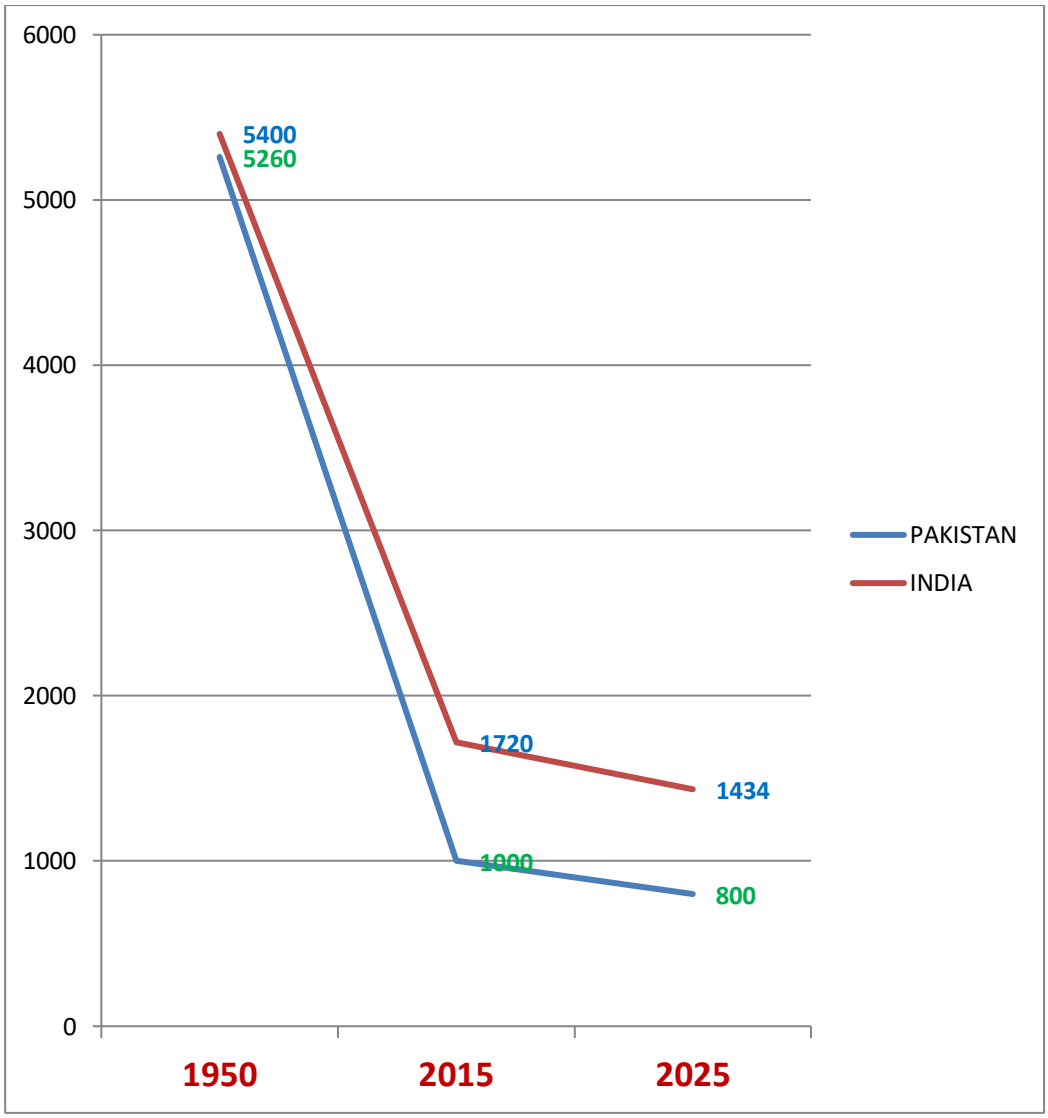
Nepal & Bhutan to meet its energy needs. One of the major unutilised source has been the hydro power in J&K. The state has a capacity of 16,475 MW out of which only 3264 MW (J&K, 2018) is being harnessed. India has taken up multiple projects like Kishenganga, Baglihar, Pakal Dul etc to bridge the gap. As per latest data projects to harness 13076 MW (J&K, 2018) are in various stages of implementation and this has caused a major concern to Pakistan, who believes that it will give India the power to regulate the flow of rivers. India on the other hand believes that it is within its right as per the IWT to construct run-of-river projects on the Western Rivers to meet its demands.

54. As far as storage of water goes, India has a surface storage capacity of 303 BCM (AAYOG, 2017)i.e. 44% of its availability. However, in per capita terms this amounts to only 225 cu m (AAYOG, 2017) compared to 4733 cu m for Australia and 1111 cu m for China. The ongoing projects are likely to increase the surface storage by 33 to 37 BCM (AAYOG, 2017). India has embarked on a major project of interlinking its rivers and if it is successful will go a long way in increasing its surface water storage capability. However, should it fail like power J&K will be an attractive option to build dams for its water security and this will naturally not be acceptable to Pakistan.

Comparative Analysis India & Pakistan

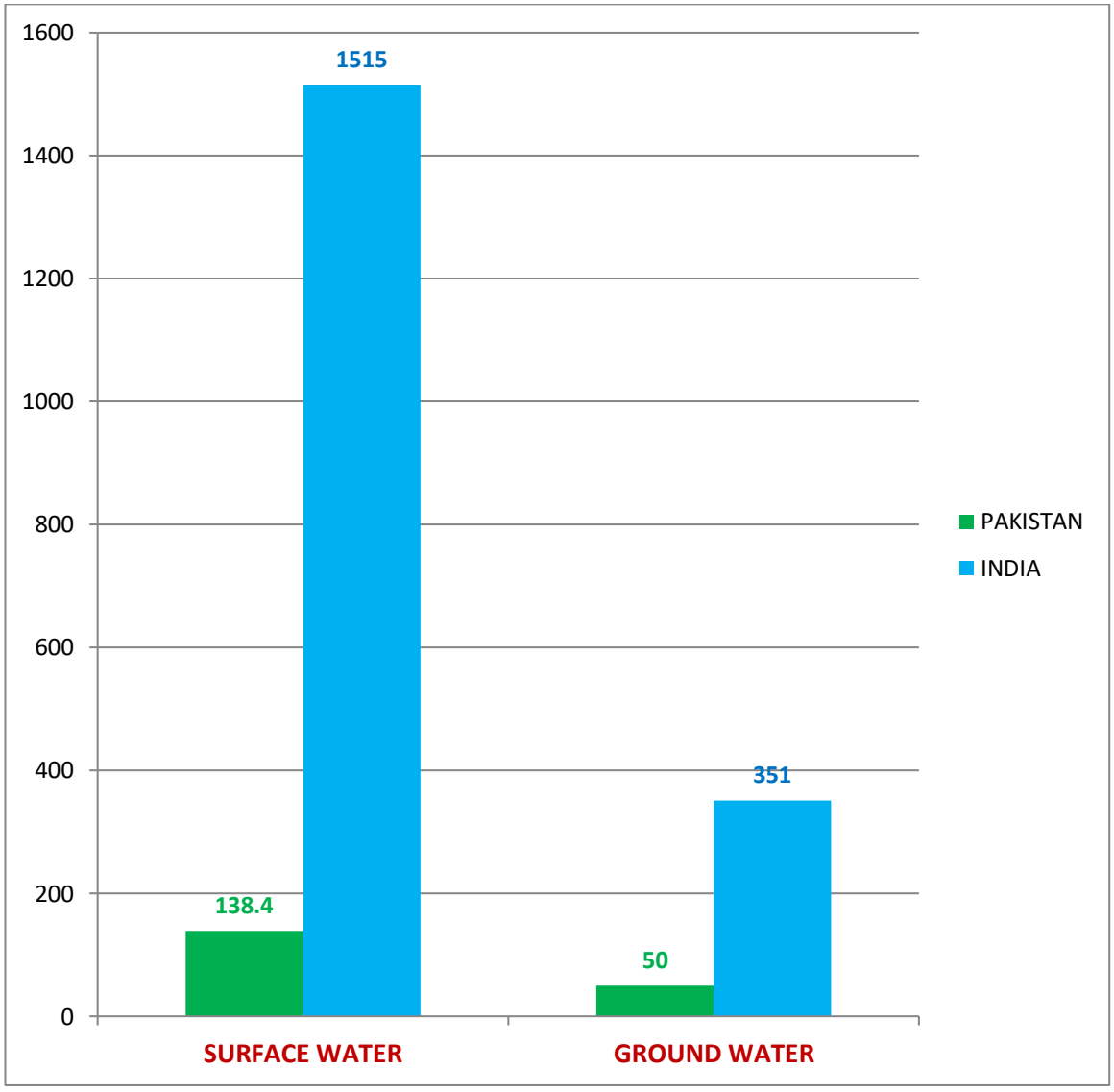
55. Thus overall in is clear that both India & Pakistan were water rich states at the time of independence and a combination of growing population, flawed agriculture policy and mismanagement of water resources has resulted in Pakistan already becoming a water stressed state and India heading towards it at a rapid rate. While India has multiple sources of water and in capable of moving water from one part of its landmass to another, Pakistan's total dependence on the Indus Water Basin for its water needs makes the relationship intertwined. Being overpopulated and agriculture based countries water is critical for their very survival and hence unless there is a drastic course correction, water is likely to be a bone of contention in the medium to far term relationship between the two countries. Based on data above, a comparative analysis of key factors converted to graphs is shown at Graphs 2 to 6 below, which highlight the crisis being faced by both countries and their linkages based on water.

(a) **Water Availability**. As can be clearly seen in Graph 2 below, both countries started out at nearly the same per capita availability after independence, however, the slide for Pakistan has been much steeper than that for India. By 2015 Pakistan had slid down to 1000 cu m per capita while India was down to 1720 cu m per capita. Projections by experts for both countries show the downward slide will continue, with Pakistan touching 800 cu m per capita by 2025 and India to 1434 cu m per capita by the same time. Hence, while both are sliding at a rapid rate, the trajectory of Pakistan is a lot steeper.



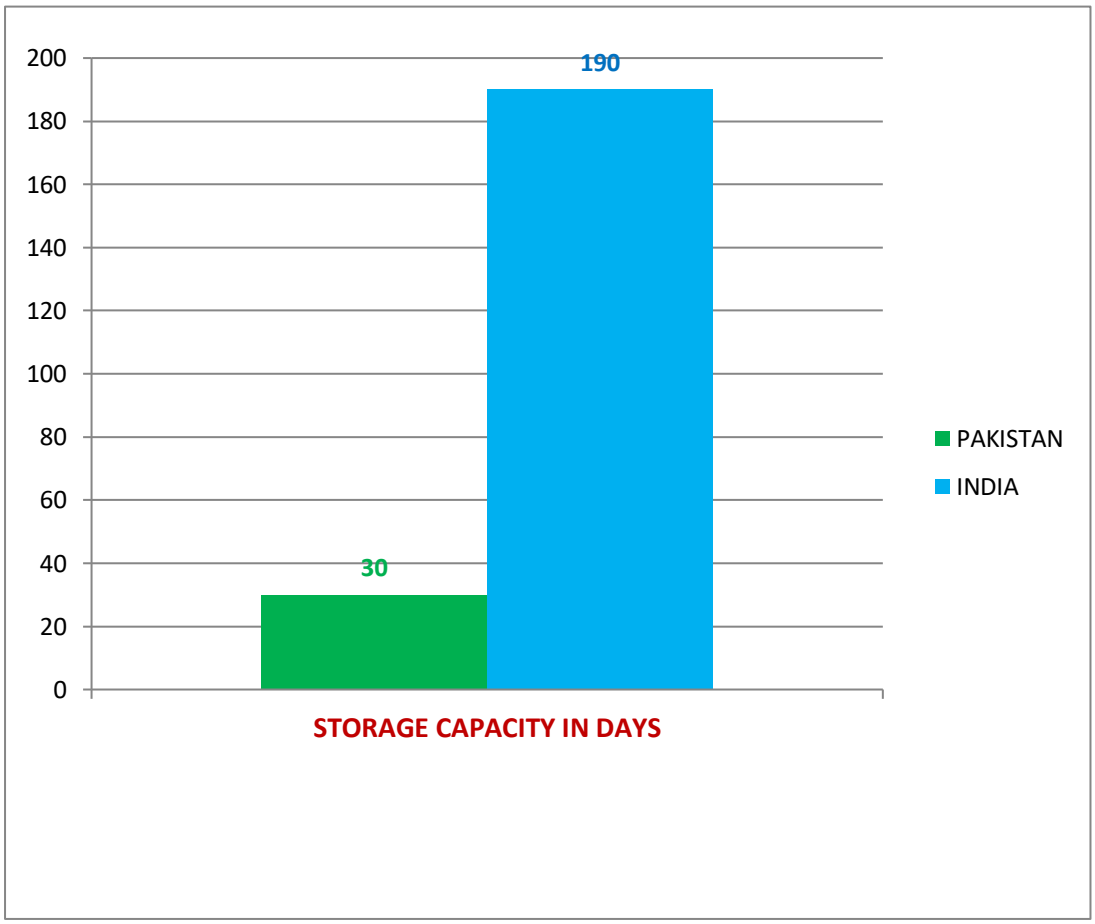
Graph 2 – Water availability Per Capita India & Pakistan in Cu M

(b) **State of Surface & Ground Water**. As on date the availability of usable surface and ground water for both the countries is shown at Graph 3 below, which indicates the heavy dependency of countries on ground water. The ratio of ground to surface water for Pakistan is 1: 2.78, while for India it is 1:2.3. Here again the crisis in Pakistan's surface water management is clearly illustrated thereby forcing it to extract huge amounts of ground water. India is actually only a shade better and like Lahore for Pakistan, NITI Aayog in its report on Composite Water Management Index 2018 has stated that Delhi alongwith 20 other Indian cities could reach "zero groundwater levels by 2020", which is alarming to say the least.



Graph 3– Surface & Ground Water availability India & Pakistan in MAF

(c) **Storage Capacity as on Date**. Storage capacity of water is essential not only for lean seasons annually but also in case of drought years. Global figures as given at Figure 8 above clearly indicate that against averages of developed countries, both India & Pakistan are way behind. However, even between the two of them, while India has storage capacities for 190 days, Pakistan has only for 30 days i.e. 14 MAF (PCRWR, 2018). Thus any seasonal and annual variations that are prolonged leaves it with little or no options. It is difficult to believe but Pakistan has not built a major dam in the last 48 years (Azeem, 2018). To overcome the same, Pakistan has initiated a drive to overcome this weakness on a serious note creating a dam fund, under the Prime Minister to raise $ 12.4 Billion to construct new dams (In Pakistan, government attempts to crowdfund $12bn for dams, 2018). The overall increase in storage is likely to go up by 20 MAF as shown at Table 14 below.

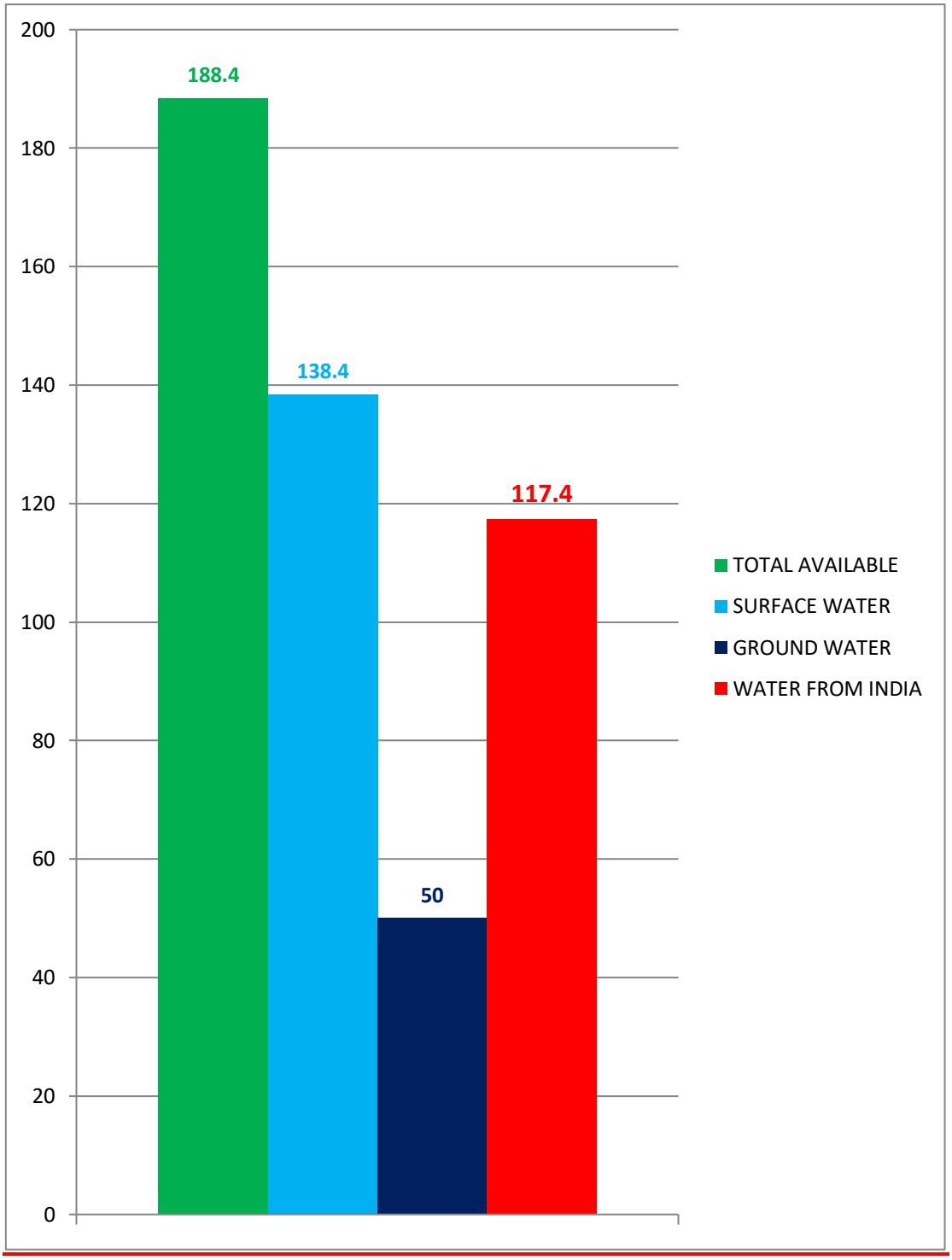


Graph 4 – Storage Capacity of Water India & Pakistan in Days

Name of Project	Storage MAF	Installed Capacity (MW)	Cost (US $ Billion)
Diamer Basha Dam	6.40	4500	11.2
Kalabagh Dam	6.10	3450	6.5
Akhori Dam	6.00	600	4.5
Munda Dam	0.87	740	1.25
Kurram Tangi	0.90	83	0.25
Total	20.27	9373	23.70

Table 14– Increased Storage Capacity of Water Pakistan in MAF (Khan, 2011)

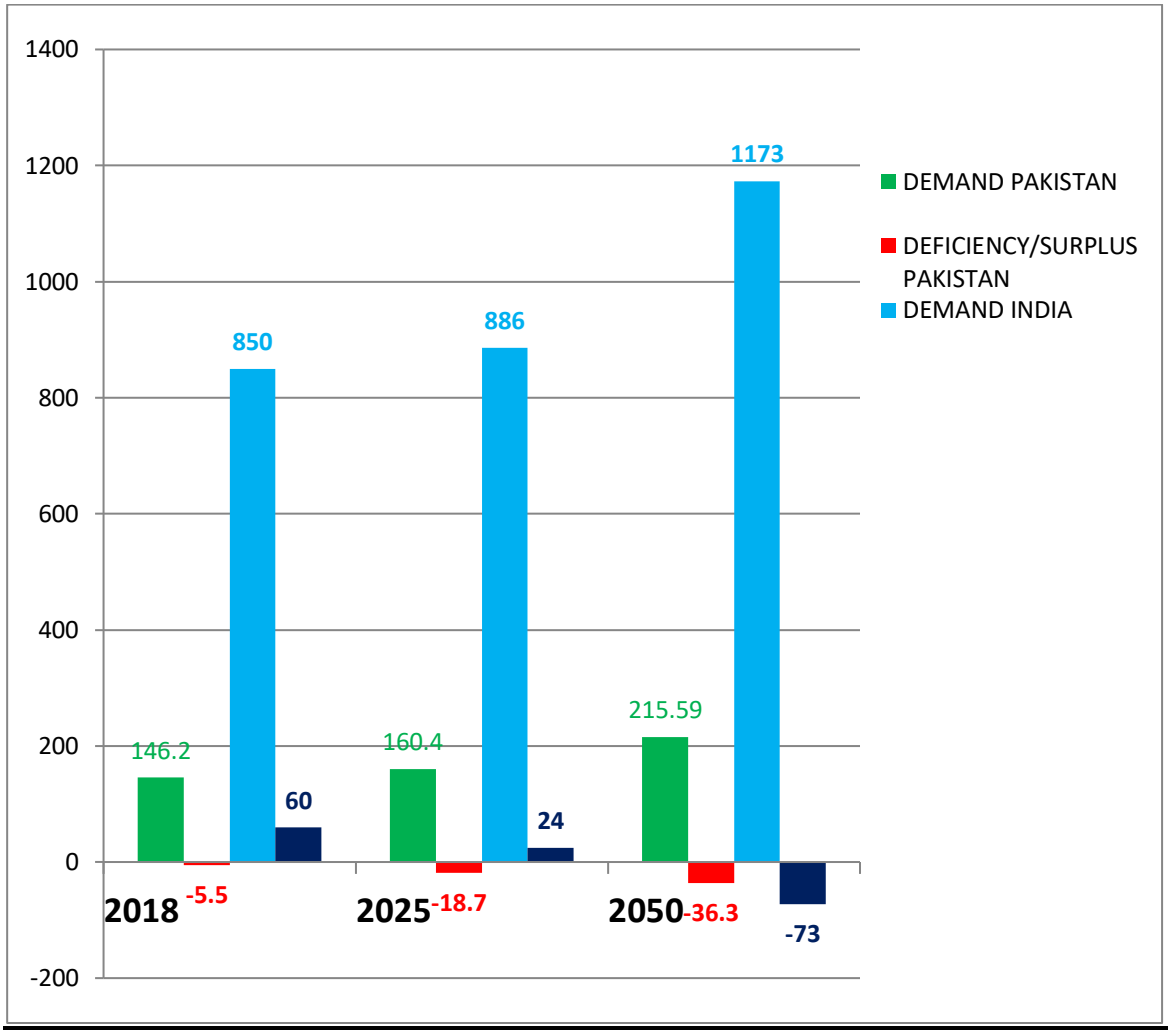
(d) **Linkages of Water India & Pakistan**. While Pakistan & India are different countries but their linkages of water make the artificial borders look really artificial. The Graph 5 below clearly highlights that Pakistan receives 85% of its surface water from India and this percentage forms 63% of its overall water availability of 188.4 MAF. The linkage is like an umbilical cord between a mother and her child, if severed will result in the instant death of the child. Thus it is clear that as far as nature is concerned it had tied the two nations together for posterity as far as water is concerned.



Graph 5 – Linkages of Water India & Pakistan in MAF

(e) **Demand & Supply Data**. The Graph below summarises the situation that persists and what is likely to unfold in the coming years and decades. While the demand and supply gap in Pakistan becomes acute from 2025 onwards, India will reach that stage

only by 2040. Given the water linkages between the two any variation in one country will be at the cost of the other thus putting into overall perspective the challenge at hand.



Graph 6 – Demand & Availability of Water India & Pakistan in MAF

(f) **Annual Variation in Flow**. A lot is written in the Pakistani press regarding India using excessive water for its projects, resulting in reduced flow to Pakistan annually. However as can be seen at Figure 15 and 16 below, the flow from the Western Rivers that were given to Pakistan has generally been consistent less the annual variations due to levels of precipitations (Wescoat, 2018). The figures of the Eastern Rivers however are naturally different. India has continued to build capacities to use these rivers for its use as per provisions of IWT resulting in a drastic fall in flows to Pakistan in recent decades i.e. from 8 MAF in the 1970's to less than 2 MAF today (Wescoat, 2018). This is likely to fall to nearly zero once India completes its Shahpurkandi Dam on River Ravi, which is likely to be

completed by 2025 (Reporter, Centre okays dam on Ravi, will cut water flow to Pakistan , 2018).

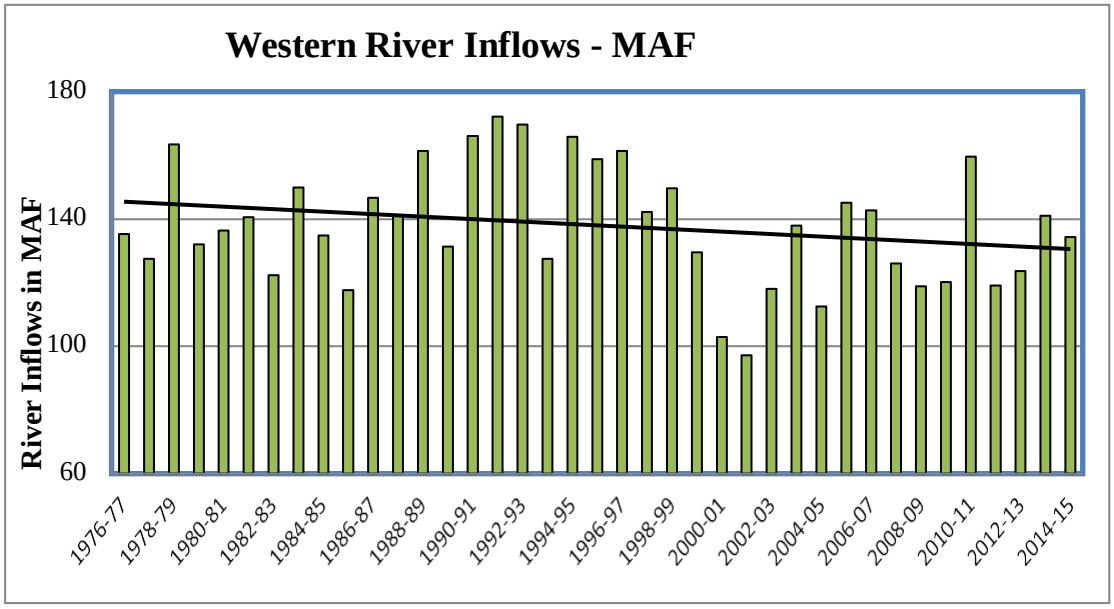


Figure 15 : Annual Flow of Western Rivers 1976 to 2015 (Habib, 2015)

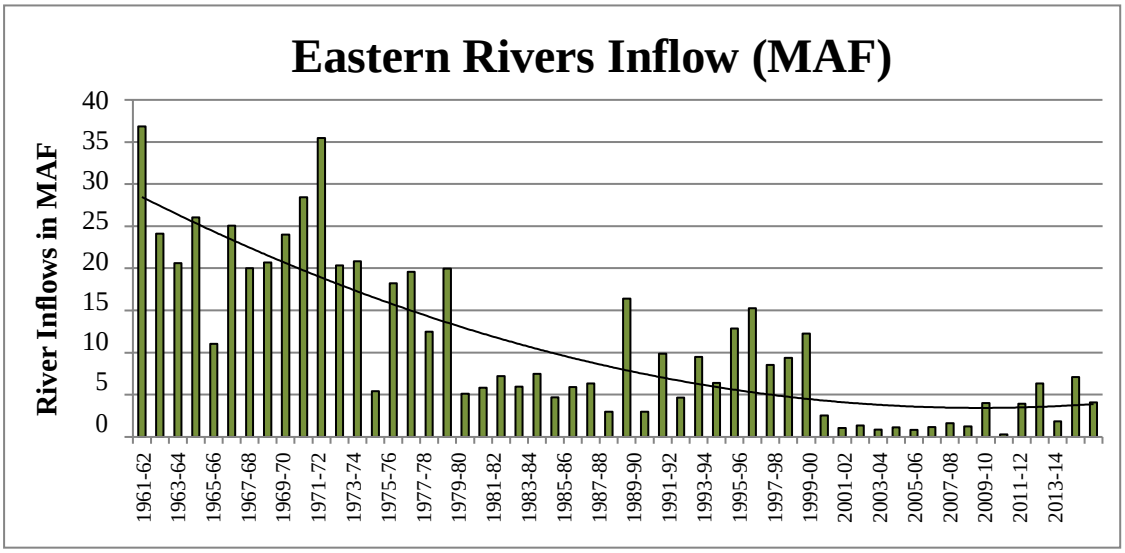


Figure 16 : Annual Flow of Eastern Rivers 1961 to 2016 (Habib, 2015)

CHAPTER 4 : PAKISTAN'S WATER DISPUTES WITHIN INDIA AND ITS IMPLICATIONS

"No Armies with bombs and shellfire could devastate a land so thoroughly as Pakistan could be devastated by simple expedient of India's permanently shutting off the source of water that keeps the fields and people of Pakistan green."

David Lilienthal, former Chairman of the Tennessee Valley Authority

56. The history of today's water crisis between India & Pakistan can be traced to events over 50 million years ago i.e. when the Great India Plate moved Northwards and collided with the Eurasian plate resulting in the formation of the Great Himalayas and the Indian Sub-continent. This unique geology also brought with it peculiar weather patterns like the monsoons, which brought moisture from the Indian Ocean to the land mass and when it hit the Himalayas, the moisture in addition to rain also brought snow. This snow accumulated over time forming glaciers, which resulted in perennial sources of water for the plains below. Another great geological peculiarity was the North East to South West flow of the land resulting in bulk of the rivers and water systems flowing in this direction. Thus the Himalayas became the great source of perennial water, which flowed through a complex water system generally from North East to South West and finally joined the Arabian Sea. Since this complex water system drained into a single river before meeting the sea, the entire system got its name from this river i.e. Indus. This perennial flow brought with it sediments from the mountains to the plains thus providing fertility to the soil and this resulted in one of the greatest civilizations finding its roots along this river called the Indus Valley civilization, which is said to have been set up about 5000 years ago.

57. With the Indus Valley civilization, the human footprint in the Indus valley was imprinted for times to come. The history of this civilization and its people over thousands of years has been researched over time and it is clear that water was the key ingredient why humans settled in this valley. Wars & conflicts have naturally ensued for various reasons over centuries in this area including over water, however, the conflict between India & Pakistan in historical terms is quite recent. As humans began to rely on agriculture and it became the

primary profession as also the key economic factor, it became imperative to find new lands for cultivation. Since it was not humanly possible to move rivers, humans decided to move water. This gave rise to a system of canals that took water from perennial rivers and diverted them to irrigate new lands thus providing greater food security and revenue for the people of the region. In the Indus valley the first such major project was the Upper Bari Doab Canal in 1859 (Chaturvedi, 2018), which brought the surplus waters from Madhopur to the water deficient regions of the Ravi irrigated Bari Doab. This was followed by a number of canals like Sirhind canal in 1872, Sidhnai Canal in 1886, Lower Chenab Canal in 1892 and Lower Jhelum canal in 1901 (FAO, Indus Basin, 2019). Subsequently in 1905 Sir Thomas Benton conceived the Triple Canal project to move the waters from Chenab & Jhelum to the water deficient regions along the Ravi leading to the construction of the Upper Chenab, Upper Jhelum and Lower Bari Doab canals by 1915 (Chaturvedi, 2018). Subsequently in 1933, the Sutlej Valley project consisting of two canals was completed (FAO, Indus Basin, 2019). Thus over a period of 80 to 90 years a complex network of canals was developed in the erstwhile undivided India under the British that ensured movement of water from surplus to deficient regions. However, when the boundaries were finally drawn by Sir Radcliff to partition the Indian dominion into India & Pakistan, this complex network of canals became a major source of friction as its construction was not based on two different countries but as one entity. After prolonged negotiations between the two countries, the IWT was finally signed in 1960 with the hope that the water issues would be amicably settled for times to come. However, as highlighted in Chapter 3 above, history has proven otherwise and today both countries have reached a state of water crisis resulting in friction. The specific cases of this friction have been enumerated in the subsequent paragraphs to highlight the sources and state of various contentious sources of dispute between these two nuclear armed states.

Salal Dam

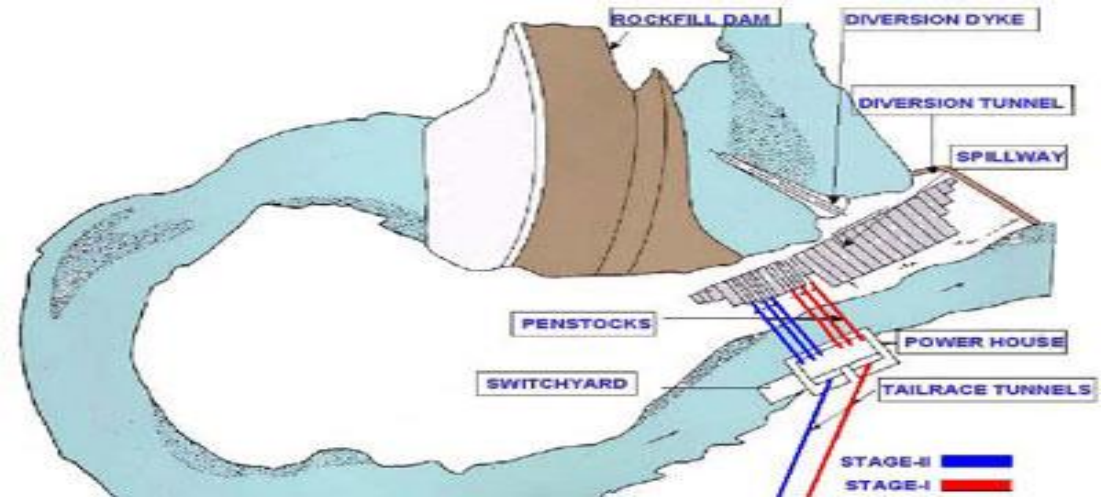


Figure 17 – Layout of Salal Dam on River Chenab (NHPC, Salal, 2019)

58. The first dispute after the IWT between India & Pakistan was over the Salal dam on River Chenab. The project was conceived pre- partition on River Chenab near Riassi, however post-partition, planning only began in 1960 and construction began in 1970. The run-of-the-river project was envisaged to produce 690 MW of power in two stages with the aim of supplying power to the other states in Northern India including J&K. However, in 1974 (Patra, 2019), Pakistan raised its first objections to the project stating that it violated the IWT and hence needed a review. Pakistan's basic objections and India's stance were as under (DAR, 2013):-

(a) Pakistan believed that the dam was in violation of the IWT. India stated that it was a run-of-the-river project as per the agreements of use of Western rivers in IWT.

(b) The technical objections of Pakistan included that the outlets at the bottom, height of foot gates and height of dam would stop flow of water to Pakistan, enable India to store water for use in conflict by causing flooding downstream. India's response was that storage was limited and before causing flooding in Pakistan, any sudden release would flood areas in India itself and hence not an option. It however conceded to one demand of Pakistan and reduced the height of the dam by two metres in 1978. Thus, an amicable solution was found and the construction of the dam began.

59. After the discussions in 1978, the construction continued and the first three units became operational in November 1987, while the balance three became operational between 1993 & 1995 (NHPC, Salal, 2019). Pakistan has sent observers to the site and the only objections have been the reduced flow of water to Pakistan downstream, which have been dispelled by Indian officials (PTI, Pak team inspects Salal hydro power project in Reasi, 2011) stating that the flow reduces in winters and increases in summers based on upstream availability. The dam thus was the first bone of contention between the two countries and its successful resolution is considered as a tribute to the IWT.

Baglihar Project

60. The Baglihar project envisaged a run-of-the river hydroelectric project on the Chenab River in Doda District for power generation (450 MW) for the Indian grid. It was conceived in 1992, got government approval in 1996 and construction began in 1999 (JKSPDC, 2019). India informed Pakistan about the project in 1992 (Sahai, 2006) and despite a number of discussions Pakistan as per the IWT informed the World Bank for a Neutral expert in January 2005 (Lafitte, 2007) as it had major objections to the project. Details are given in succeeding paragraphs.

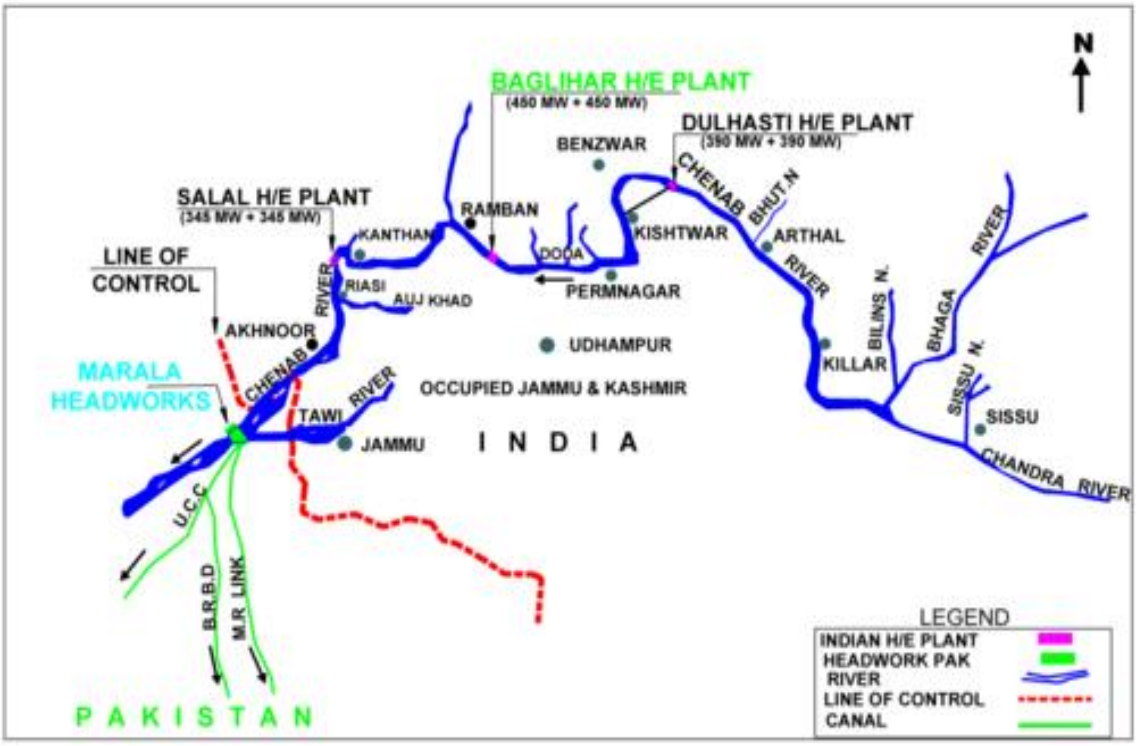


Figure 18 – Baglihar dam on River Chenab (Aquapedia, 2015)

61. **Issues of Dispute**. As per the Executive Summary of the Experts Report of the nominated expert Professor Raymond Lafitte in 2007 (Lafitte, 2007) **,** the main points of contention between the two countries with their respective stance is given below"-

(a) **Design of Project** (Lafitte, 2007).

(i) **Pakistan's View**. The design does not conform to paragraph 8, criteria (e) and (a) of Appendix D of IWT 1960. The design is not based on correct and realistic estimates of maximum flood discharge.

(ii) **India's View** (Lafitte, 2007). The Indian side does not agree with Pakistan's position.

(b) **Pondage**.

(iii) **Pakistan's View**. The pondage of 37.722 twice exceeds pondage required for power as per Paragraph 8 (c) of appendix D of IWT.

(iv) **India's View** (Lafitte, 2007). The Indian side does not agree with Pakistan's position.

(c) **Turbines**.

(v) **Pakistan's View**. Turbines are not located at highest point as per paragraph 8 (f) of IWT.

(vi) **India's View** (Lafitte, 2007). The Indian side does not agree with Pakistan's position.

62. **Experts Determination**. As per the analysis of experts under Prof Raymond Lafitte, in 2007, six clear issues were analysed and assessments determined. These are explained below:-

(a) **Maximum Flood Design**. The difference of design of 16,500 cu m/s of India and 14,900 cu m/s of Pakistan were analysed and the experts determined "*In view of all the uncertainties of flood analysis, the NE (Nominated Expert) has decided to retain the value of 16,500 m3/s for the peak discharge of the design flood. Climate change, with the possible associated increase in floods, also encourages a prudent*

approach".

(b) **Spillway Gated or Ungated**. The difference of design of gated of India and ungated of Pakistan were analysed and the experts determined "*The NE considers, in conformity with the state of the art, that the conditions at the site of the Baglihar plant require a gated spillway. An analysis done by the NE on 13,000 existing spillways in the world shows that 89% of these structures, having a design discharge higher than 14,000 m3/s, are gated*".

(c) **Spillway Level of Gates**. The difference of design in terms of height of gates was analysed and the experts determined "*The NE considers that the gated chute spillway on the left wing, planned in India's design, which has its sill located at el. 821, is at the highest level consistent with sound and economical design and satisfactory construction and operation of the works*".

(d) **Spillway Level of Gates**. The difference of design in terms of height of gates was analysed and the experts determined "*The NE considers that the gated chute spillway on the left wing, planned in India's design, which has its sill located at el. 821, is at the highest level consistent with sound and economical design and satisfactory construction and operation of the works*".

(e) **Artificial Raising of Water Levels**. The difference of design in terms of Full Pondage level of 840 asl and Free Board above Full Pondage Level of 4.5 as was recommended by India and opposed by Pakistan was analysed and the experts determined "*The Determination of the NE is that the freeboard should be 3.0 m above the Full Pondage Level leading to a dam crest elevation at 843.0 m asl*".

(f) **Pondage Levels**. The difference of design in terms pondage levels i.e. 37.5 mn cu m by India and 6.22 mn cu m by Pakistan was analysed by the experts. They ruled that "*The Determination of the NE is that the maximum Pondage should be fixed at 32.56 M.m3, and the corresponding Dead Storage Level at el. 836 m asl, one meter higher than the level of the Indian design*".

(g) **Level of Power Intake**. The difference of design in terms levels of power intake i.e. 818 m asl as submitted by India and considered too low by Pakistan was analysed by the experts. They ruled that "*The determination of the NE is that the*

intake level should be raised by 3 m and fixed at el. 821.0 m asl".

63. Thus as can be seen above, the experts broadly upheld India's design for the project with some changes. The project construction was carried out in two phases with Phase I being commissioned in 2008 and Phase II in 2015. While India was the beneficiary of the Experts Panel's decision, however, in Pakistan naturally it was considered as a reversal. The case became a landmark for all future projects and gave a fillip to India's desire to exploit the hydel potential of the Western rivers. It is important to understand this judgement as it is likely to be a benchmark in all future cases and as things stand the list of disputed projects is only increasing.

Kishenganga Project

64. The next bone of contention over use of waters between the two countries came up with India deciding to construct a 330 MW project near Bandipur in J&K by diverting the water from River Kishenganga to Bonar Madumati Nala called the Kishenganga Hydro Electric Project (KHEP). While India had informed Pakistan of the project, Pakistan in a slightly delayed timeframe decided to construct its own project downstream called the Neelum Jhelum Hydro Electric Project (NJHEP). Naturally since the source of water was the same i.e. Kishenganga (called Neelum in Pakistan), a dispute was only waiting to happen. The dispute naturally centred on water, its diversion and whether it was as per provisions of IWT. While the project commenced in 2009, Pakistan took the case to the Court of Arbitration at The Hague on 17 May 2010 (Arbitration, 2013). The basic contentions of Pakistan were (Arbitration, 2013):-

(a) The diversion of water from Kishenganga to Bonar Madmati Nallah is in breach of the IWT.

(b) Can India deplete reservoir level bellow Dead Storage Level (DSL) in any circumstances ?

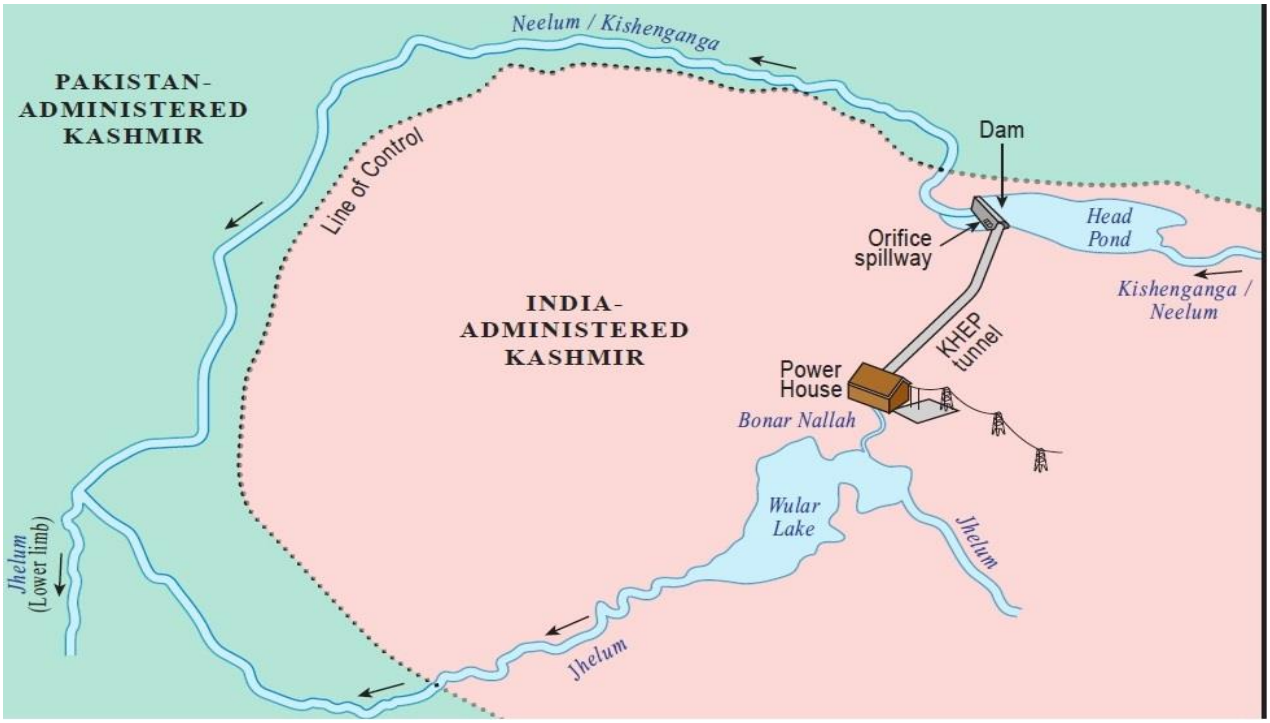


Figure 19 – KHEP (Patra, 2019)

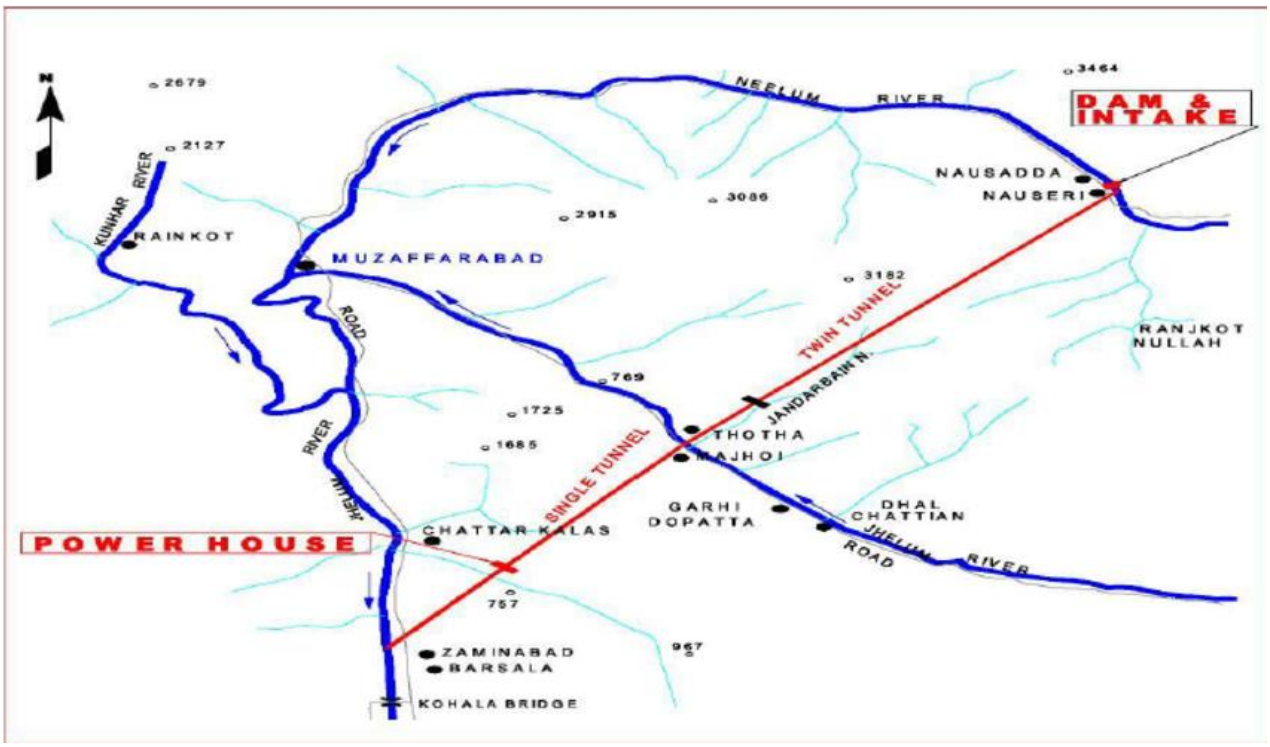


Figure 20 – NJHEP (Mushtaq, 2017)

65. The CoA was constituted in December 2010 and the proceedings began with both sides placing their points of view. After great deliberations, in 2011in an interim order the CoA allowed India to proceed with the work but discontinued any dam construction (Arbitration, 2013), as also ordered a joint inspection. After receiving the views of both parties post inspections, the CoA gave its Partial award in February 2013, where it held that the project was a run of the river project and that India could go ahead with its construction subject to maintain a minimum flow of water, which was to be decided in the Final order (Arbitration, 2013). Meanwhile, in 2011 India unilaterally reduced the height of the dam from 75.48 m to 35.48 m asl based on submergence and environment concerns (MEA, 2011). The CoA gave its Final Award on 20 December 2013, wherein it basically upheld its interim order and also amplified that the total minimum flow level to be maintained by India should be 9 cumecs (Arbitration, 2013). The project was accordingly completed by India and became operational in March 2018. Naturally Pakistan was not happy with the judgement and in 2016 it went to the World Bank along with another project i.e. Ratle. The World Bank is yet to take a final decision on the request as on date.

Ratle Project

66. Continuing with its push to meet the power needs of its growing economy and tapping into the vast hydel potential of J&K, India has embarked on another project on river Chenab. The Ratle Hydroelectric Project is proposed to be a run-of-the-river project downstream of the Dulhasti Project and upstream of the Baglihar project, producing 850 MW of power (GVK, 2012). The scale of the project is much bigger than either Baglihar or Kishenganga, with dam height of 133 m above deepest foundation, length 194.8 m and a designed flood of 13,814 cu m (GVK, 2012). After an international bidding process the contract was won by GVK and work commenced in June 2013 (Technology, 2018). The project was scheduled to be completed in 60 months (Technology, 2018) and was delayed because of Pakistan approaching the World Bank to set up a CoA in 2016 as it had serious objections to the design. However, in August 2017, with differences continuing between the two countries, the World Bank allowed India to proceed with the construction (PTI, India permitted to construct Kishanganga, Ratle projects: World bank, 2017). The construction is not progressing well as the company GVK has cited security challenges and the Government is looking to set up a JV between the Central & State government to complete the project and if

all goes as per plan the likely completion is by 2022 (Ali, 2018). Pakistan refused to discuss the issue in the Indus Waters Commission on 30 Mar 2018, but brought up two more projects i.e. Pakal Dul & Lower Kalnai (Mohan, 2018).

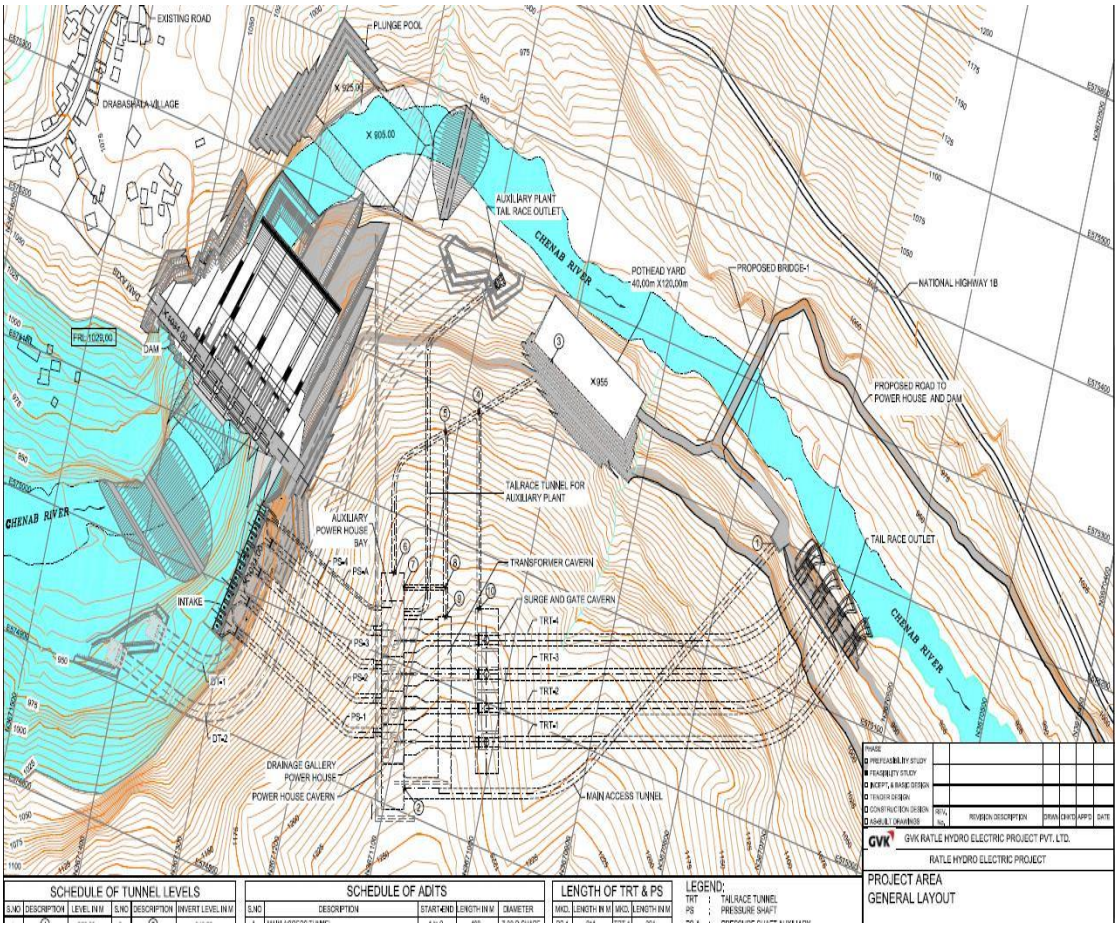


Figure 21 – Ratle Power Project Design (GVK, 2012)

Other Projects

67. As stated earlier India has undertaken a major drive to exploit the hydro potential in J&K in recent years and with each project the objections of Pakistan naturally keep increasing. Some of the ongoing projects in various stages of planning or execution are as under and to those that Pakistan has already raised objections have been highlighted:-

(a) **Tulbul Navigation Project (Wullur Barrage)**. The project aimed at construction of a barrage along the Jhelum River with the aim of making it navigable in the summer months. Work started in 1984 but was halted in 1987 after Pakistan raised objection on the storage of water (0.3 MAF against 0.01 MAF allowed by IWT) by converting a natural structure into a manmade one (Murada, 2016). In 1991-92 India agreed to forgo the storage, however, Pakistan made it conditional to India stopping work on the Kishenganga project, which was rejected by India (Murada, 2016).

(b) **Pakal Dul Project**. Another mega project called Pakal Dul on River Marusudar a tributary of River Chenab is being executed by India. The project envisages a dam height of 167 m and will have a storage with gross storage at 125.4 mn cu m, producing 1000 MW of power (NHPC, Pakal Dul, 2018). Given its scale, Pakistan has raised objections on similar lines as other projects i.e. it violates the IWT and had requested the Indian side to adjust their design by reducing the height by 5 metres as also making the spillway gates at 40 metres above sea level, thus reducing the overall storage capacity (Excelsior, 2018). This was rejected by India and the foundation stone for the project was laid by the Prime Minister on 19 May 2018 and the project is expected to be completed in 66 weeks (PIB, 2018).

(c) **Lower Kalnai Hydroelectric Project**. This is a 48 MW project on the Lower Kalnai, which is a tributary of River Chenab. Construction began in 2013 and was to be completed in 2017 (Affairs, 2018), however is running late. Again Pakistan has raised objections to it in the recent Indus Waters Commission in 2018 on the grounds that the pondage/intake/freeboard and opines that the depth of bridge girder be reduced to one metre instead of the current two-metre freeboard (Reporter, Water talks: Pakistan objects to India's hydropower projects, 2018).

(d) **Other Projects Under Planning**. In addition to the above a very large number of projects are at various stages of planning as given below (only medium sized) and with each project the pressure on water only increases and so

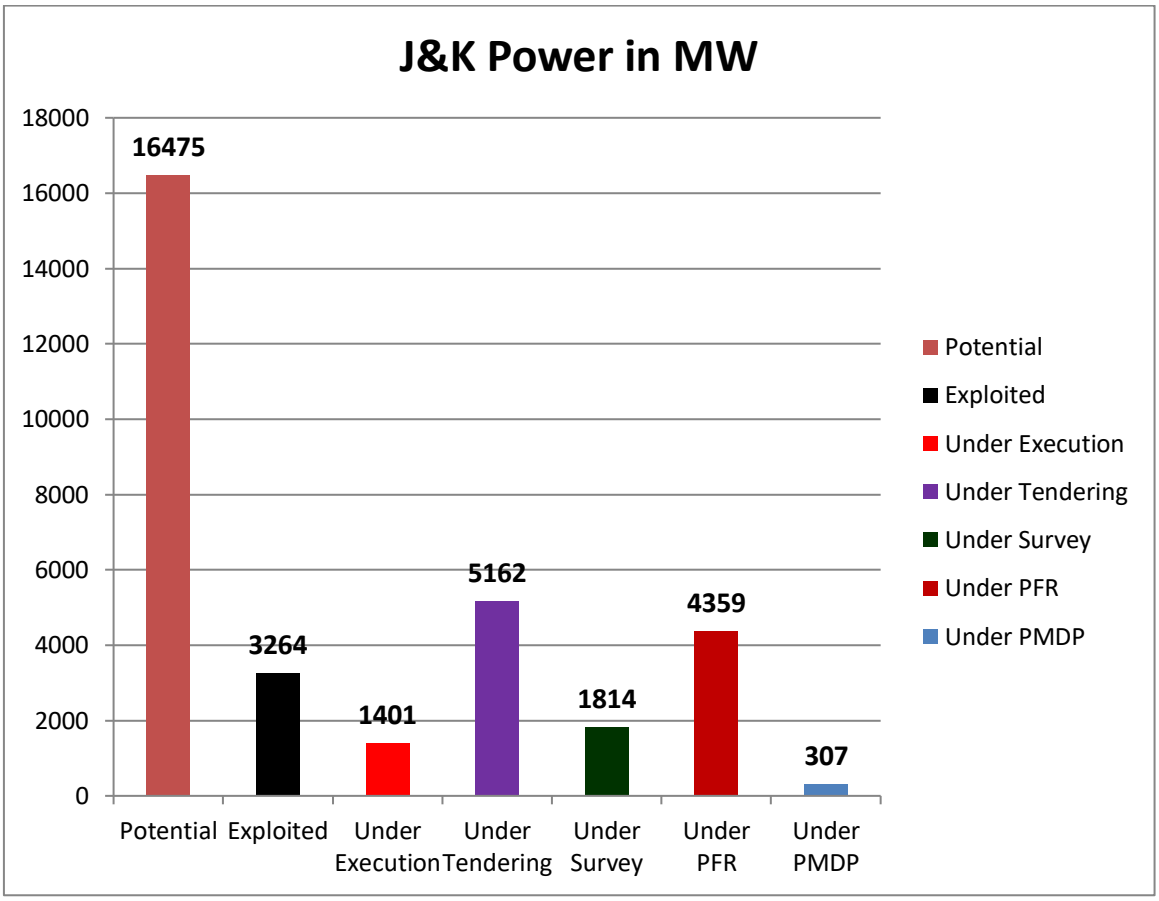
does the dispute between the two countries. The same have been shown at Table 15 below.

S.No.	NAME / LOCATION	CAPACITY (MWs)
1.	Lower Ans , Udhampur	37
2.	Parnai , Rajouri	37
3.	Mandi , Rajouri	37
4.	Bichllery , Rajouri	36
5.	Naiaguh , Kishtwar	200
6.	Uri - II , Baramulla	200
7.	Sonmarg , Srinagar	83
8.	New Ganderbal , Srinagar	50
9.	Sewa - II , Kathua	90
10.	Sawalkote	1856
11.	Kirthai I & II	1320
12.	Kwar	540
13.	Kiru	600
14.	Bursar	800

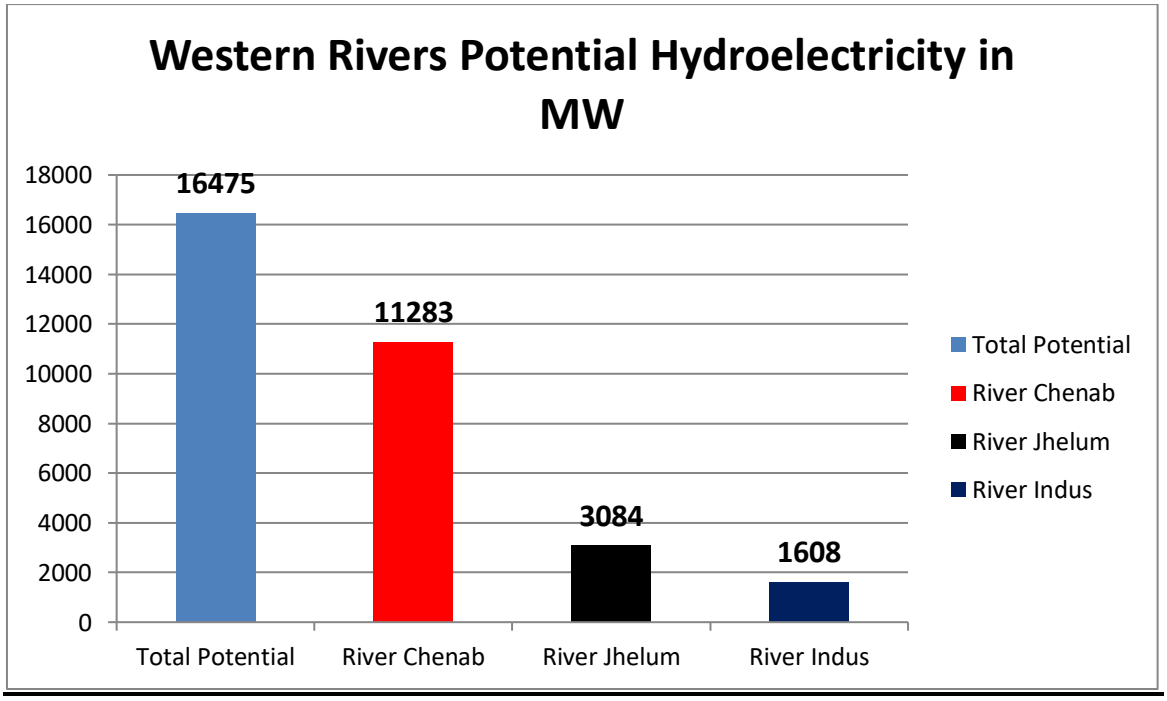
Table 15 : Power Projects Under Investigation (Ahad, 2017) (NHPC, Projects, 2019)

68. **Summary of Hydroelectric Projects in J&K**. J&K is a gifted state as far as hydroelectric capacity is concerned. It has the potential of generating 16475 MW of capacity and at present only 3264 MW (19.8%) is being generated (J&K, 2018). Thus there is an unutilised potential of 13201 MW out of which 13076 MW (80% of potential) (Department, 2018) projects are in various stages of planning or execution. The researched potential of 16475 MW is further distributed within the three Western rivers with River Chenab having the maximum potential of 11283 MW followed by River Jhelum 3084 MW and River Indus 1608 MW (Department, 2018). The magnitude and scale of the expansion can be understood from the fact that only 20% of the known potential has been exploited as on date and India proposes to exploit the balance 80% in the near to medium term, thereby putting immense pressure on

Pakistan. The humongous scale of this venture has been explained in Figure 22 and Graphs 7 & 8 below to understand the worry and scepticism in Pakistan.



Graph 7 – Details Hydroelectric Power in J&K (J&K, 2018)



Graph 8 – River Wise Potential Hydroelectric Power in J&K (J&K, 2018)

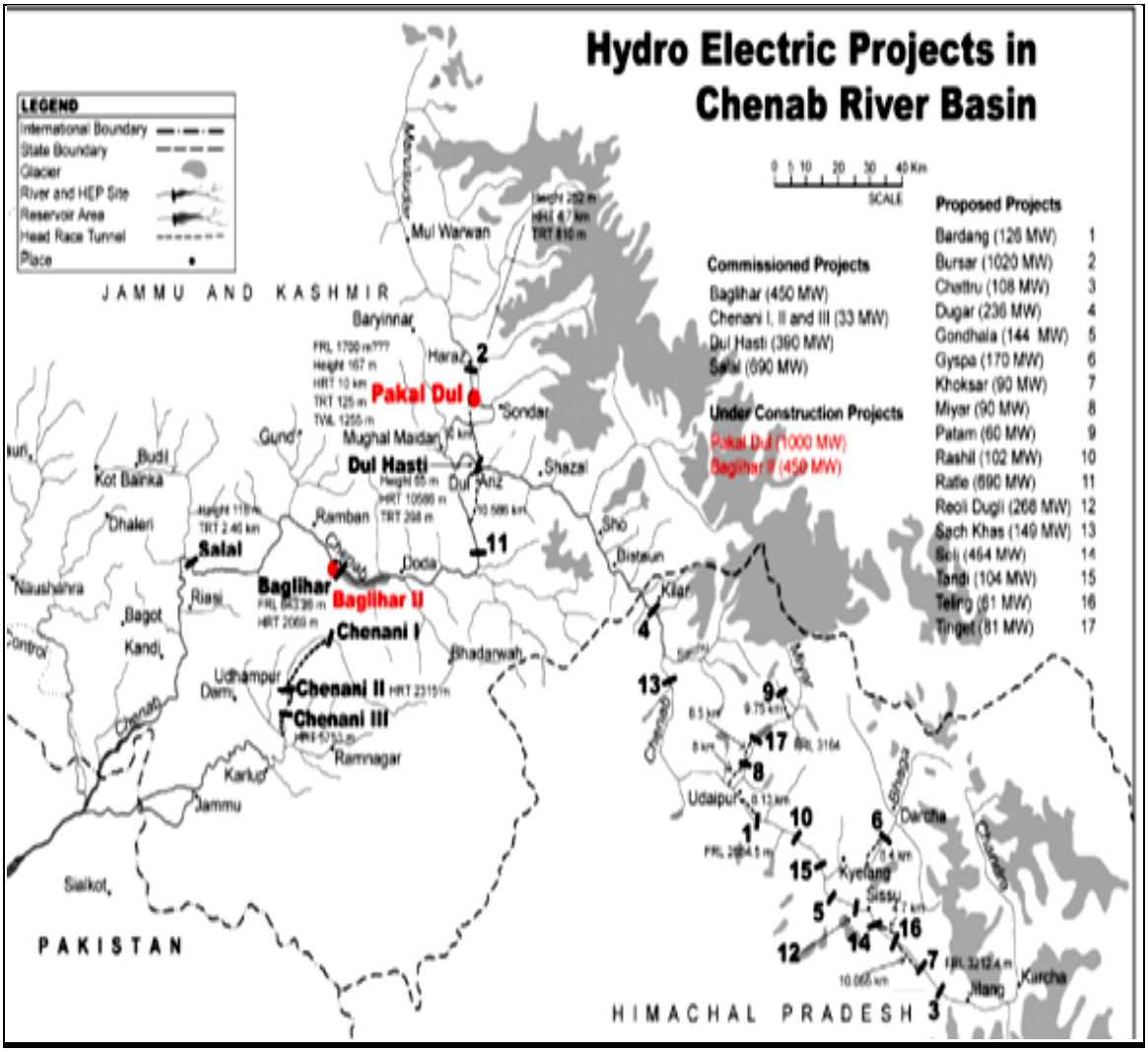


Figure 22 – Projects on River Chenab basin in J&K (Rivers, 2019)

The Eastern Border River Kabul

69. The next area of dispute over water between India & Pakistan is far away from J&K i.e. in Afghanistan; however as stated earlier River Kabul is part of the Indus Water basin and hence is key in the overall matrix. River Kabul provides Pakistan with 21 MAF (15%) of water annually out of its total surface water of 138.4 MAF (PCRWR, 2018) and hence is a critical source of water for the country especially NWFP that borders Afghanistan. Unlike with India, where Pakistan shares the IWT, there is no treaty between Pakistan & Afghanistan on water sharing. With some kind of peace in Afghanistan leading to planning and execution of development projects, focus has shifted on power & irrigation to meet its needs due to growing

population and aspirations. River Kabul and its distributaries provide vast potential for the same.

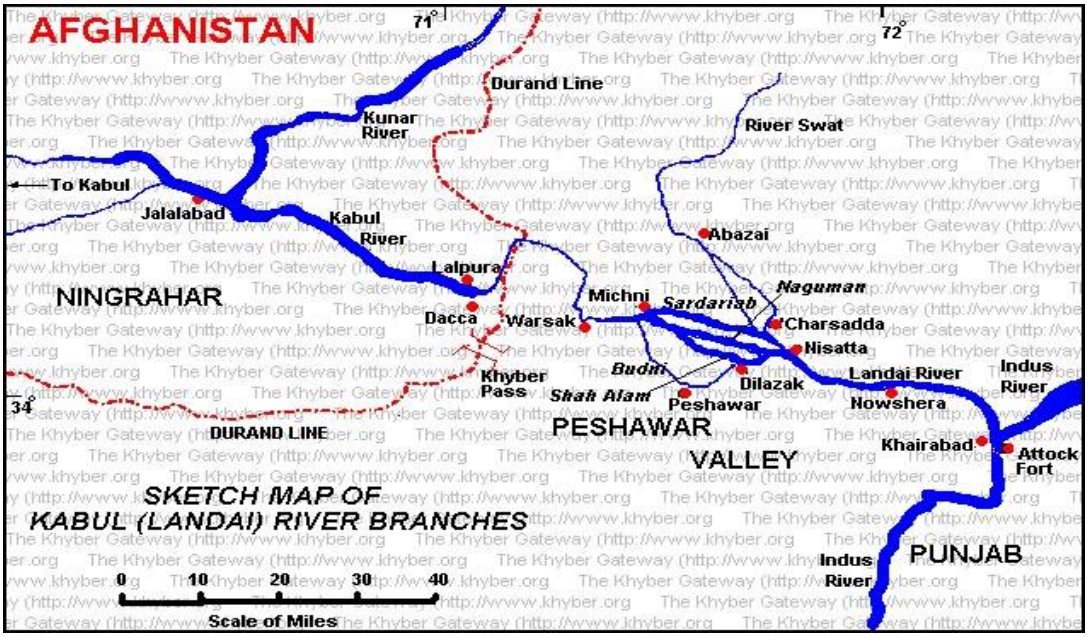


Figure 23 – River Kabul (Sial, 2012)

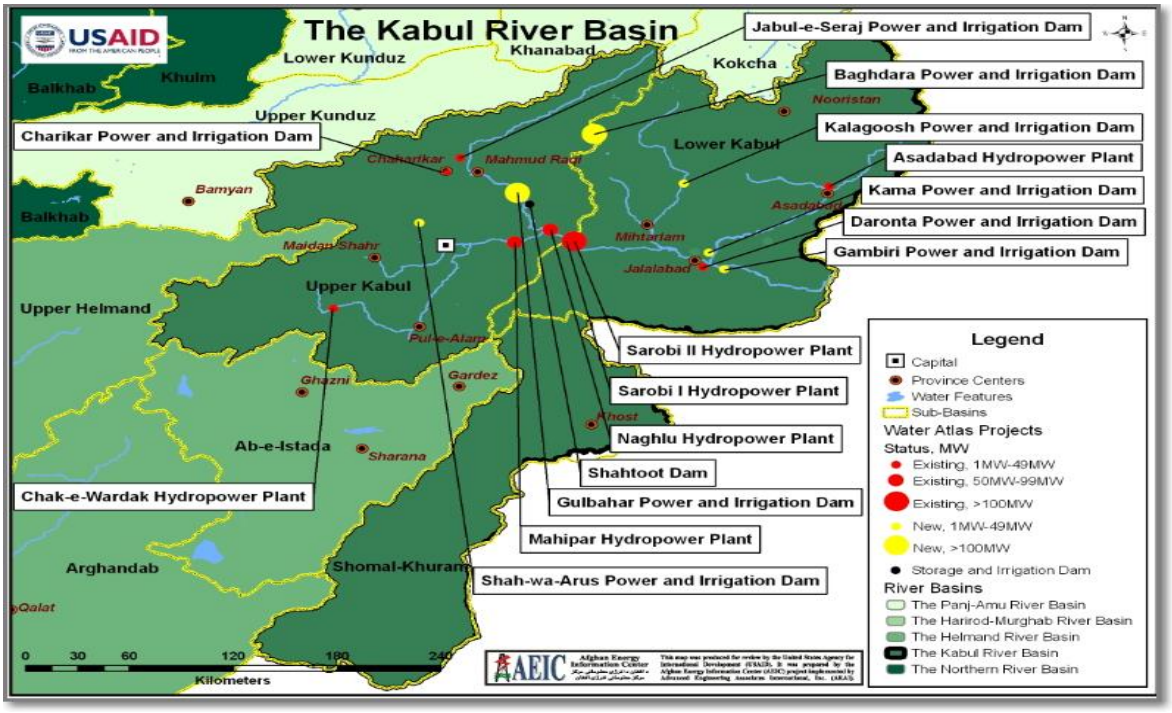


Figure 24 – Hydroelectric Projects on River Kabul (Studies, 2018)

70. As part of its development, Afghanistan is planning to construct 12 hydroelectric projects (Mustafa, 2016) on River Kabul and its tributaries with a potential of 1177 MW (Mustafa, 2016). Details of the planned projects are given at Table 16 below and these highlight the challenge that Pakistan faces. The projects are said to be proposed to be funded by World Bank costing approximately $ 7 billion and India will provide the technical assistance to a large number of these projects (Mustafa, 2016). These projects will naturally need water storage and as per news reports, it is estimated that 4.7 MAF of water will be retained in these projects when completed as also the projects will enable additional irrigation of 14,000 acres, which will consume an additional 0.5 MAF (Mustafa, 2016). Thus there is a potential of 5.2 MAF of water being reduced from Pakistan's annual availability i.e. 3.75%, which will further add to the water woes. Naturally Pakistan's media blames India (Mustafa, 2016) for this potential drop in water availability and feels that it is part of a grand strategy to choke Pakistan. Should these dams be constructed, Pakistan has a major problem on its hands in moving water to NWFP against the grain of the country and it will need massive investments, which it can presently ill afford. Given the fact that the World Bank is ready to fund the project and India's commitment to the economic 7 social growth of Afghanistan, this is likely to be another major source of dispute on water between the two countries that gets further complicated with a third country getting involved.

Serial Number	Name of Project	Capacity in MW
1	Barah	100
2	Totumdara	200
3	Panjsher	100
4	Bagdhara	201
5	Kaijana	72
6	Kajab	15
7	Tangi Wadag	56
8	Gat	86
9	Sorobi	210
10	Laghman	1251
11	Konar	94.8
12	Kama	11.5

Table 16 : Power Projects Under Planning River Kabul (Mustafa, 2016)

Survey of People on Both Sides

71. Since it is difficult to get a survey of both Indians and Pakistanis on issues of conflict due to security reasons, the research relies on a key survey conducted in 2014-15 by the China University of Geosciences, Wuhan and was published in the Asia Pacific Journal of Multidisciplinary Research, Volume 3, Number 1 in February 2015 (Muhammad Tayyab Sohail, 2015). Details of the survey conducted are as under:-

(a) **Timeline**. 2014-15.

(b) **Participants**. Total 300 with 150 from each country. It included employees working in Indus Water Commission and professors doing research on the subject.

(c) **Questions**. 10 questions were given to the respondents.

72. **Questions 1 to 9**. The results of questions 1 to 9 are given at Table 17 below.

Box	Category	Country	Agree	%	Neutral	%	Disagree	%
Q1	As per you knowledge and experiences what you think water issue between India and Pakistan also leave effect on the overall issue between both country relation.	PAK	132	88.0	9	6.0	9	6.0
		IND	60	40.0	53	35.3	37	24.7
Q2	Some incidences took place in past (after partition 1947) between Pakistan and India have been effecting the bilateral relations of both the countries.	PAK	126	84.0	10	6.7	14	9.3
		IND	89	59.3	24	16.0	37	24.7

Q3	Is there any relation between historical issues and current indo-Pak Relations?	PAK	105	70.0	31	20.7	14	9.3
		IND	46	30.7	49	32.7	55	36.7
Q4	Water resources issue have impact on bilateral relations as well as on Pakistani agriculture	PAK	101	67.3	31	20.7	18	12.0
		IND	42	28.0	23	15.3	85	56.7
Q5	Issue of Water Resources is the major hindrance in the way of good relations between Pakistan and India.	PAK	74	49.3	32	21.3	44	29.3
		IND	39	26.0	54	36.0	57	38.0
Q6	Bad relations of both countries leave effect on economy of Pakistan or India.	PAK	83	55.3	34	22.7	33	22.0
		IND	45	30.0	56	37.3	49	32.7
Q7	If Pakistan and India solve all the issue, what you think then both countries will have good relations in future.	PAK	78	52.0	33	22.0	39	26.0
		IND	65	43.3	48	32.0	37	24.7
Q8	Leaderships in both the countries are capable enough to resolve their outstanding issues.	PAK	38	25.3	32	21.3	80	53.3
		IND	58	38.7	43	28.7	49	32.7
Q9	As per conclusion what you think the current situation between Pakistan and India is friendly or positive?	PAK	19	12.7	54	36.0	77	51.3
		IND	41	27.3	64	42.7	45	30.0

Table 17 : Answers to Survey Questions 1 to 9 (Muhammad Tayyab Sohail, 2015)

73. **Question 10**. The question was specifically aimed at arranging key issues of potential conflict between the two countries in order of seriousness. The question asked was "*Arrange the following outstanding issues between Pakistan and India from most serious to least serious: Kashmir, Sir Creek, Siachen, Water Resources and Terrorism."* While Kashmir was the obvious choice of a majority of participants i.e. 48% Pakistani's and 59% Indians, what was really surprising was that Water resources was voted as the 2nd most serious subject

getting 23.3% of Pakistani votes and 17% Indian votes. The seriousness of other issues have also been tabulated and the overall results of the survey conducted are given at Table 18 below.

Sr. No.	Category	Country	f	%
1	Kashmir	PAK	72	48.0
		IND	89	59.3
2	Water Resources	PAK	35	23.3
		IND	26	17.3
3	Sir Creek	PAK	12	8.0
		IND	7	4.7
4	Siachen	PAK	28	18.7
		IND	19	12.7
5	Terrorism	PAK	3	2.0
		IND	9	6.0

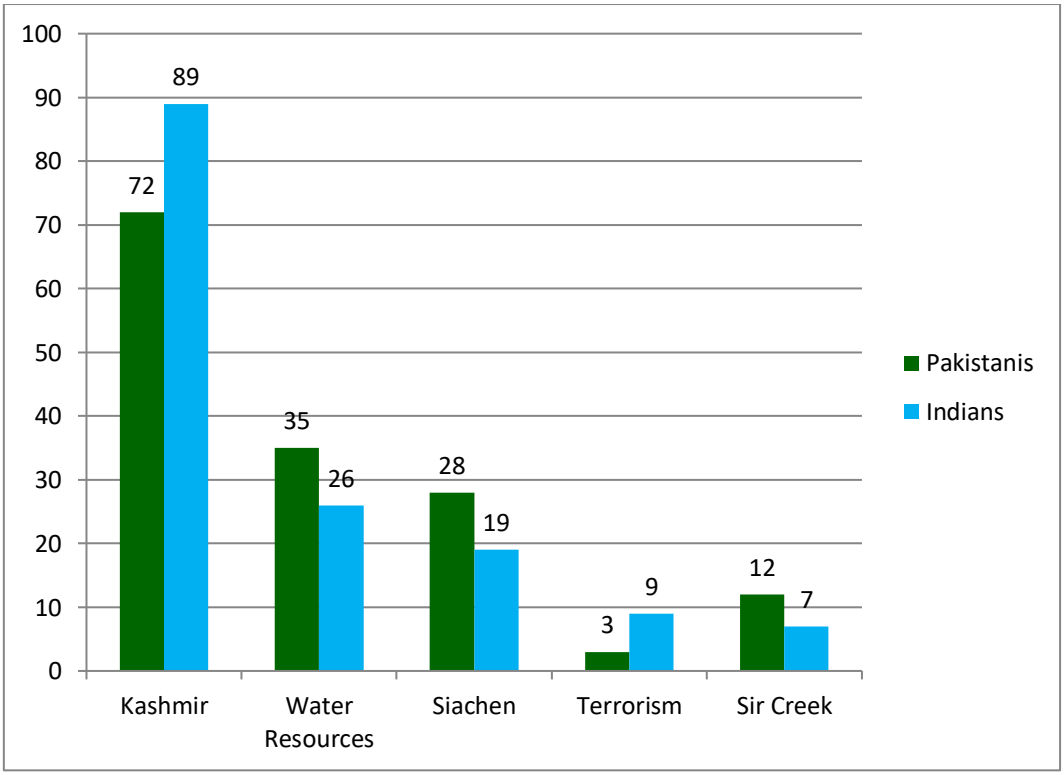
Table 18 : Answers to Survey Questions 10 (Muhammad Tayyab Sohail, 2015)

74. **Analysis of Survey**. The survey was conducted in 2014-15 and hence can be considered quite recent as there have only been minor changes to the water situation since then. The key aspects that emerge from the survey are explained below:-

(a) As per question 1, 88% of Pakistanis and 40% of Indians believe that water issue affects the overall relations between the two countries, while 6% in Pakistan and 35% in India were neutral. Thus it would be fair to assume that water affects relations between the two countries and naturally with Pakistan being the lower riparian the effect on its population is greater as India has other sources of water. Aligned to question 1 is question 4 i.e. the effect on bilateral relations including agriculture. Here 67% of Pakistanis and 28% of Indians agreed while 12% of Pakistanis and 57% of Indians disagreed. Thus it would be correct to assume that since the Indus basin water is critical to the agriculture of Pakistan, most Pakistanis believe it is critical to bilateral relations, while Indian's are generally in disagreement as very little of the Western rivers water is critical for India's agriculture. In terms of water being a major hindrance in good relations

between the countries as sought in question 5, 49% Pakistanis agree while 29% disagree, whereas only 39% Indians agree and 38% disagree, thereby highlighting the greater importance given by Pakistanis vis-a-vis Indians. Question 8 focuses on the trust in leadership on both sides to resolve the issue and here 38% Pakistanis have trust while 53% are distrustful, whereas 58% Indians have trust and 32% are distrustful. Thus, greater number of Indians have trust in their leadership to resolve these issues, but even then nearly 1/3 don't, thus highlighting the trust deficit as well as leadership challenges in resolving these tricky issues.

(b) Question 10 throws up some interesting findings. While most Indians were neutral of disagreed on water being a major hindrance in good relations between the two countries, however they rated water as the 2nd most serious issue after Kashmir, with 17%. Similarly Pakistanis (23%) also felt that it is the 2nd most serious issue after Kashmir. The difference in rankings of seriousness of issues between the two countries only differed in Sir Creek & Terrorism, where Pakistanis gave Sir Creek greater ranking vis-a-vis Terrorism by Indians for 4th & 5th rankings. The same is captured at Graph 9 below.



Graph 9 – Seriousness of Outstanding Issues (Muhammad Tayyab Sohail, 2015)

Summary of Disputes on Water between India & Pakistan

75. From issues discussed above it is clear that water is a major source of dispute between India & Pakistan. The basic source of dispute revolves around the use of Western rivers, wherein India believes that it is empowered as per IWT to exploit the potential of these rivers for hydroelectricity using the run-of-the-river technology to meet its growing power needs and Pakistan is of the view that India is not adhering to the spirit of the IWT and is using its clout in the international arena to get its way in various projects thereby endangering the water security of Pakistan both in terms of water storage thereby reducing the availability of water downstream to Pakistan as also holding water to use it as a strategic weapon at tome and location of choice either by holding onto it at critical periods of sowing season leading to drought like conditions in Pakistan or releasing huge amounts causing floods in Pakistan. India emboldened by its victory over the Baglihar & Kishenganga projects is planning some major projects in J&K like Pakal Dul (1000 MW), Bursar (800 MW), Sawalkote (1856 M), Kirthai I & II (1320 MW), Ratle (850 MW), Kwar (540 MW) & Kiru (600 MW), each of which will raise the stakes for Pakistan. To add to its woes along its Eastern borders, Pakistan is now faced with a new water dispute brewing on its Western front i.e. on river Kabul with Afghanistan. Under normal circumstances, Pakistan would have been able to use its influence and dissuade Afghanistan from such a venture, but given the new geo-political realities in Afghanistan wherein easy funding through the World Bank and technical assistance from India thrown up new challenges. Thus, Pakistan sees itself boxed in from both the sides of the Indus water basin which provides its only source of surface water. Given its present per capita availability of water at 865 cu m, which is likely to fall to 850 cu m by 2025 (Report, 2018), Pakistan is in desperate need to address the issue before its sees its citizens rising against the establishment. Similarly for India, its growing economy could suddenly be derailed if water becomes a serious issue both in terms of water for various uses as also as a source for power. Hence, both countries are at a threshold and given the water linkages between the two coupled with their historic animosity towards each other has the potential for an escalation which could have serious bilateral and global consequences. The scenarios that could play out and possible inferences are discussed in the next chapter.

CHAPTER 5: SCENARIO BUILDING, ANALYSIS AND PROGNOSIS

''When the well is dry, we learn the worth of water.''

Benjamin Franklin

76. Based on Chapters 1 to 5 above, it is clear that both India and Pakistan are facing their most challenging water crisis in history. From being water surplus countries at the time of Independence in 1947, both countries have seen a drastic fall in per capita water availability to their people because of multiple factors that range from increasing demand on account of growing population, increased requirements for irrigation & industry, poor management in terms of storage & efficiency, overdependence on surface water leading to falling water tables and reduced water availability on account of global climate change. It is also a fact that being a lower riparian state, Pakistan because of its geography is dependent on India & Afghanistan for its complete availability of surface water and with each country facing similar crisis the pressure on water will only increase with time.

77. The history of water conflicts at Chapter 2 clearly indicates the growing pressure on people globally for water resulting in conflicts both intra & interstate. The turn of the millennium has seen a sharp increase in such conflict with figure showing that 357 out of 551 recorded conflicts because of water took place post 2000. India and Pakistan are also seeing a growth in intra-state conflicts like the ones between Punjab & Sindh in Pakistan and Karnataka & Tamil Nadu in India. It is also clear that water could either be a Trigger, Weapon or Casualty of any of these conflicts.

78. People are central to any conflict and issues are the trigger for such conflicts. In the India-Pak scenario, there has rarely been peace between the two countries despite the fact that they were one entity only 70 years back. They have fought four wars, had countless skirmishes and continue to be engaged in Low Intensity Conflict on causes that range from the future of Kashmir, terrorism, boundary disputes like Sir Creek etc and water. The whole situation is further compounded by the fact that both are nuclear armed states and hence the stakes are extremely high. Given their chequered history, tense present, it is difficult to imagine a future that will be peaceful. The issues involved are complex and the leadership on both sides has displayed a lack of statesmanship to really get down to resolving any issue. Also given the fact that they are neighbours, these issues cannot be wished away and will crop up every time there is a crisis and naturally will tend to get mixed up because each side has their own perceptions.

Hence, any scenario building will be fraught with danger as no one issue can be taken without seeing the implications on the other. However, for the purposes of this study, water will be the key driver for any scenario building and all other issues will be kept out of the matrix for obvious reasons.

Scenario Building

79. Scenario building is a complex exercise as it is difficult to predict what may happen based on what has and is happening. However, it is an important tool for leaders to develop future scenarios so that one is able to plan to tackle them if and when they do get realised. While there is no definition of the term in any dictionary but a common understanding would best be described by stating that "*Scenario Building is an exercise of forecasting possible outcomes of an issue based on historical data, current trends and future predictions by experts*". As in most cases the model needs to be based on a timeline i.e. short, medium or long term. Also for any outcome the guiding inputs could be in three broad spectrums i.e. optimistic, pessimistic and realistic.

80. For the purposes of the study the basic issue is water. The broad methodology of undertaking scenario building will be firstly to get the historical data (already carried out in chapters above), assess the current trends (already carried out in chapters above) and get accurate predictions (already highlighted in chapters above). These inputs will be referred to as "Terms of reference" since they are quantifiable based on historical records and studies by experts and will therefore be the core of the entire process of scenario building as the fixed blocks around which all other blocks will be formed. Subsequently build the time continuum, which in this case will be taken as short/medium term i.e. 2025 and long term i.e. 2050. Thereafter, three scenarios will be discussed i.e. Climate Change, Unilateral Actions by India (upper riparian state) and Status Quo. Based on the scenarios, three inputs will be provided i.e. optimistic, pessimistic and realistic to arrive at possible outcomes in each scenario. These will then be discussed to arrive at a final conclusion i.e. "will water be a trigger for a future Indo-Pak conflict". The same has been shown diagrammatically at figure 21 below.

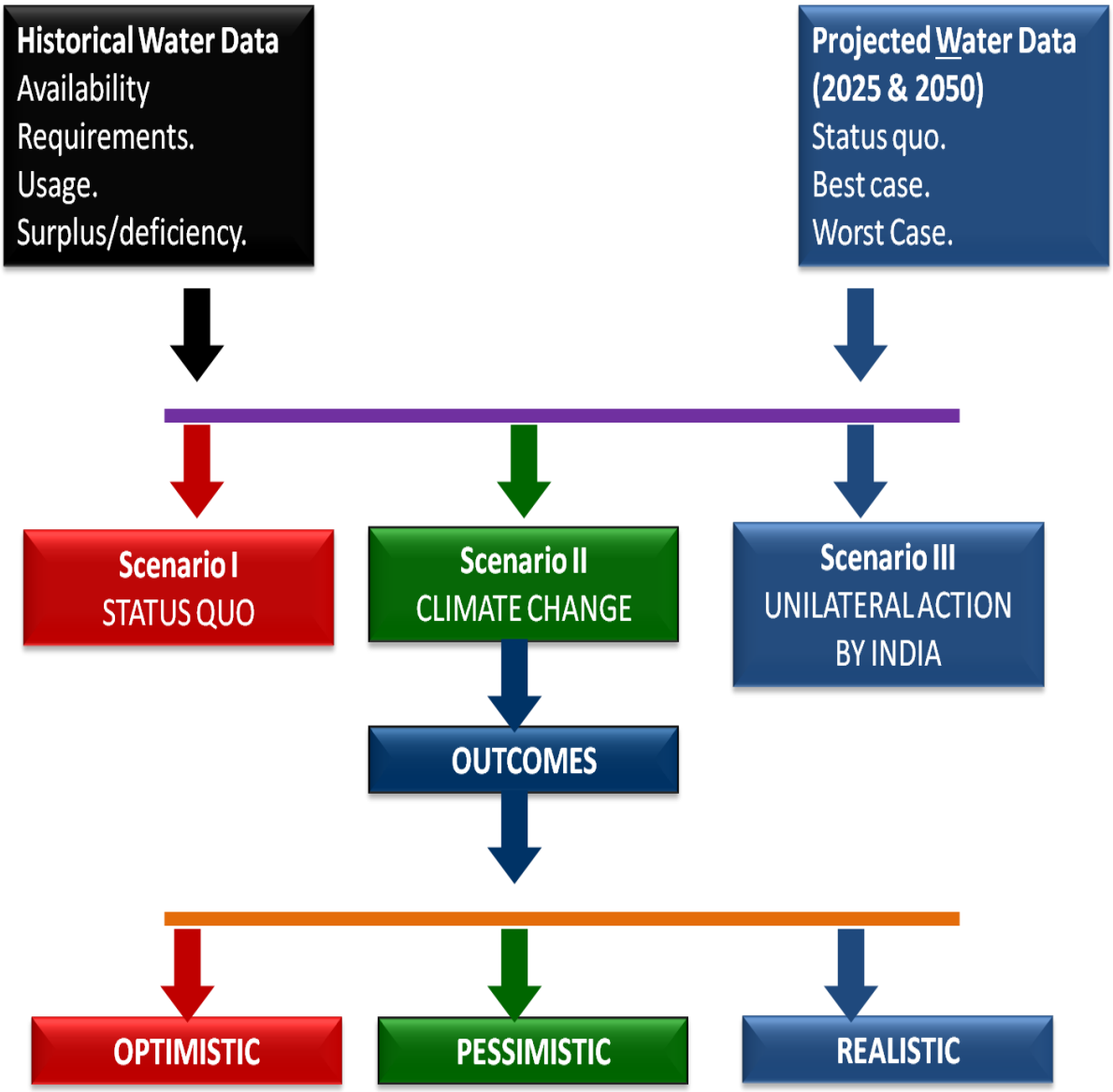


Figure 25 - Scenario Building Model

Terms of Reference

81. The following terms of reference will be used for scenario building:-

(a) **Pakistan**.

(i) Water Available. 188.4 MAF (138.4 MAF surface water & 50 MAF ground water). The further distribution of 138.4 MAF is 116 MAF from Western Rivers, 21 MAF from River Kabul and 1.4 MAF from Eastern Rivers.

(ii) Water Demand. The demand as projected by IISD is as shown at Table 19 below for three possible scenarios i.e. Business as usual, strong Demand management and Climate change based.

	Business as Usual	Demand Management	Climate Change Based
2025	186.8 MAF	172.8 MAF	197.8 MAF
2050	194.7 MAF	178.6 MAF	215.69 MAF

Table 19- Projected Water Demand in Pakistan

(iii) Key Variables.

(aa) Historical high of 186.8 MAF and low of 98.6 MAF.

(ab) Potential maximum storage of water along western rivers 3.6 MAF by India and 5.2 MAF by Afghanistan on River Kabul.

(ac) Total water from Eastern Rivers to Pakistan 1.4 MAF, which can be stopped by India with better management.

(ad) The transmission water losses in Pakistan's canal network due to inherent inefficiency are 46.7 MAF.

(ae) Water flowing into Arabian Sea beyond Kotri Barrage, due to inefficient storage capability is approximately 20 MAF.

(af) Pakistan gets a total of 117.4 MAF of its surface water from India.

(ag) Any reduction in water availability from existing figure of 141.7 MAF greater that 10% i.e. beyond 14 MAF (reduction of 70 & 55 cu m per capita in 2025 & 2050 scenario respectively) will create a crisis for Pakistan and a 20% i.e. beyond 28 MAF (reduction of 141 & 111 cu m per capita in 2025 & 2050 scenario respectively) will leave Pakistan with little option but to take on the challenge with its neighbours head on.

(b) **India**. Firstly being an upper riparian state, India has no water that flows from Pakistan. Key variables for India are as under:-

(iv) Water availability is 1100 MAF and is likely to remain adequate till 2025. However, by 2050 there is likely to be a deficiency of 263 MAF.

(v) 3.6 MAF of waters from western rivers can be stored for own use.

(vi) Present flow of water to Pakistan from Eastern Rivers can be brought down to zero as per IWT.

(vii) Is a lower riparian state for most of its other rivers and hence needs to be cognisant of any unilateral action with Pakistan may invite a backlash from powerful upper riparian states like China.

Scenario I – Status Quo

82. This scenario envisages that both India & Pakistan continue down their present trajectory of population, industrial and agricultural growth, thereby continuously putting greater pressure on the water resources. As regards availability of water, three studies have been conducted to study the futures of water and all have concluded that the volume of water flowing in the Indus basin is unlikely to see any appreciable change due to climate change before 2050 as the drop in availability due to decrease in snow melt will be compensated by increase in water due to precipitation (Jo-Ellen Parry, 2017). However, the studies have shown that the timing of peak flow will occur three to four weeks earlier that in the early 2000's i.e. June vis-a-vis June/July presently (Jo-Ellen Parry, 2017).

83. In this scenario, the population growth of Pakistan has been aligned with UN Report of 2015, which predicted would reach 245 million by 2030 & 309 million by 2050 (Economics, 2015). The water demand scenarios based on business as usual taking into account the increased demands of agriculture, industry and domestic use will be 146.2 MAF in 2018, 151.4 MAF in 2025 & 157.8 MAF in 2050 as already highlighted in chapter 3 above.

84. **Optimistic Scenario**. In an optimistic scenario, the variables that work for Pakistan are that India restricts itself to existing storage of water from Western Rivers and it continues to get 1.4 MAF from the Eastern Rivers thus ensuring its annual supply of 117.4 MAF from India. Similarly Afghanistan is unable to store any additional water on River Kabul and Pakistan gets 21 MAF. Pakistan is also able to build its storage capacity to reduce the escapage into Arabian Sea by present 20 MAF to 15 MAF. It is also able to bring in efficiency in its canal network and reduce wastages from present 46.7 MAF to 45 MAF. The picture that now develops is shown below, which clearly establishes that Pakistan has no major water crisis over and above its present state and hence there is unlikely to be any trigger for any conflict with its neighbours.

(a) **Availability**. 158.4 MAF {141.7(existing) + 5 (storage) + 1.7 (efficiency)}.

(b) **Outcome**.

	2018	2025	2050
Demand (MAF)	146.2	151.4	157.8
Surplus/Deficiency	**+ 12.2**	**+ 7.0**	**+ 0.6**

Table 20 - Outcome Optimistic Scenario I

(c) **Result**. No cause for trigger.

85. **Realistic Scenario**. In a realistic scenario, the variables that work against Pakistan are that India continues with its water storage drive and reduces the combined flow into Pakistan by 2 MAF i.e. 1.4 from Eastern Rivers & additional 0.6 from Western rivers by 2025 & 3 MAF by 2050. Similarly Afghanistan commences construction of its dams and is able to store approximately 2 MAF additional by 2025 and 5 MAF by 2050. However, Pakistan is able to build its storage capacity to reduce the escapage into Arabian Sea by present 20 MAF to 15 MAF by 2025 and 10 MAF by 2050. It is also able to bring in efficiency in its canal network and reduce wastages from present 46.7 MAF to 45 MAF by 2025 & to 40 MAF by 2050. The picture that now develops is shown below.

(a) **Availability**. 141.7 MAF (2018), 144.4 MAF (2025) & 150 MAF (2050).

(b) **Outcome**.

	2018	2025	2050
Availability	141.7	144.4	149.0
Demand (MAF)	146.2	151.4	157.8
Surplus/Deficiency	**- 4.5**	**- 7.0**	**- 6.8**

Table 21 - Outcome Realistic Scenario I

(c) **Result**. While Pakistan will suffer water shortages and is likely to move international organisation to get its perceived share from India & Afghanistan, it is unlikely to be a trigger in the medium to long term.

86. **Pessimistic Scenario**. In a pessimistic scenario, the variables that work against Pakistan are that India gives a fillip to its water projects leading to nil flow to Pakistan from Eastern Rivers and 3.6 MAF from its Western rivers by 2025. Similarly Afghanistan completes construction of its dams by 2025 and is able to store 5 MAF by 2025. Also, Pakistan is able to build its storage capacity to reduce the escapage into Arabian Sea by only 5 MAF till 2050 and is unable to bring in efficiency in its canal network. The picture that now develops is shown below.

(a) **Availability**. 141.7 MAF (2018), 132.3 MAF (2025) & 137.3 MAF (2050).

(b) **Outcome**.

	2018	2025	2050
Availability	141.7	132.3	137.3
Demand (MAF)	146.2	151.4	157.8
Surplus/Deficiency	**- 4.5**	**-19.1**	**-20.5**

Table 22 - Outcome Pessimistic Scenario I

(c) **Result**. Such a scenario has very serious implications as it causes severe water stress in Pakistan and with both India & Afghanistan contributing to this

crisis, Pakistan is left with only two options i.e. firstly to use it as a trigger for conflict or secondly undertake major water sector reforms to build up its availability to make up the deficiency from water coming from its neighbouring states.

87. **Summary**. Thus in the Status Quo scenario, the optimistic and realistic scenarios preclude any serious triggers on account of water, however the pessimistic scenario shows a deficiency of approximately 20 MAF in the medium and long term, which translates to 666 cu m per capita in the 2025 scenario and 548 cu m per capita in the 2050 scenario. Such a drastic drop in water availability will cause major upheaval within Pakistan that will naturally overflow to the neighbours especially India, which will be blamed by Pakistan's establishment & media rather than accepting their weaknesses in managing their resources.

Scenario II – Climate Change

88. As explained above, three studies have been conducted to study the futures of water and all have concluded that the volume of water flowing in the Indus basin is unlikely to see any appreciable change due to climate change before 2050 as the drop in availability due to decrease in snow melt will be compensated by increase in water due to precipitation (Jo-Ellen Parry, 2017). However, the studies have shown that the timing of peak flow will occur three to four weeks earlier that in the early 2000's i.e. June vis-a-vis June/July presently (Jo-Ellen Parry, 2017). Hence for the purposes of the scenario building, the availability of water has been calculated based on historical highs and lows of flow into Pakistan through the Indus basin as given in chapter 3 above. However, while there is little change in the availability of water the scenario developed assumes that temperatures will rise 3℃, which will increase agricultural water demand by 6% by 2025 and 12 to 15% by 2050 (Habib, 2015). Accordingly the water demand will be 146.2 MAF in 2018, 160.4 MAF in 2025 & 178.0 MAF in 2050 (Jo-Ellen Parry, 2017) as already highlighted in chapter 3 above.

89. **Optimistic Scenario**. As in Scenario I, the optimistic scenario envisages that the variables that work for Pakistan are that India restricts itself to existing storage of water thus

ensuring its annual supply of 117.4 MAF from India. Similarly Afghanistan is unable to store any additional water on River Kabul and Pakistan gets 21 MAF. Pakistan is also able to build its storage capacity to reduce the escapage into Arabian Sea by present 20 MAF to 15 MAF by 2025 & 10 MAF by 2050. It also brings in efficiency in its canal network and reduces wastages by 1.7 MAF by 2025 & 6.7 MAF by 2050. The picture that now develops is shown below.

(a) **Availability**. 158.4 MAF till 2025 & 168.4 MAF by 2050.

(b) **Outcome**.

	2018	2025	2050
Availability	158.4	158.4	168.4
Demand (MAF)	146.2	160.4	178.0
Surplus/Deficiency	**+ 12.2**	**-2.0**	**-9.6**

Table 23 - Outcome Optimistic Scenario II

(c) **Result**. No cause for trigger in the medium term and only a small chance in the long run.

90. **Realistic Scenario**. As for scenario I, the variables that work against Pakistan are that India continues with its water storage drive and reduces the combined flow into Pakistan by 2 MAF i.e. 1.4 from Eastern Rivers & additional 0.6 from Western rivers by 2025 & 3 MAF by 2050. Similarly, Afghanistan commences construction of its dams and is able to store approximately 2 MAF additional by 2025 and 5 MAF by 2050. However, Pakistan is able to build its storage capacity to reduce the escapage into Arabian Sea by present 20 MAF to 15 MAF by 2025 and 10 MAF by 2050. It is also able to bring in efficiency in its canal network and reduce wastages from present 46.7 MAF to 45 MAF by 2025 & to 40 MAF by 2050. The picture that now develops is shown below.

(a) **Availability**. 141.7 MAF (2018), 144.4 MAF (2025) & 149 MAF (2050).

(b) **Outcome**.

	2018	2025	2050
Availability	141.7	144.4	149.0
Demand (MAF)	146.2	160.4	178.0
Surplus/Deficiency	**- 4.5**	**- 16.0**	**- 29.0**

Table 24 - Outcome Realistic Scenario II

(c) **Result**. Pakistan in such a scenario is staring at major water shortages that are likely to be a trigger for conflict in both the medium and long term.

91. **Pessimistic Scenario**. Similar to Scenario I above, in this scenario, the variables that work against Pakistan are that India gives a fillip to its water projects leading to nil flow to Pakistan from Eastern Rivers and 3.6 MAF from its Western rivers by 2025. Similarly Afghanistan completes construction of its dams by 2025 and is able to store 5 MAF by 2025. Also, Pakistan is able to build its storage capacity to reduce the escapage into Arabian Sea by only 5 MAF till 2050 and is unable to bring in efficiency in its canal network. The picture that now develops is shown below.

(a) **Availability**. 141.7 MAF (2018), 132.3 MAF (2025) & 137.3 MAF (2050).

(b) **Outcome**.

	2018	2025	2050
Availability	141.7	132.3	137.3
Demand (MAF)	146.2	160.4	178.0
Surplus/Deficiency	**- 4.5**	**-28.1**	**-40.7**

Table 25 - Outcome Pessimistic Scenario II

(c) **Result**. The medium and long term implications of such a scenario are serious as they cause extremely acute water stress in Pakistan. Such a scenario will

be unacceptable to all Pakistanis and hence, Pakistan will be left with very few options but to put the blame on India thus making the water scarcity a trigger for conflict.

92. **Summary**. Climate change is a reality and with temperatures likely to rise, the demand for water will only increase. Pakistan being an agrarian economy will feel the effects of climate change more than others and as clearly highlighted in the pessimistic and realistic scenarios above, the deficiency of water could go upto 28% of availability. The drop in per capita availability in the worst case scenario will range from 141.4 cu m per capita in 2025 to 162.4 cu m per capita in 2050. When compared to the present availability of 865, such drastic drops in water availability in the medium and long term are bound to cause a major crisis within Pakistan, which us likely to be blamed on India and may be sufficient trigger to lead to an outbreak of hostilities between the two countries.

Scenario III – Unilateral Action by India

93. There is no other country in the World that voluntarily gave up nearly 75% of its water resources to its neighbour as was done by India in 1960 while signing the IWT. However, history bears testimony to the fact that such historical largesse did not bring the peace as perceived. Being the upper riparian, India controls 117.4 MAF of water which is 85% of the 138.4 MAF of surface water received by Pakistan. Therefore many in India question the need for continuing with honouring the IWT and no less than its Prime Minister hinted about it post the Uri attacks in September 2016. However, it is also a fact that since the World Bank was closely involved in the IWT as also being an international treaty unilateral abrogation may have serious repercussions, the options to India get limited. However, in recent years certain events like continued cross border terrorism, the need for environmentally friendly hydroelectric power from the vast potential in J&K, acute internal water crisis and climate change have led to a re-think in the Indian establishment. The scenarios so developed below are some of the options available to India; however, they need the development of infrastructure as well as the will to raise the ante. The aim for India will be to put adequate pressure for it to stop its cross border terrorism. Unlike other options above, here water is being used as a weapon to get strategic gains by one nation against another.

94. Based on the above, the three scenarios being developed are as under:-

(a) **Optimistic Scenario**. Restrict the flow of water in the sowing season.

(b) **Realistic Scenario**. Combine a drought year with restricting flow of water for crops.

(c) **Pessimistic Scenario**. Unilaterally abrogates the IWT and ensure Afghanistan is able to complete its hydroelectric projects with full storage.

95. **Optimistic Scenario**. Being an upper riparian state to an agricultural based economy like Pakistan, India enjoys great leverage. The two main crops in the two sowing seasons are Wheat in the Rabi season and rice in the Kharif season. As per details shown at table above Pakistan gets approximately 104 MAF from the western rivers during Kharif & 22.7 MAF during the Rabi season, an average of 0.57 MAF & 0.16 MAF daily. If India was to build storage of approximately 4 to 5 MAF along its western rivers, it will be able to hold water for about 8-10 days for Kharif and 30 days for Rabi. Combined with this if India were to completely stop all flows from its Eastern Rivers, the situation only worsens for Pakistan. Naturally the effect in the Rabi season is more pronounced and any delay in sowing will create an uproar amongst the farmers of Pakistan and is more likely than not be considered an act of aggression by Pakistan thus making water a trigger for conflict.

96. **Realistic Scenario**. The Indian subcontinent is no stranger to drought and phenomena's like El Nino hit globally once every 4 to 5 years. The lowest recorded water flow in the Indus water basin to Pakistan was in 2000-01, where only 98.6 MAF of annual flow was recorded, which is a deficiency of 29%. The net effect was that the production of wheat fell by 30% and that of rice by 25% (FAO, FAO/WFP CROP AND FOOD SUPPLY ASSESSMENT MISSION TO PAKISTAN, 2011). Livestock figures were down by 40%, rupee depreciated 20% and there was double digit inflation coupled with shortage of food. Now supposing India utilising its superior metrological technology were to use its advance knowledge to also use

water as a tool against Pakistan as in the optimistic scenario above. It would solve two issues for India i.e. assuage its own population who would be suffering similar conditions and put severe pressure on Pakistan. An existing deficiency of 29 to 30% could easily be accentuated to look like a 50% deficiency in water availability by India controlling the waters at critical times for the crops. The consequences for any government in Pakistan will be catastrophic leaving it with few choices. It is safe to assume that with India having the initiative, even a military option will be difficult for Pakistan to employ but will it have any other option?

97. **Pessimistic Scenario**. The last scenario is what is mostly discussed by panellists on television i.e. India abrogates the IWT and begins to develop projects that divert and store more water than the 3.6 MAF presently given to it on the Western rivers. Combined with this it opens up a second front by providing Afghanistan with the necessary funding and technical assistance to complete its 12 projects on River Kabul. It goes without saying that this becomes an existential threat to Pakistan and leaves it with no option but to initiate a conflict to win over key dams close to the border to ensure its very survival. Of all the scenarios this is a sure recipe for conflict.

98. **Summary**. Pakistan is an agriculture based economy and hence very sensitive to any issue that affects this sector. Bulk of its political and military leadership comes from Punjab, which is its food bowl. Therefore any unilateral action by India that seriously impinges on its key economic and employment sector will be considered by Pakistan as a hostile act and act as a trigger for escalation.

Prognosis

99. From the nine scenarios developed above it is clear that a majority of them have the potential of making water a trigger for a conflict between India & Pakistan. The cards naturally are heavily in favour of India, which has no water dependency on Pakistan but the situation the other way around is that it controls over 80% of Pakistan's surface water. Under normal circumstances, the IWT would have been a landmark treaty that could tide over most issues, but these are not normal circumstance. Both countries are moving towards a major water crisis, have explosive population growth, are agrarian economies that employ bulk of their labour force, have inefficient water management systems in place that accentuate an already precarious situation, are victim of climate change that may not be due to their making

and lastly have a history mutual animosity that has reached a new level with the increasing incidents of terrorist strikes on Indian soil. This heady mix is an ideal cocktail ready to explode. All it needs is a trigger and as has been seen above water which has no alternative is likely to become that trigger. A summary of three scenarios i.e. Status Quo, Climate Change & Unilateral Actions by India on two broad timelines i.e. medium upto 2025 and long upto 2050 above is summarised in the Table 26 below.

Water a Trigger	Scenario I – Status Quo			Scenario II – Climate Change			Scenario III – Unilateral Action by India		
	Optimistic	Realistic	Pessimistic	Optimistic	Realistic	Pessimistic	Optimistic	Realistic	Pessimistic
Medium Term 2025	NO	NO	YES	NO	YES	YES	YES	YES	YES
Long Term 2050	NO	NO	YES	NO	YES	YES	YES	YES	YES

Table 26- Summary of Scenarios

100. From table above we can infer the following:-

(a) In the status quo scenario, water is unlikely to be a trigger in the short to medium term, however unless both countries focus on water management, it has the potential to be a trigger in the long term.

(b) In the climate change scenario, the demands of water of Pakistan increase substantially and with static availability the normal principles of demand and supply loose equilibrium. Thus it is imperative that both in the medium term and long term water could be a trigger.

(c) In the unilateral action by India scenario, it is clear that any act of water control that affects the agriculture of Pakistan has the potential to be a trigger for conflict. While India retains all the cards, however the reaction card is still with Pakistan and fine tuning this operation will be a major challenge for India and it may not be able to control the escalatory ladder.

101. **Intangibles**. Having reached the conclusions above, there are a number of intangibles that could alter this prognosis. The first among them is a breakthrough in agricultural technology that allows crop production with 20 to 30 % reduced requirement of water. Given that both India & Pakistan use over 90% of their water for agriculture, this would clearly alter the demand and hence ease the crisis. The next is the effect of climate change. In case the projections by experts do not come true and temperatures in the sub-continent do not rise drastically, combined with normal monsoons, there is likely to be a situation of reduced demand with existing supply, resulting in drastic reduction in deficiencies. The next intangible is China, which is an upper riparian for a number of Indian rivers. In case Pakistan & china sign a pact that any unilateral action on water by India will invite a joint reaction by both Pakistan & China, India will be constrained with regard to any unilateral actions. Since the above are all intangibles and impossible to quantify, they have been kept out of the calculations for scenario building and resultant conclusions. As President John F Kennedy once said ***"If we could ever competitively, at a cheap rate, get fresh water from saltwater, ..(this) would be in the long-range interests of humanity which could really dwarf any other scientific accomplishments."***

102. **Overall Prognosis**. Based on all the analysis carried out above it clearly emerges that water will be a critical factor in all future Indo-Pak equations. The overall prognosis for the medium to long term is that water is likely to be used as a Weapon by India, Trigger by Pakistan and is likely to be a Casualty in any future water related conflict based on details as under:-

(a) **Water as a Trigger**. Since India is the upper riparian state that has no dependency on Pakistan for its water, while Pakistan is dependent on India for over 80% of its surface water, any water crisis will give the upper hand to India. Based on scenarios above water is likely to be used as a Trigger by Pakistan in the medium to long term during i.e. during a major water crisis.

(b) **Water as a Weapon**. Being the upper riparian state with major disputes like Kashmir & Cross Border Terrorism, India is likely to use Water as a Weapon to settle its disputes by using means other that War. It will attempt to control the escalatory ladder; however, that is a matter for greater research.

(c) **Water as a Casualty**. Historically neither India nor Pakistan have ever targeted each other's water resources during their four wars. However, since water will either be a trigger or a weapon in the conflict, this is likely to change and more likely than not Pakistan will attempt to capture/breech water reservoirs close to the International Boundary/ Line of Control during a conflict, to ensure flow of water along the rivers.

103. **Likely Manifestation**. The most likely manifestation of water as a Trigger, Weapon and Casualty based on scenarios developed above are explained below:-

(a) The timeline being discussed is between 2025 and 2035.

(b) India has completed its projects on the Western rivers especially the large ones like Pakal Dul & Sawalkote and is now capable of storing over 5 MAF of water in all reservoirs combined along these rivers. On its Eastern rivers, India has completed the Shahpurkandi dam and reduced the flow to Pakistan to zero. Pakistan has been able to increase its storage capacity by 5 MAF through construction of new dams but its water scarcity remains critical with per capita availability dropping below 800 cu m per capita. On the Eastern borders, Afghanistan has completed its 12 dams and is now capable of holding at least 5 MAF of water to tide over lean periods.

(c) On the political front status quo in terms of ongoing disputes especially Kashmir and cross border terrorism persist.

(d) The El Nino effect drastically affects the annual monsoon and the average rainfall comes down drastically in the catchment areas reducing the overall availability of water. The same was predicted by the Indian Metrological Department and hence India decides that it will ensure maximum storage of its reservoirs along both Western & Eastern Rivers to tide over the crisis.

(e) As a result of the above, there is not only a delay in release of water to Pakistan but there is also a drop in the total water reaching Pakistan. Against the annual average of between 101 to 110 MAF in the Kharif season, it now drops to approximately 85 to 90 MAF. This results in a major uproar in Pakistan because

the farmers are feeling the shortage for their rice sowing season. While Pakistan protests in the Indus Water Commission, India attributes the drop to the poor monsoons. Pakistan naturally approaches the World Bank and seeks arbitration, which is resisted by India. A similar picture emerges between Pakistan & Afghanistan.

(f) To overcome the shortage of water for its farmers, Pakistan releases water from its reservoirs bringing down its storage from 19 MAF to 10 MAF. This drop in reservoirs results in a drop in hydroelectricity generation causing discomfort to the locals, who blame the Government for the crisis.

(g) Despite the crisis and both countries blaming each other, the Kharif season is completed with a 20% drop in production in Pakistan, which is causing an agrarian crisis. However, with some international support, Pakistan is able to tide over the crisis but blames India for the situation. Its reservoirs are now at an all time low and it expects that the winter precipitation will make up the deficiency.

(h) However, the winter precipitation also is slightly below normal and reservoirs continue to fall to all time low levels and to make matters worse, the Rabi season sowing season has arrived. Wheat is ready to be sowed but India decided to use water as a tool to get Pakistan to stop cross border terrorism and decides to delay the release of water from the western rivers by 20 days. This causes a major crisis in Pakistan because it is incapable of releasing any more water from its reservoirs, which will all shut down if water levels come down any further. Farmers are in severe crisis as wheat is the main crop and with the poor produce in the Kharif season, most are debt ridden. Major national protests break out in Pakistan with farmers on the street asking for water and power. Given the weather situation, even in India the farmers are agitating for more water and the Government in under severe stress in the media to decide whether it wants to release water to Pakistan or save its own people and farmers.

(i) The overall deficiency for Pakistan based on the developing situation is given below that highlights the challenge to the Government:-

(i) Kharif Season. 85 MAF against annual average of 105 MAF i.e. deficiency of 20 MAF. Even with enhanced storage capacity of 19 MAF

compared to 14 MAF presently, Pakistan will be unable to meet its requirements. The delay in release of water by India for 15 to 20 days will put additional pressure.

(ii) Rabi Season. 10 MAF against an annual average of 25 MAF i.e. deficiency of 15 MAF. Given the sensitivity of wheat to farmers any delay or drop in availability will be very serious.

(iii) Total Shortage of Water. Pakistan will get 95 MAF of water that compares with its low average in the year 2000-01, when it was 97.6 MAF. However, its demand will have gone upto 165 MAF (Jo-Ellen Parry, 2017). Out of this deficiency ground water will make up 40 MAF leaving an overall deficiency of about 30 MAF resulting in per capita availability of just 478 cu m per capita, which as per the Falkenmark Index is "Absolute Water Scarcity".

(j) Pakistan requests India to release water for its Western rivers; however India decides to leverage water as a tool to get Pakistan to agree to stop cross border terrorism.

(k) The situation is now ripe for a major crisis. One outcome is that the Pakistani Government falls due to the farmer agitation, however the situation remains the same for the next Government also and hence its options are limited. The only option left with Pakistan is to declare India's actions as an act of War and use the water crisis as a trigger to launch a conflict.

(l) This unfolding story can easily become a reality after 2025 unless both countries take drastic actions to improve their water management, reduce wastages, increase efficiency, enhance storage to tide over seasonal variations, minimise carbon footprint to delay the climate change due to global warming and begin to recycle this precious resource.

Recommendations.

104. Having arrived at this conclusion, the following actions if taken will not only increase the threshold to pull the trigger but will also delay it.

(a) Pakistan has huge inefficiencies in its water management system. Some of the key ones that it can improve include additional storage capacity to prevent wastage of water that flows into the Arabian Sea (20 MAF).

(b) The canal system in Pakistan is generally unlined that results in seepage/evaporation of 46.7 MAF of water, which is unacceptable for a water deficient country. This can be addressed through multiple means like lined canals, pipelines, high efficiency irrigation systems etc.

(c) Similarly India looses 53% of its surface water to evaporation, which can easily be improved through better canal systems, water harvesting techniques and better irrigation technology.

(d) Over usage of ground water is likely to cause a major crisis for both countries. Free or cheap power to farmers is the primary cause. For long term sustenance it is imperative that farmers in both countries move towards sustainable exploitation with the shortfall being made up through greater efficiency at the farm level.

(e) Climate change is a reality and though studies indicate no major changes in water availability till 2050, however, it is incumbent on this generation to think of the future ones too and hence both countries need to study the hydro graphics of the basin together and ensure minimum degradation due to climate change.

(f) The IWT meets Pakistan's requirements but is perceived in India to be detrimental to its growth. It will continue to be a cause of dispute between the two countries till it is linked with other disputes like Kashmir and cross border terrorism. Once delinked from these issues, there is a possibility of both countries

amicably meeting their needs.

(g) Agriculture is the primary consumer of water in both countries i.e. in excess of 90%. It is this sector that needs special focus in terms of low water consuming crops, shift to other crops from water guzzlers like rice and sugarcane. If agriculture sector in both countries can bring in even 10% greater efficiency, the over availability of water will jump manifold.

(h) A very large percentage of water in both countries is lost to pollution and unlike developed countries where technology is being used to recycle water, the same is found lacking in both India and Pakistan. Special emphasis on the issue will ameliorate the problem to a great degree.

(i) Overall the time has come for both countries especially Pakistan to look at water as a strategic resource that needs a national effort to conserve and protect. Once this is understood, a lot of things will automatically fall into place.

(j) The prognosis in the medium to long term is grim and unless drastic steps are taken on a war footing the possibility of water being the nemesis of both nations cannot be wished away.

CHAPTER 6: CONCLUSION

"According to the U.N., more than 2.7 billion people will face severe water shortages by 2025. Many social scientists predict that the next big wars will be over water. Nevertheless, the average American family blissfully consumes 300 gallons a day, when you add in watering the lawn and washing dishes, clothes, and cars."

Alex Shoumatoff

105. Decades of mismanagement, uncontrolled population growth and total lack of water management planning have resulted in the per capita availability of water drastically falling from over 5000 cu m per capita at the time of independence to 860 cu m & below 1500 cu m per capita respectively for both India & Pakistan. Predictions by experts for both countries does not make happy reading either, with Pakistan expected to fall below 800 cu m per capita and India to about 1340 cu m per capita by 2025. Therefore the basic question for research was whether water will be a trigger for a future Indo-Pak conflict?

106. India and Pakistan were once one entity and the geography of the Himalayas has ensured that no matter what, their destinies are intertwined. While India still has multiple sources of surface water, but Pakistan is restricted to only one i.e. the Indus Water Basin comprising six rivers that flow from India and one from Afghanistan. The intertwining between the two countries can be gauged from the fact that out of the 138.4 MAF of surface water that Pakistan gets annually, 117.4 MAF comes from India, while the balance 21 MAF comes from Afghanistan. Its present requirements are over 180 MAF and it meets the shortfall by extracting ground water. The fall in water tables in both countries is one of the fastest in the world and with the passage of time will only get worse. To make matters worse for Pakistan, its relations with Afghanistan are at a historic low and it is in this period that Afghanistan has decided to build 12 dams on River Kabul and its distributaries, which if executed may result in a drop of over 5 MAF of water annually, which is more than the storage capacity of one of Pakistan's biggest dams Mangla.

107. History is witness to the fact that no civilization has survived without water. As per records, till date there have been 655 conflicts related to water in history out of which 279 (42%) have taken place since 2000 out of which 42 have been in Southern Asia itself. Hence, water has been and will continue to be a source of conflict for mankind. On account of their shared past the water usage in both India & Pakistan follows a similar pattern i.e. over 90% is

consumed by the agriculture sector and the balance 10% is shared between industry & domestic use. Water guzzling crops like rice and water result in major demands of water, which is further accentuated by an inefficient irrigation system and poor yield per drop. This mix of flawed priorities and inefficient water management systems has brought both these countries to a major water crisis. When times were good and water was aplenty, both countries signed a historical treaty called the Indus Water Treaty in 1960, which gave the unrestricted use of the Eastern Rivers to India, while it gave bulk of the Western Rivers to Pakistan though with certain usage allowed for India also. It stood the test of time because nature was kind to both countries and water was never really a challenge. However, post 1990's the situation took a turn for the worse primarily on account of the exponential growth in population in both countries and the resultant pressure for feeding the millions of additional citizens. Add to this global climate change especially in terms of rise in temperatures and the present and future both look bleak to say the least. The good news is that four major studies carried out in the last 6 to 7 years have concluded that there will be no change to water availability due to climate change and the decrease due to glacial melt will be made up by increase in precipitation. However, the experts have also concluded that the rise in global temperatures will lead to an increase in demand resulting the proverbial demand and supply imbalance.

108. The situation today is worse for Pakistan vis-a-vis India because it has fewer resources and its demand in increasing at a more rapid rate. The demand supply mismatch is best highlighted in the Graph 6 above, which in one snapshot highlights that Pakistan has very little time and by 2025 it will be staring at a major water crisis that it may not be able to manage. For India the prognosis is the same albeit in a different timeframe i.e. beyond 2040.

109. One of the major causes of friction between the two countries is that India sees great hydroelectric potential in its state of J&K. The state has a capacity of 16,475 MW out of which only 3264 MW (20%) is being harnessed. India has taken up multiple projects like Kishenganga, Baglihar, Pakal Dul, and Sawalkote to bridge this 80 % gap and as per present reports, projects to harness 13076 MW are in various stages of planning, survey and implementation. While India calls them run-of-the-river projects, Pakistan is aware that there can be no project without the storage on some water. This leverage that India is slowly building up worries Pakistan on two accounts i.e. one that it will reduce its supply of water and second that India will retain the capability to regulate the flow of water thus making it capable of using water as a weapon. If Pakistan had other sources of water, it could have leveraged them to overcome any temporary crisis, however it has none. Similarly, if this was the only

bone of contention between the two countries, it could have been dealt with based on the merits of each case. The tragedy is that both countries have other major dispute, the key amongst them being Kashmir & Cross Border Terrorism, which hold to ransom any chance of a peaceful negotiation between the two. The Indus Water Commission has also failed to be a good mediator and in recent years Pakistan has taken its cases to the World Bank and the Court of Arbitration at The Hague. Though it has lost both the cases i.e. Baglihar & Kishenganga, however, its water crisis is so acute that it suits the establishment to blame everyone including India and the international community rather than accepting the blame. Having said this in the last year or so there has been a quantum change in how Pakistan views its water crisis. From the media to researchers and now even some in the establishment have started blaming faulty internal policies for the same. The National Water Policy of 2018 is a step in the right direction as is India's own water Policy. While this may a silver lining but the history of the two countries proves that they never miss an opportunity to blame each other and take to conflict to get their way and the Kargil conflict at the turn of the millennium only highlights the risks and challenges.

110. Therefore, to arrive at any conclusion it was important to build probable scenarios and based on past experience, global trends, history between the two countries and most importantly data to substantiate or negate the scenarios, three probable scenarios were built for testing Scenario I- Status Quo, Scenario II – Climate Change, & Scenario III – Unilateral action by India . These three scenarios were further subdivided into three sub scenarios based on their probability i.e. Optimistic, Realistic and Pessimistic to ensure that the entire spectrum was covered. Three basic timelines were taken i.e. present 2018, medium term 2025 and long term 2050

111. The outcomes of the nine scenarios developed and game played are best displayed in the Table 26 above and based on the data from each scenario, the key findings are as under:-

(a) **Scenario I**. In the status quo scenario, water is unlikely to be a trigger in the short to medium term, however unless both countries focus on water management, it has the potential to be a trigger in the long term.

(b) **Scenario II**. In the climate change scenario, the demands of water of Pakistan increase substantially and with static availability the normal principles of

demand and supply loose equilibrium. Thus it is imperative that both in the medium term and long term water could be a trigger.

(c) **Scenario III**. In the unilateral action by India scenario, it is clear that any act of water control that affects the agriculture of Pakistan has the potential to be a trigger for conflict. While India retains all the cards, however the reaction card is still with Pakistan and fine tuning this operation will be a major challenge for India and it may not be able to control the escalatory ladder.

112. Based on all the analysis carried out above it clearly emerges that water will be a critical factor in all future Indo-Pak equations. The overall prognosis for the medium to long term is that water is likely to be used as a Weapon by India, Trigger by Pakistan and is likely to be a Casualty in any future water related conflict.

113. The writing is on the wall that water will become a major source of dispute between India & Pakistan in the medium to long term. While it will be a trigger for Pakistan being a lower riparian state, it will be a weapon for India being the upper riparian state and for the people of both nations water will become the casualty of years of mismanagement. The broad timeline when such a crisis is likely take place will be from 2025 onwards. These timelines can be delayed with better water management as described at Paragraph 99 above, as also better relations between the two countries. However, at some point the pot will boil over due to the fact that climate change and growing populations will put unsustainable demands on meagre resources. The IWT is likely to be the first casualty of such a crisis and may have to be renegotiated in the medium to long term. For India, because of its multiple sources the timelines are not that critical but for Pakistan the time to act is now or else it stares at a bleak future on account of one of life's greatest and most precious resource, water.

"The earth, the air, the land and the water are not an inheritance from our fore fathers but on loan from our children. So we have to handover to them at least as it was handed over to us."

Mahatma Gandhi

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Appendix A
(Refers to Paragraph 29)

Water Conflict Chronology since 2000 (South Asia)

Date	Headline	Conflict Type	Description
2010	Fighting in Pakistan over irrigation water	Trigger	More than 100 are dead and scores injured following two weeks of tribal fighting in Parachinar in the Kurram region of Pakistan, near the Afghanistan border. The conflict over irrigation water began as the Shalozan Tangi tribe cut off supplies to the Shalozan tribe. Some report that al Qaeda may be involved; others claim sectarian violence is to blame as one group is Sunni Muslim and the other Shiite.
2010	Bomb in water truck kills 3 in Afghanistan	Weapon	A remote-controlled bomb hidden in a water truck kills three people, including two children, in the eastern Afghan province of Khost, which borders Pakistan.
2010	Pakistan irrigation dispute kills 116	Trigger and Weapon	A water dispute in Pakistan's tribal region leads to 116 deaths. In early September, the Mangal tribe cut off the supply of irrigation water to lands used by the neighbouring Tori tribe, leading to fighting.
2010	Violent water protest in India	Trigger	A protest about water shortages in the National Capital Territory of Delhi in India leads to violence. Erratic water supply and cut-offs in the Kondli area of Mayur Vihar in East Delhi causes a violent protest and several injuries.
2010	Protestors killed and injured in	Trigger	At least three deaths and dozens of injuries are reported during protests over land and water given away for a power plant in Sompeta in Srikakulam district in Andhra Pradesh, India.
2010-2013	Water disputes between Iran and	Trigger and	Disputes over water between Iran and Afghanistan are escalating. One Afghan newspaper, Weesa, has suggested that Iran blocked the transport of fuel oil to Afghanistan in 2010 as

	Afghanistan escalate	Casualty	a means to put more pressure on the country over water. An Iranian editorial calls for bolder action by the Foreign Ministry and states that any aid to Afghanistan should be linked to "Iran's rights to water." In 2011, Mullah Dadullah, a Taliban commander captured in south-western Afghanistan by Afghan authorities, claims to have been trained in Iran to sabotage projects in Afghanistan, including being offered $50,000 to destroy the Kamal Khan Dam, a claim Iran has denied. Shakila Hakimi, a member of the Nimroz provincial council, accuses Iran in 2012 of conducting an insurgency in order to prevent construction of the Kamal Khan Dam.
2010	Severe flooding strengthens militant groups in Pakistan	Weapon	Militant groups in Pakistan take advantage of severe flooding to reorganize and gain political power. Military resources in the country have been diverted to humanitarian relief efforts.
2012	Afghani terrorists poison water at girls' school	Weapon	Up to 150 schoolgirls are reported sickened by poison in a school water supply in an intentional attack thought to be carried out by religious conservatives opposed to the education of women.
2012	Afghani Terrorists plant bomb at spring	Casualty	Seven children are killed by a bomb thought to be aimed at Afghan police and planted at a fresh water spring in Ghor Province.
2012	Islamist kill dam guards in Afghanistan	Casualty	Islamist militants execute militia members defending the Machalgho Dam in eastern Afghanistan. The dam is being developed for irrigation and local power supply. This dispute is one of several surrounding the international waters of Afghanistan, Iran, and Pakistan, which share several rivers.
2012	Injuries during protest over dam releases in India's Cauvery River	Trigger	Thousands of farmers in Karnataka try to prevent the release of water from two dams (Krishna Raja Sagar and Kabini) on the Cauvery River. Injuries to protestors and police are reported. The water releases were ordered by the Indian Supreme Court, which required Karnataka to deliver water downstream state of Tamil Nadu despite severe drought. The

			dispute continues later in the year when Karnataka again halts releases.
2012	Violent protests over water shortages in New Delhi	Trigger	Scuffles and protests break out around New Delhi during the summer of 2012 as residents surround water delivery trucks and fight over water. The summer was the hottest in 33 years, leading to extensive energy and water shortages.
2012	Pakistani militants attack water systems in Kashmir	Trigger and Casualty	Violence erupts in the latest event in the dispute between Pakistan and India over the waters of the Indus Basin. Pakistani militants attack and sabotage water systems, flood protection works, and dams in the Wullar Lake region of northern Kashmir. They attack engineers and workers and detonate explosives at the unfinished Tulbul Navigation Lock/Wullar Dam. Pakistan claims the new dam violates the Indus Water Treaty by cutting flows to Pakistan.
2012	Militants block work at the Wullar Dam construction site in India	Trigger	Militants block work at the Wullar Conservation Project (Wullar Dam) construction site in the Baramulla District of India - a project opposed by Pakistan. Officials suggest that these militants may have been sent by Pakistan because of their concerns that the project is in violation of Pakistani interests under the Indus Water Treaty of 1960. Sources said that eight of the 16 militants who stopped work of the Project were Pakistani nationals. India says the dam is not in violation of the Treaty and would, if completed, be used only for transportation purposes. Pakistan believes the Indian control over Jehulm waters has the potential to disrupt the Pakistan-Upper Jhelum Canal, Upper Chenab Canal, and the Lower Bari Doab Canal.
2012	Women assaulted for attempting to take well water in India	Trigger	Women from the village of Rasooh are reportedly assaulted for attempting to take water from a village well. The tensions over water are related to long-standing tensions between caste groups but have been worsened by drought and water shortage.
2013	Farmers in Iran clash with	Trigger and	Hundreds of farmers in the town of Varzaneh, in Iran's Esfahan province, clash with police during a protest against

	police over water diversions	Casualty	the government's decision to divert water from the area to another province. Iranian media say farmers smash a pipeline carrying water from Zayandeh Rood river to neighbouring Yazd province in an effort to prevent the water transfer. Dozens are reported injured and more arrested.
2013	Water shortage leads to local fighting in India	Trigger	An acute water shortage in Ahmednagar district, Maharashtra, India leads to fights among locals and one death. The government expresses concern about large-scale public unrest due to a severe drought and major water shortages.
2013	Sri Lankan archbishop accuses army of killing unarmed protestors	Trigger	The Catholic Archbishop of Colombo, Sri Lanka accuses the Sri Lankan army of shooting unarmed protesters and desecrating a church during demonstrations against water contamination. In the incident, at least six people are reported killed and more than 50 others wounded. Thousands of residents were protesting against the contamination of groundwater supply to 15 local villages, allegedly by chemical waste from a rubber glove factory.
2013	Pakistan and India clash over Siachen Glacier	Trigger	Tensions continue between India and Pakistan over access to and control of the Siachen Glacier in Kashmir, with a demand by Pakistan that India withdraw troops stationed there.
2013	Water tanker in Myanmar is attacked	Casualty	Employees of the private company Assam Rifles are escorting a water tanker near the Manipur-Myanmar border when they are attacked with a remotely-detonated bomb. No one is reported injured, however the water tanker is damaged.
2013-2014	Fight over control of water in Pakistan	Trigger	In Karachi, rival sects of the Taliban fight for the control of water by controlling infrastructure and land.
2014	Upper caste women reportedly	Weapon	Tensions revive in the area of Jammu and Kashmir in early 2014 when upper caste women reportedly restrict access to

	restrict access to water sources		higher quality water sources.
2014	Armed bandits force villages to pay a 'water tax'	Trigger	Drought in northern India causes local bandits to threaten to kill nearby villagers unless they deliver water to their rural hideouts. Twenty-eight local villages obey the order and take turns paying what the bandits call a daily "water tax.'
2014	Water well attacked in Pakistan	Casualty	Two schools and a solar-powered tube well are destroyed in a blast attributed to militants in the Mohmand Agency. No injuries are reported.
2014	Water construction equipment damaged	Trigger and Casualty	Maoists in Dharambandha, India claim responsibility for a bombing attack on a culvert and the excavation machine being used to build a canal.
2015	Iranian border guards open fire on Afghan villagers accessing river water	Trigger	A dispute over the allocation and rights to water from the Hari Rud River between Afghanistan and Iran leads to at least ten deaths when Iranian border guards allegedly open fire on Afghan villagers trying to collect river water. The river provides water for agricultural production in Herat province, Afghanistan, and to the downstream Iranian city of Mashhad, Iran's second largest city.
2015	Water pipeline damaged in Pakistan	Casualty	A water pipeline is damaged in a blast from an explosive reportedly placed by the Baloch Republican Army in Nokani, Baluchistan province, Pakistan. No injuries are reported.
2016	Scarce water supplies in drought regions of India spark violence	Trigger	Scarce water supplies in drought-hit regions of India sparks violence. As northern and central India suffer thorough severe drought and heat, police in Bundelkhand and several other regions including Tikamgarh are reporting a rise in violent, often deadly clashes over water. Indian police report that the fighting is getting more frequent and bloody, with numerous injuries and deaths reported.

2016	Protests against the building of dams on the Brahmaputra River in India	Trigger	Protests against the building of dams on the Brahmaputra River in India's Himalayan state of Arunachal Pradesh turns violent, leading to two deaths and additional injuries. Both China and India have put forward plans for nearly 150 dams in the region, with major local opposition.
2016	Riots over water in Bangalore, India	Trigger	At least two people died and others were injured in riots over water in Bangalore, India in the state of Karnataka. The unrests started when the Indian Supreme Court ordered Karnataka to release water from dams on the Cauvery river to neighbouring Tamil Nadu. Over 400 people were arrested.
2016	18 killed and 200 injured after reopening of the Munak canal	Weapon and Casualty	At least 18 people are killed and 200 injured after the Indian Army intervenes to reopen the Munak canal, which supplies New Delhi with three-fifths of its freshwater supply. The canal was shut down by economic protests in Haryana state. Sabotage of the canal left more than 10 million people in India's capital, Delhi, without water.
2016	Armed guards clash with farmers over drought-struck region of Bundelkhand	Trigger	Armed guards and farmers clash over access to water from Jamuniya River at the Bari Ghat Dam in the drought-struck region of Bundelkhand.
2016	Riots over water leave two people dead	Trigger	At least two people die and others are injured in riots over water in Bangalore, India in the state of Karnataka. The unrests starts when the Indian Supreme Court orders Karnataka to release water from dams on the Cauvery River to neighbouring Tamil Nadu. Over 400 people are arrested.
2016	Attack on a local dam in India	Casualty	A group of heavily armed militants fire blank rounds of bullets at a dam, creating panic among the locals. No casualties are reported.
2016	Water pipeline is damaged in	Casualty	A water pipeline is damaged from explosions when it is misidentified as a gas pipeline, disrupting the water supply to a

	Pakistan		nearby village.
2016	Water shortage led to clashes between two groups in the parched Sehore district, India	Trigger	Water shortage led to clashes between two groups in the parched Sehore district, India leaving 7 people injured and one critical.
2017	Clashes over the ecological impacts of a proposed coal plant on aquatic ecosystems and fisheries	Trigger	Protesters take to the streets in the centre of Dhaka and more than 50 are injured in clashes over the potential ecological impacts of a proposed coal plant on aquatic ecosystems and fisheries. These actions follow on protests from 2016.
2017	Suspected Taliban militants blow up irrigation dam in Afghanistan	Casualty	Suspected Taliban militants blow up a dam storing water for irrigation in Shorabak, Kandahar, Afghanistan.
2018	Protests in Iran over lack of water, mismanagement, and corruption around water lead to deaths of dozens	Trigger	Ongoing protests against lack of water, mismanagement, and corruption around water are led by residents in small towns in western Iran. These protests gain more media attention as tensions escalate over time and may be linked to demonstrations from late 2017 and early 2018 that lead to the death of dozens of people. In 2018, at least nine environmental leaders are arrested, and one jailed environmentalist dies of alleged suicide.
2018	Water shortages in India lead to deadly fights	Trigger	Lack of water in cities across India -- due to drought, growing populations, and inadequate infrastructure -- leads to high tensions, resulting in at least two deaths when a fight breaks out between residents waiting in line at a water truck. Those

	between civilians and harassment of water company employees		working for the water companies with the responsibility of turning different water lines on and off, called "key men," are increasingly harassed by residents wanting to persuade them to keep their water on.
2018	Protests over water shortages turn violent	Trigger	Water shortages in the southern part of Iran have caused protests, which turned violent with attacks on property and other infrastructure. Police action to break up the protests lead to several injuries and deaths.
2018	Alleged support of Taliban by Iran, in part to disrupt water projects in Afghanistan	Trigger	Attacks to the city of Farah in the western region of Afghanistan in early 2018 by the Taliban may, in part, be supported by Iran in an attempt to reduce Afghanistan's ability to pursue water dam infrastructure projects. Experts disagree to the amount of support given to Taliban militants by Iran, but water projects in Afghanistan's western region are indisputably a point of contention between the two nations

Appendix B
(refers to paragraph 36)

Indus Waters Treaty

September 19, 1960

TREATY BETWEEN THE GOVERNMENT OF INDIA AND THE GOVERNMENT OF PAKISTAN CONCERNING THE MOST COMPLETE AND SATISFACTORY UTILISATION OF THE WATERS OF THE INDUS SYSTEM OF RIVERS

Karachi

PREAMBLE

The Government of India and the Government of Pakistan, being equally desirous of attaining the most complete and satisfactory utilisation of the waters of the Indus system of rivers and recognising the need, therefore, of fixing and delimiting, in a spirit of goodwill and friendship, the rights and obligations of each in relation to the other concerning the use of these waters and of making provision for the settlement, in a cooperative spirit, of all such questions as may hereafter arise in regard to the interpretation or application of the provisions agreed upon herein, have resolved to conclude a Treaty in furtherance of these objectives, and for this purpose have named as their plenipotentiaries :

THE GOVERNMENT OF INDIA:

Shri JAWAHARLAL NEHRU,
Prime Minister of India,

and
THE GOVERNMENT OF PAKISTAN
Field Marshal MOHAMMAD AYUB KHAN, HP., H.J.,
President of Pakistan;

who, having communicated to each other their respective Full Powers and having found them in good and due form, have agreed upon the following Articles and Annexures ;

Article I

Definitions

As used in this Treaty:

1. The terms "Article and "Annexure" mean respectively an Article of, and an Annexure to, this Treaty. Except as otherwise indicated, references to Paragraphs are to the paragraphs in the Article or in the Annexure in which the reference is made.

2. The term "Tributary" of a river means any surface channel whether in continuous or intermittent flow and by whatever name called, whose waters in the natural course would fall into that river, e.g. a tributary, a torrent, a natural drainage, an artificial drainage, a nadi, a nallah, a nai, a khad, a cho. The term also includes any sub-tributary or branch or subsidiary channel, by whatever name called, whose waters, in the natural course, would directly or otherwise flow into that surface channel.

3. The term "The Indus," "The Jhelum," "The Chenab," "The Ravi," "The Beas" or "The Sutlej" means the named river (including Connecting Lakes, if any) and all its Tributaries : Provided however that

(i) none of the rivers named above shall be deemed to be a Tributary;

(ii) The Chenab shall be deemed to include the river Panjnad; and

(iii) the river Chandra and the river Bhaga shall be deemed to be Tributaries of The Chenab.

4. The term "Main" added after Indus, Jhelum, Chenab, Sutlej, Beas or Ravi means the main stem of the named river excluding its Tributaries, but including all channels and creeks of the main stem of that river and such Connecting Lakes as form part of the main stem itself. The Jhelum Main shall be deemed to extend up to Verinag, and the Chenab Main up to the confluence of the river Chandra and the river Bhaga.

5. The term "Eastern Rivers" means The Sutlej, The Beas and The Ravi taken together.

6. The term 'Western Rivers" means The Indus, The Jhelum and The Chenab taken together.

7. The term "the Rivers" means all the rivers, The Sutlej, The Beas, The Ravi, The Indus, The Jelum and The Chenab.

8. The term "Connecting Lake" means any lake which receives water from, or yields water to, any of the Rivers; but any lake which occasionally and irregularly receives only the spill of any of the Rivers and returns only the whole or part of that spill is not a Connecting Lake.

9. The term "Agricultural Use" means the use of water for irrigation, except for irrigation of household gardens and public recreational gardens.

. The terms "Domestic Use" means the use of water for drinking, washing, bathing, recreation, sanitation (including the conveyance and dilution of sewage and of industrial and other wastes), stock and poultry, and other like purposes;

(i) household and municipal purposes (including use for household gardens and public recreational gardens); and

(ii) industrial purposes (including mining, milling and other like purposes);

(iii) but the term does not include Agricultural Use or use for the generation of hydro-electric power.

10. The term "Non-Consumptive Use" means any control or use of water for navigation, floating of timber or other property, flood protection or flood control, fishing or fish culture, wild life or other like beneficial purposes, provided that, exclusive of seepage and evaporation of water incidental to the control or use, the water (undiminished in volume within the practical range of measurement) remains in, or is returned to, the same river or its Tributaries; but the term does not include Agricultural Use or use for the generation of hydro-electric power.

11. The term "Transition Period" means the period beginning and ending as provided in Article 11(6).

12. The term' Bank" means the International Bank for Reconstruction and Development.

13. The term "Commissioner" means either of the Commissioners appointed under the provisions of Article VIII(1) and the term "Commission" means the Permanent Indus Commission constituted in accordance with Article VIII(3).

. The term "interference with the waters" means : Any act of withdrawal therefrom; or

Any man-made obstruction to their flow which causes a change in the volume (within the practical range of measurement) of the daily flow of the water : Provided however that an obstruction which involves only an insignificant and incidental change in the volume of the daily now, for example, fluctuations due to afflux caused by bridge piers or a temporary by-pass, etc., shall not be deemed to be an interference with the waters.

14. The term "Effective Date" means the date on which this Treaty takes effect in accordance with the provisions of Article XII, that is, the first of April 1960.

Article II

Provisions Regarding Eastern Rivers

1. All the waters of the Eastern Rivers shall be available for the unrestricted use of India, except as otherwise expressly provided in this Article.

2. Except for Domestic Use and Non-Consumptive Use, Pakistan shall be under an obligation to let flow, and shall not permit any interference with, the waters of the Sutlej Main and the Ravi Main in the reaches where these rivers flow in Pakistan and have not yet finally crossed into Pakistan. The Points of final crossing are the following : (a) near the new Hasta Bund upstream of Suleimanke in the case of the Sutlej Main, and (b) about one and a half miles upstream of the syphon for the B-R-B-D Link in the case of the Ravi Main.

3. Except for Domestic Use, Non-Consumptive Use and Agricultural Use (as specified in Annexure B), Pakistan shall be under an obligation to let flow, and shall not permit any interference with, the waters (while flowing in Pakistan) of any Tributary which in its natural course joins the Sutlej Main or the Ravi Main before these rivers have finally crossed into Pakistan.

4. All the waters, while flowing in Pakistan, of any Tributary which, in its natural course, joins the Sutlej Main or the Ravi Main after these rivers have finally crossed into Pakistan shall be available for the unrestricted use of Pakistan : Provided however that this provision shall not be construed as giving Pakistan any claim or right to any releases by India in any such Tributary. If Pakistan should deliver any of the waters of any such Tributary, which on the Effective Date joins the Ravi Main after this river has finally crossed into Pakistan, into a reach of the Ravi Main upstream of this crossing, India shall not make use of these waters; each Party agrees to establish such discharge observation stations and make such observations as may be necessary for the determination of the

component of water available for the use of Pakistan on account of the aforesaid deliveries by Pakistan, and Pakistan agrees to meet the cost of establishing the aforesaid discharge observation stations and making the aforesaid observations.

5. There shall be a Transition Period during which, to the extent specified in Annexure H, India shall

(i) limit its withdrawals for Agricultural Use,

(ii) limit abstractions for storages, and

(iii) make deliveries to Pakistan from the Eastern Rivers.

6. The Transition Period shall begin on 1st April 1960 and it shall end on 31st March 1970, or, if extended under the provisions of Part 8 of Annexure H, on the date up to which it has been extended. In any event, whether or not the replacement referred to in Article IV(1) has been accomplished, the Transition Period shall end not later than 31st March 1973.

7. If the Transition Period is extended beyond 31st March 1970, the Provisions of Article V(5) shall apply.

8. If the Transition Period is extended beyond 31st March 1970, the provisions of Paragraph (5) shall apply during the period of extension beyond 31st March 1970.

9. During the Transition Period, Pakistan shall receive for unrestricted use the waters of the Eastern Rivers which are to be released by India in accordance with the provisions of Annexure H. After the end of the Transition Period, Pakistan shall have no claim or right to releases by India of any of the waters of the Eastern Rivers. In case there are any releases, Pakistan shall enjoy the unrestricted use of the waters so released after they have finally crossed into Pakistan : Provided that in the event that Pakistan makes any use of these waters, Pakistan shall not acquire any right whatsoever, by prescription or otherwise, to a continuance of such releases or such use.

Article III

Provisions Regarding Western Rivers

1. Pakistan shall receive for unrestricted use all those waters of the Western Rivers which India is under obligation to let flow under the provisions of Paragraph (2).

2. India shall be under an obligation to let flow all the waters of the Western Rivers, and shall not permit any interference with these waters, except for the following uses, restricted (except as provided in item (c) (11) of Paragraph 5 of Annexure C) in the case of each of the rivers, The Indus, The Jhelum and The Chenab, to the drainage basin thereof

(i) Domestic Use;

(ii) Non-Consumptive Use;

(iii) Agricultural Use, as set out in Annexure C; and

(iv) Generation of hydro-electric power, as set out in Annexure D.

3. Pakistan shall have the unrestricted use of all waters originating from sources other than the Eastern Rivers which are delivered by Pakistan into The Ravi or The Sutlej, and India shall not make use of these waters. Each Party agrees to establish such discharge observation stations and make such observations as may be considered necessary by the Commission for the determination of the component of water available for the use of Pakistan on account of the aforesaid deliveries by Pakistan.

4. Except as provided in Annexure D and E, India shall not store any water of, or construct any storage works on, the Western Rivers.

Article IV

Provisions Regarding Eastern Rivers and Western Rivers

1. Pakistan shall use its best endeavours to construct and bring into operation, with due regard to expedition and economy, that part of a system of works which will accomplish the replacement, from the Western Rivers and other sources, of water supplies for irrigation canals in Pakistan which, on 15th August 1947, were dependent on water supplies from the Eastern Rivers .

2. Each Party agrees that any Non-Consumptive Use made by it shall be so made as not to materially change, on account of such use, the flow in any channel to the prejudice of the uses on that channel by the other Party under the provisions of this Treaty. 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.

3. Nothing in this Treaty shall be construed as having the effect of preventing either Party from undertaking schemes of drainage, river training, conservation of soil against erosion and dredging, or from removal of stones, gravel or sand from the beds of the Rivers : Provided that

(i) in executing any of the schemes mentioned above, each Party will avoid, as far as practicable, any material damage to the other Party;

(ii) 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;

(iii) except as provided in Paragraph (5) and Article VII(l)(b), India shall not take any action to increase the catchment area, beyond the area on the Effective Date, of any natural or artificial drainage or drain which crosses into Pakistan, and shall not undertake such construction or remodelling of any drainage or drain which so crosses or falls into a drainage or drain which so crosses as might cause material damage in Pakistan or entail the construction of a new drain or enlargement of an existing drainage or drain in Pakistan; and

(iv) should 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.

4. Pakistan shall maintain in good order its portions of the drainages mentioned below with capacities not less than the capacities as on the Effective Date

(i) Hudiara Drain

(ii) Kasur Nala

(iii) Salimshah Drain

(iv) Fazilka Drain.

5. If India finds it necessary that any of the drainages mentioned in Paragraph (4) should be deepened or widened in Pakistan, Pakistan agrees to undertake to do so as a work of public interest, provided India agrees to pay the cost of the deepening or widening.

6. Each Party will use its best endeavours to maintain the natural channels of the Rivers, as on the Effective Date, in such condition as will avoid, as far as practicable, any obstruction to the flow in these channels likely to cause material damage to the other Party.

7. Neither Party will take any action which would have the effect of diverting the Ravi Main between Madhopur and Lahore, or the Sutlej Main between Harike and Suleimanke, from its natural channel between high banks.

8. The use of the natural channels of the Rivers for the discharge of flood or other excess waters shall be free and not subject to limitation by either Party, and neither Party shall have any claim against the other in respect of any damage caused by such use. Each Party agrees to communicate to the other Party, as far in advance as practicable, any information it may have in regard to such extraordinary discharges of water from reservoirs and flood flows as may affect the other Party.

9. 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.

10. Each Party declares its intention to prevent, as far as practicable, undue pollution of the waters of the Rivers which might affect adversely uses similar in nature to those to which the waters were put on the Effective Date, and agrees to take all reasonable measures to ensure that, before any sewage or industrial waste is allowed to flow into the Rivers, it will be treated, where necessary, in such manner as not materially to affect those uses :

Provided that the criterion of reasonableness shall be the customary practice in similar situations on the Rivers.

11. The Parties agree to adopt, as far as feasible, appropriate measures for the recovery, and restoration to owners, of timber and other property floated or floating down the Rivers, subject to appropriate charges being paid by the owners.

. The use of water for industrial purposes under Articles 11(2), 11(3) and HIM shall not exceed in the case of an industrial process known on the Effective Date, such quantum of use as was customary in that process on the Effective Date;

(i) in the case of an industrial process not known on the Effective Date :

a. such quantum of use as was customary on the Effective Date in similar or in any way comparable industrial processes; or

b. if there was no industrial process on the Effective Date similar or in any way comparable to the new process, such quantum of use as would not have a substantially adverse effect on the other Party.

12. Such part of any water withdrawn for Domestic Use under the provisions of Articles 11(3) and 111(2) as is subsequently applied to Agricultural Use shall be accounted for as part of the Agricultural Use specified in Annexure B and Annexure C respectively; each Party will use its best endeavours to return to the same river (directly or through one of its Tributaries) all water withdrawn there from for industrial purposes and not consumed either in the industrial processes for which it was withdrawn or in some other Domestic Use.

13. In the event that either Party should develop a use of the waters of the Rivers which is not in accordance with the provisions of this Treaty, that Party shall not acquire by reason of such use any right, by prescription or otherwise, to a continuance of such use.

14. Except as otherwise required by the express provisions of this Treaty, nothing in this Treaty shall be construed as affecting existing territorial rights over the waters of any of the Rivers or as affecting existing property rights under municipal law over such waters or beds or banks.

Article V

Financial Provisions

1. In consideration of the fact that the purpose of part of the system of works referred to in Article IV(1) is 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, India agrees to make a fixed contribution of Pounds Sterling 62,060,000 towards the costs of these works. The amount in Pounds Sterling of this contribution shall remain unchanged irrespective of any alteration in the par value of any currency.

2. The sum of Pounds Sterling 62,060,000 specified in Paragraph (1) shall be paid in ten equal annual instalments on the Ist of November of each year. The first of such annual

instalments shall be paid on lst November 1960, or if the Treaty has not entered into force by that date, then within one month after the Treaty enters into force.

3. Each of the instalments specified in Paragraph (2) shall be paid to the Bank for the credit of the Indus Basin Development Fund to be established and administered by the Bank, and payment shall be made in Pounds Sterling, or in such other currency or currencies as may from time to time be agreed between India and the Bank.

4. The payments provided for under the provisions of Paragraph (3) shall be made without deduction or set-off on account of any financial claims of India on Pakistan arising otherwise than under the provisions of this Treaty : Provided that this provision shall in no way absolve Pakistan from the necessity of paying in other ways debts to India which may be outstanding against Pakistan.

5. If, at the request of Pakistan, the Transition Period is extended in accordance with the provisions of Article 11(6) and of Part 8 of Annexure H, the Bank shall thereupon pay to India out of the Indus Basin Development Fund the appropriate amount specified in the Table below.

TABLE

Period of Aggregate	**Payment of India**
Extension Payment to of Transition Period	
One year	stg. 3,125,000
Two years.	stg 6,406,250
Three years	stg 9,850,000

6. The provisions of Article IV(1) and Article V(1) shall not be construed as conferring upon India any right to participate in the decisions as to the system of works which

Pakistan constructs pursuant to Article IV(1) or as constituting an assumption of any responsibility by India or as an agreement by India in regard to such works.

7. Except for such payments as are specifically provided for in this Treaty, neither Party shall be entitled to claim any payment for observance of the provisions of this Treaty or' to make any charge for water received from it by the other Party.

Article VI

Exchange of Data

1. The following data with respect to the flow in, and utilisation of the waters of, the Rivers shall be exchanged regularly between the Parties :

(i) Daily (or as observed or estimated less frequently) gauge and discharge data relating to flow of the Rivers at all observation sites.

(ii) Daily extractions for or releases from reservoirs.

(iii) Daily withdrawals at the heads of all canals operated by government or by a government agency (hereinafter in this Article called canals), including link canals.

(iv) Daily escapages from all canals, including link canals.

(v) Daily deliveries from link canals.

(vi) These data shall be transmitted ' monthly by each Party to the other as soon as the data for a calendar month have been collected and tabulated, but not later than three months after the end of the month to which they relate : Provided that such of the data specified above as are considered by either Party to be necessary for operational purposes shall be supplied daily or at less frequent intervals, as may be requested. Should one Party request the supply of any of these-data by telegram, telephone, or wireless, it shall reimburse the other Party for the cost of transmission.

2. If, in addition to the data specified in Paragraph (1) of this Article, either Party requests the supply of any data relating to the hydrology of the Rivers, or to canal or reservoir operation connected with the Rivers, or to anv provision of this Treaty, such data shall be supplied by the other Party to the extent that these are available.

Article VII

Future Co-operation

1. The two Parties recognize that they have a common interest in the optimum development of the Rivers, and, to that end, they declare their intention to co-operate, by mutual agreement, to the fullest possible extent. In particular :

(i) Each Party, to the extent it considers practicable and on agreement by the other Party to pay the costs to be incurred, will, at the request of the other Party, set up or install such hydrologic observation stations within the drainage basins of the Rivers, and set up or install such meteorological observation stations relating thereto and carry out such observations thereat, as may be requested, and will supply the data so obtained.

(ii) Each Party, to the extent it considers practicable and on agreement by the other Party to pay the costs to be incurred, will, at the request of the other Party, carry out such new drainage works as may be required in connection with new drainage works of the other Party.

(iii) At the request of either Party, the two Parties may, by mutual agreement, co-operate in undertaking engineering works on the Rivers.

The formal arrangements, in each case, shall be as agreed upon between the Parties.

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

Article VIII

Permanent Indus Commission

1. India and Pakistan shall each create a permanent post of Commissioner for Indus Waters, and shall appoint to this post, as often as a vacancy occurs, a person who should ordinarily be a high-ranking engineer competent in the field of hydrology and water-use. Unless either Government should decide to take up any particular question directly with the other Government, each Commissioner will be the representative of his Government for all. matters arising out of this Treaty, and will serve as the regular channel of communication on all matters relating to the implementation of the Treaty, and, in particular, with respect to

(i) the furnishing or exchange of information or data provided for in the Treaty; and

(ii) the giving of any notice or response to any notice provided for in the Treaty.

(iii) The status of each Commissioner and his duties and responsibilities towards his Government will be determined by that Government.

2. The two Commissioners shall together form the Permanent Indus Commission.

3. The purpose and functions of the Commission shall be to establish and maintain co-operative arrangements for the, implementation of this Treaty, to promote co-operation between the Parties in the development of the waters of the Rivers and, in particular,

.to study and report to the two Governments on any problem relating to the development of the waters of the Rivers which may be jointly referred to the Commission by the two Governments : in the event that a reference is made by one Government alone, the Commissioner of the other Government shall obtain the authorization of his Government before he proceeds to act on the reference;

(i) to make every effort to settle promptly, in accordance with the provisions of Article IX(1), any question arising there under;

(ii) to undertake, once in every five years, a general tour of inspection of the Rivers for ascertaining the facts connected with various developments and works on the Rivers,

(iii) to undertake promptly, at the request of either Commissioner, a tour of inspection of such works or sites on the Rivers as may be considered necessary by him for ascertaining the facts connected with those works or sites; and

(iv) to take, during the Transition Period, such steps as may be necessary for the implementation of the provisions of Annexure H.

4. The Commission shall meet regularly at least once a year, alternately in India and Pakistan. This regular annual meeting shall be held in November or in such other month as may be agreed upon between the Commissioners. The Commission shall also meet when requested by either Commissioner.

5. To enable the Commissioners to perform their functions in the Commission, each Government agrees to accord to the Commissioner of the other Government the same privileges and immunities as are accorded to representatives of member States to the principal and subsidiary organs of the United Nations under Sections 11, 12 and 13 of Article IV of the Convention on the Privileges and Immunities of the United Nations (dated 13th February, 1946) during the periods specified in those Sections. It is understood and agreed that these privileges and immunities are accorded to the Commissioners not for the personal benefit of the individuals themselves but in order to safeguard the independent exercise of their functions in connection with the Commission; consequently, the Government appointing the Commissioner not only has the right but is under a duty to waive the immunity of its Commissioner in any case where, in the opinion of the appointing Government, the immunity would impede the course of justice and can be waived without prejudice to the purpose for which the immunity is accorded.

6. For the purposes of the inspections specified in Paragraph (4) (c) and (d), each Commissioner may be accompanied by two advisers or assistants to whom appropriate facilities will be accorded.

7. The Commission shall submit to the Government of India and to the Government of Pakistan, before the first of June of every year, a report on its work for the year ended on the preceding 31st of March, and may submit to the two Governments other reports at such times as it may think desirable.

8. Each Government shall bear the expenses of its Commissioner and his ordinary staff. The cost of any special staff required in connection with the work mentioned in Article VII(1) shall be borne as provided therein.

9. The Commission shall determine its own procedures.

Article IX

Settlement of Differences and Disputes

1. Any question which arises between the Parties concerning the interpretation or application of this Treaty or the existence of any fact which, if established, might constitute a breach of this Treaty shall first be examined by the Commission, which will endeavour to resolve the question by agreement.

2. If the Commission does not reach agreement on any of the questions mentioned in Paragraph (1), then a difference will be deemed to have arisen, which shall be dealt with as follows :

(i) Any difference which, in the opinion of either Commissioner, falls within the provisions of Part I of Annexure F shall, at the request of either Commissioner, be dealt with by a Neutral Expert in accordance with the provisions of Part 2 of Annexure F;

(ii) If the difference does not come within the provisions of Paragraph (2) (a), or if a Neutral Expert, in accordance with the provisions of Paragraph 7 of Annexure F, has informed the Commission that, in his opinion, the difference, or a part thereof, should be treated as a dispute, then a dispute will be deemed to have arisen which shall be settled in accordance with the provisions of Paragraphs (3), (4) and (5) :

Provided that, at the discretion of the Commission, any difference may either be dealt with by a Neutral Expert in accordance with the provisions of Part 2 of Annexure F or be deemed to be a dispute to be settled in accordance with the provisions of Paragraphs (3), (4) and (5), or may be settled in any other way agreed upon by the Commission.

3. As soon as a dispute to be settled in accordance with this and the succeeding paragraphs of this Article has arisen, the Commission shall, at the request of either Commissioner, report the fact to the two Governments, as early as practicable, stating in its report the points on which the Commission is in agreement and the issues in dispute, the views of each Commissioner on these issues and his reasons therefore. (4) Either Government may, following receipt of the report referred to in Paragraph (3), or if it comes to the conclusion that the report is being unduly delayed in the Commission, invite

the other Government to resolve the dispute by agreement. In doing so it shall state the names of its negotiators and their readiness to meet with the negotiators to be appointed by the other Government at a time and place to be indicated by the other Government. To assist in these negotiations, the two Governments may agree to enlist the services of one or more mediators acceptable to them.

4. A Court of Arbitration shall be established to resolve the dispute in the manner provided by Annexure G

.upon agreement between the Parties to do so; or

(i) at the request of either Party, if, after negotiations have begun pursuant to Paragraph (4), in ' its opinion the dispute is not likely to be resolved by negotiation or mediation; or

(ii) at the request of either Party, if, after the expiry of one month following receipt by the other Government of the invitation referred to in Paragraph (4), that Party comes to the conclusion that the other Government is unduly delaying the negotiations.

5. The provisions of Paragraphs (3), (4) and (5) shall not apply to any difference while it is being dealt with by a Neutral Expert.

Article X

Emergency Provision

If, at any time prior to 31st March 1965, Pakistan should represent to the Bank that, because of, the outbreak of large-scale international hostilities arising out of causes beyond the control of Pakistan, it is unable to obtain from abroad the materials and equipment necessary for the completion, by 31st March 1973, of that part of the system of works referred to in Article IVU) which relates to the replacement referred to therein, (hereinafter referred to as the replacement element") and if, after consideration of this representation in consultation with India, the Bank is of the opinion that

1. these hostilities are on a scale of which the consequence is that Pakistan is unable to obtain in time such materials and equipment as must be procured from abroad for the completion, by 31st March 1973, of the replacement element, and

2. since the Effective Date, Pakistan has taken all reasonable steps to obtain the said materials and equipment and, with such resources of materials and equipment as have been available to Pakistan both from within Pakistan and from abroad, has carried forward the construction of the replacement element with due diligence and all reasonable expedition,

the Bank shall immediately notify each of the Parties accordingly. The Parties undertake, without prejudice to the provisions of Article XII (3) and (4), that, on being so notified, they will forthwith consult together and enlist the good offices of the Bank in their consultation, with a view to reaching mutual agreement as to whether or not, in the light of all the circumstances then prevailing, any modifications of the provisions of this Treaty are appropriate and advisable and, if so, the nature and the extent of the modifications.

Article XI

General Provisions

1. It is expressly understood that

    (i) this Treaty governs the rights and obligations of each Party in relation to the other with respect only to the use of the waters of the Rivers and matters incidental thereto; and

    (ii) nothing contained in this Treaty, and nothing arising out of the execution thereof, shall be construed as constituting a recognition or waiver (whether tacit, by implication or otherwise) of any rights or claims whatsoever of either of the Parties other than those rights or claims which are expressly recognized or waived in this Treaty.

Each of the Parties agrees that it will not invoke this Treaty, anything contained therein, or anything arising out of the execution thereof, in support of any of its own rights or claims whatsoever or in disputing any of the rights or claims whatsoever of the other Party, other than those rights or claims which are expressly recognized or waived in this Treaty.

2. Nothing in this Treaty shall be construed by the Parties as in any way establishing any general principle of law or any precedent.

3. The rights and obligations of each Party under this Treaty shall remain unaffected by any provisions contained in, or by anything arising out of the execution of, any agreement establishing the Indus Basin Development Fund.

Article XII

Final Provisions

1. This Treaty consists of the Preamble, the Articles hereof and Annexures A to H hereto, and may be cited as "The Indus Waters Treaty 1960".

2. This Treaty shall be ratified and the ratifications thereof shall be exchanged in New Delhi. It shall enter into force upon the exchange of ratifications, and will then take effect retrospectively from the first of April 1960.

3. The provisions of this Treaty may from time to time be modified by a duly ratified treaty concluded for that purpose between the two Governments.

4. The provisions of this Treaty, or, the provisions of this Treaty as modified under the provisions of Paragraph (3), shall continue in force until terminated by a duly ratified treaty concluded for that purpose between the two Governments.

IN WITNESS WHEREOF the respective Plenipotentiaries have signed this Treaty and have hereunto affixed their seals.

DONE in triplicate in English at Karachi on this Nineteenth day of September 1960.

For the Government of India
(Sd) JAWAHARLAL NEHRU

For the Government of Pakistan
(Sd) MOHAMMAD AYUB KHAN
Field Marshal, H.P., H.J.

For the International Bank for Reconstruction and Development for the purposes specified in Articles V and X and Annexures F, G and H:

(Sd) W.A.B. ILIFF

ANNEXURE A-EXCHANGE OF NOTES BETWEEN GOVERNMENT OF INDIA AND GOVERNMENT OF PAKISTAN

I. Note dated 19th September 1960, from the High Commissioner for India in Pakistan, Karachi, to the Minister for Foreign Affairs and Commonwealth Relations, Government of Pakistan.

19th September, 1960

EXCELLENCY:

I have been instructed by my Government to communicate to you the following :

"The Government of India agrees that, on the ratification of the Indus Waters Treaty 1960, the Inter-Dominion Agreement on the Canal Water Dispute signed at New Delhi on 4th May 1948 (of which a copy is annexed hereto) and the rights and obligations of either party thereto claimed under, or arising out of, that Agreement shall be without effect as from Ist April 1960.

The position of the Government of India stated above and Your Excellency's Note of to-day's date stating the position of the Government of Pakistan on this question will form part of Annexure A to the Indus Waters Treaty 1960."

Accept, Excellency, the renewed assurance of my highest consideration.