

Politics of Water Resource Development in Pre-Partition India

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ABSTRACT

Water is the basic requirement to sustain life on earth. The basic source of water is precipitation. Most of Indus Basin is situated in arid and semi-arid climatic zones. Indus River System is a source of life for its 300 million inhabitants. For a long time, this system had been a source of prosperity for the region as well as a cause of perennial quarrel among the co-riparian. In the mid-nineteenth Century, the British appeared as new rulers. They initiated various projects to irrigate highlands between the rivers of the Punjab which became a cause of quarrel over water sharing among the various riparian especially, between provinces of the Punjab and Sindh. After the World War I, questions about water apportionment arose because of increasing withdrawals of river supplies. It called for the apportionment of the river waters among several riparian by the government of India. This paper is an attempt to analyze the nature of the problem of water sharing among the riparian during the British rule in India and efforts for its solution.

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Introduction

Indus River Basin is located in the territories of four countries—Pakistan, India, Afghanistan and China. More than 40 percent of the total area of the basin is located on the higher altitude at an elevation higher than 2000m (above the mean sea level). Total population of the basin is about 193 million of which 72 percent lives in Pakistan, 23 percent in India (including Indian occupied territory of Jammu and Kashmir), 5 percent in Afghanistan and very little population in Chinese part of the basin due to the rough topography. 74 percent of the total irrigated area of the basin is located in Pakistan and about 24 percent (including Indian occupied territory of Jammu and Kashmir) in India.¹

Various forms of irrigation are being practiced in the Indus Basin to irrigate land for agricultural purposes, including dug wells, *sailab* (Urdu: Flood), inundation canals, and later perennial canal networks. Rivers, streams, rainfall and groundwater are the main sources of water.²

Open wells have been one of the earliest forms of irrigation. Groundwater was lifted by draft animals or manually. It irrigates small areas close to the human habitats. Gulhati claims that apart from supplementing on inundation and non-perennial canals, about 4.73 million acres of land were irrigated only by wells annually.³ Open wells have been replaced by tube wells with electric or mechanical prime movers.⁴

Sailab is another important source of irrigation in the Indus Basin. It is a common practice in the river flood plains mostly in Sindh and southern Punjab. In summers the Indus

1 A. N. Laghari, D. Vanham, W. Rauch. "The Indus Basin in the Framework of Current and Future Water Resources Management." *Hydrology and Earth System Sciences* (Copernicus Publications) 8 (2011): 2263-2288.

2 Fazal Karim Khan, *Pakistan: Geography, Economy and People* (Karachi: Oxford University Press, 2004).

3 Niranjana D. Gulhati, *Indus Water Treaty: An Exercise in International Mediation* (New Delhi: Allied Publishers, 1973).

4 Bashir A. Malik, *Indus Water Treaty in Retrospect* (Lahore: Brite Books, 2005).

overflows its banks at high stages inundating low areas. The area benefited by *sailab* varies from year to year depending upon river levels. About 300,000 acres⁵ of land is irrigated by *sailab* in kacha lands along the Indus in Sindh.⁶

Canal irrigation in the Indus Basin is classified into perennial, non-perennial and inundation. Inundation or rainy canals irrigate relatively large areas close to the rivers. These operate only in summers during the rainy season when river levels are high due to floods. Location of intakes shifted frequently since rivers often changed course during floods. It leaves the canals high and dry. Inundation canals, besides interruption in supplies, suffer from heavy silt deposits requiring frequent clearances.⁷ Non-perennial canals are those canals which operate in one part of the year. They irrigate only during the summer season whereas perennial canals are permanent canals which receive continuous and permanent supplies from a barrage or reservoir. These canals irrigate the fields throughout the year without any disruption with equitable rate of flow.⁸

Indus Basin has a long history of canals. In the mid-14th Century, inundation canals were introduced to enhance the agricultural output. These canals were seasonal and supplied water to the fields in the summers when the donor rivers were in flood, so that they were beneficial for Kharif crops. The Rabi crops took advantage of the moisture left in the land from summer flooding. Inundation canals can only irrigate flood plains where the land is sufficiently levelled and slopes downward from the river bank. That is why the main network of the inundation canals was developed in Sindh and in southern Punjab. A limited number of inundation

5 Niranjana D. Gulhati provided different figure that is 2.17 million acres.

6 Malik, *Indus Water Treaty in Retrospect*,13.

7 Malik, *Indus Water Treaty in Retrospect*,13-14.

8 Civil Engineering Terms. *Classification of Canals based on the Nature of Source of Supply & Inundation Canals*. March 27, 2013. <http://www.civilengineeringterms.com/water-resources-irrigation-engineering/perennial-non-perennial-inundation-canal/>(accessed January 18, 2014).

canals took off from the Upper Indus, Jhelum, Chenab, Ravi and Sutlej Rivers. The bar uplands were not served by the inundation canals, as they could not rise up 5 to 7 meter high bluffs separating the flood plains and the bar uplands. The bar uplands were only irrigated and heavily colonized after the introduction of perennial canals to the region.⁹

Most of the region depended on catch crops because of scanty and uncertain rainfall. Lack of rain often led to famines and starvation. At times hundreds of thousands of people died and millions of animals perished in the Punjab, Bihar, Bengal and elsewhere in the sub-continent.¹⁰ In the mid-19th Century, the British appeared as new rulers. Due to the occurrence of frequent famines they realized the imperative need for a secure source of food supply. Wheat, barley, sorghum and gram were the staple food in most parts of the region. These grow in the Rabi (winter). Practice of irrigation by inundation canals in summer was limited in scope and unreliable. There was a need for a dependable source of irrigation, and perennial canals were the answer.¹¹ Due to the flat terrain and doab topography, Punjab was suitable for construction of large canal networks. A canal taken off at a sufficiently high level upstream of a river could command extensive tracts of land down the doab by gravity flow. There was one serious constraint. Due to the low water levels in winter, canals could not draw required amount of supply. Solution was found in throwing a barrier or a weir across the river to raise the water levels. They were dropped in winter to raise the water levels and lifted in summers to pass the flood discharge safely.¹² This paper analyzes various water related disputes among the various provinces/princely states of British India under the framework of the principle of equitable and reasonable utilization which protects water rights of all riparian.

9 Khan, *Pakistan: Geography, Economy and People*.

10 Kaiser Bengali, *The Politics of Managing Waters* (Karachi: Oxford University Press, 2005).

11 Malik, *Indus Water Treaty in Retrospect*, 37.

12 Malik, *Indus Water Treaty in Retrospect*, 37-38.

Historical Overview of Water Resource Development in the Indus Basin

Irrigation has been provided in the Indus Basin since pre-historic times before the British regime with all its potentialities of continuing improvements and initiating new projects. The situation of the mountains, rivers and the nature of the surface offered a great scope. It was also noticed that almost every ruling authority had done something to expand irrigation facilities in the region. Soils of the Indus plains are fertile. But due to the arid climatic conditions crops cannot be grown without irrigation which has been practiced since time immemorial. Indus Valley civilizations of Mohanjodaro and Harrapa were sustained by irrigation agriculture about 5000 years ago.¹³ Evidences show that agriculture was the main source of their livelihood and economic prosperity was totally dependent on the waters of the Indus System.¹⁴ A well-established irrigation system was practiced to enhance the agricultural output.¹⁵ Inundation irrigation was used by those civilizations which were totally dependent on the rise and fall of the waters of Indus system. After the decline of Indus Valley Civilization, later ruling dynasties like Shakas, Cholas, Pallavas, Bhoj and Pandyas also contributed to develop the Indus Basin. The irrigation infrastructure like dams and dikes were enlarged for the agricultural purposes.¹⁶

13 Khan, *Pakistan: Geography, Economy and People*, 25.

14 Rita P. Wright, *The Ancient Indus: Urbanism, Economy and Society* (New York: Cambridge University Press, 2010).

15 J. M. Kenoyer, *Ancient Cities of the Indus Valley Civilizations* (Karachi: Oxford University Press, 1998).

16 Subash G. Shinde, "History of Irrigation in India, National Level Conference on Water Management Scenario 2025: Problems Issues and Challenges." *VPMThane.org*.www.vpmthane.org/publication-wms/WMSscenario_2025.pdf (accessed January 12, 2011).

Irrigation Development during the Muslim period

Arabs occupied Sindh in the 8th Century.¹⁷ They also applied the same techniques to develop the water infrastructure like former dynasties. Keeping in view the demands and needs of the agriculture, the Arabs developed a good canal system.¹⁸

During the period of Delhi Sultanate, the water development continued to achieve full benefits of land and agriculture. Due to the expansion of empire, more food was required to feed the growing population and this led to an increase of agricultural activities in the region. The Sultans considered water development as an important factor to make the region prosperous. Due to the hot climatic conditions, the land of the Indus Basin is mostly arid and it could only be irrigated by artificial sources. Thus, during that period, water storages and lakes were constructed to irrigate the plain areas. These reservoirs were also utilized for drinking purpose.¹⁹

Sultan Iltutmish was the first ruler who built a multi-purpose lake to provide clean water for drinking in the 12th Century. Soon after, Western Yamuna Canal was constructed by Sultan Feroz Shah Tughlaq in the year 1355 A.D. to irrigate land in Hissar (now Haryana). The Mughals also extended this canal.²⁰ Zahir-uddin Babar defeated the last ruler of Delhi Sultanate, Ibrahim Lodhi, in 1526 and laid the foundations of the Mughal dynasty in India.²¹

The Mughals improved and developed their irrigation system. In 1568, Emperor Muhammad Akbar renovated

17 Muhammad bin Qasim occupied Sindh in 712 A.D. by defeating Raja Dahir in the reign of Waleed bin Abdul Malik (Ummaid Caliph).

18 Jean Fairly, *The Lion River: The Indus* (Lahore: Brother Publisher, 1993); Gill & Sadique A. "Indus River and the Irrigation System in Pakistan." *Journal of South Asian Studies* 20, no. 2 (2005): 1-15.

19 Aloys Arthur Michel, *The Indus River: A Study of the Effects of Partition* (London: Yale University Press, 1967), 49-50.

20 Iqtidar Hussain Saddiqui, *Authority and Kinship under Sultans of Delhi: Thirteenth-Fourteenth Centuries* (New Delhi: Manohar Publishers, 2006), 260.

21 Fairly, *The Lion River: The Indus*, 206.

Western Yamuna Canal. Emperor Jahangir constructed a perennial canal in the 17th Century to provide water to a garden on the western bank of the River Ravi near Lahore. In the reign of Emperor Shah Jahan, a canal was built to irrigate Shalimar Garden in Lahore from the River Ravi in 1639 under the supervision of Ali Mardan Khan. Later on, the Sikhs extended this canal to Amritsar to fill the tanks at Golden Temple.²²

In the reign of Emperor Aurangzeb Alamgir (1657-1707), the irrigation system was extensively enlarged, as much as the Indus Basin had never seen before. Its credit goes to Emperor Aurangzeb who took much interest in developing tanks, lakes and canals to promote agriculture in the region. His famous works were the renovation of Western Yamuna Canal, construction of Harsi Canal, Shah Nehr Canal and a number of other non-perennial canals. Many canals were also built by the Kalhora (1701-1783) and Talpur (1783-1843) dynasties in the Province of Sindh.²³

Irrigation Development in British India

The battle of Plassey was fought between Nawab of Bengal, Siraj-ud-Dola, and British East India Company in 1757 and the Nawab was dethroned by the Company. It is considered the dawn of British rule in Indian sub-continent. Later on, the Company extended its control over Bengal, Bihar and Orissa after the war of Buxar which was fought in 1765. In 1799, with the death of Tipu Sultan (Ruler of Masore), most of the South India came under the direct or indirect control of the Company. After the third Anglo-Maratha war of 1818, the Company took over the subcontinent almost entirely except the provinces of Punjab, Sindh and some princely states. Soon afterward, the Company defeated Sikhs in Anglo-Sikhs war of 1849 and occupied Punjab.²⁴ Eventually, after the fall

22 Fairly, *The Lion River: The Indus*, 207.

23 Punjab Irrigation Department, *Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan: A Case Study of the Punjab* (Lahore: Punjab Irrigation Department, 1998), 13.

24 Eric Stokes, "The First Century of British Colonial Rule in India: Social Revolution or Social Stagnation?" *jstor.org*. February 1973.

of Punjab, except some princely states, the Indian subcontinent came under the direct or indirect control of British East India Company.²⁵

After the war of independence in 1857, the British Parliament passed the Government of India Act, 1858. Under that Act, the territories under the control of Company were transferred to and vested in Crown.²⁶ After the direct control of the Crown over the Indian territories in 1858, the British Government initiated several programmes to enhance the agricultural output which was the main source of revenue at that time.

Under the new colonial policy of the British, a number of irrigation projects were launched across the main Indus and its tributaries. Initially, preference was given to transform large tracts of barren land and unoccupied wastelands into productive land. From 1860 to 1947, the British Government invested a large amount of money in the Indus Basin Irrigation System which made it the largest contiguous irrigation system of the world. It had command area of about 20 million hectares and annual irrigation capacity of about 12 million hectares.²⁷

From the middle of the 18th Century, various irrigation projects were initiated to irrigate high lands between the five rivers. First time the British engineers introduced a new concept of perennial and rotational canals in the Indus Basin. Construction of weirs and perennial canals in the Punjab began in the second half of the 19th Century. No irrigation technology was available. Early engineers had no knowledge and experience of the construction of weirs and perennial canal networks for year round irrigation. Early

<http://www.jstor.org/page/info/about/policies/terms.jsp/> (accessed August 13, 2011).

25 Michel, *The Indus River: A Study of the Effects of Partition*, 57.

26 Hamid Khan, *Constitutional and Political History of Pakistan* (Karachi: Oxford University Press, 2009), 46.

27 Ashok Swain. "Environmental Cooperation in South Asia." *Environmental Cooperation in South Asia*, by Ken Conca and Geoffrey D. Washington D. C.: Woodrow Wilson Press, 2002, 66.

works faced serious problems. Madhupur weir at head of Bari Doab Canal was damaged year after year. Bari Doab Canal was closed within a couple of days of its first opening because heavy sediment deposits filled first mile of its head reach. Later Sirhind Canal faced a similar problem. Subsequent irrigation works were built based on the research and experience.²⁸ Punjab Irrigation Research Institute and later Central Design Office were established to solve the problems of perennial canals. Punjab Irrigation Department played an important role to solve the problems. Punjab canals were designed to operate according to a knife-edge criterion of non-silting and non-scouring. Water velocity in channel was maintained neither too slow to encourage silt deposit nor too fast to cause scour of the bed and erosion of the banks. It required effective sediment control canal head which was achieved through appropriate rules and channel design.²⁹

Upper Bari Doab canal (UBDC) was the first in Punjab which was opened in 1859. It was taken off from the Madhupur weir at the Ravi. About 1,000,000 (4000 square kilometer) acres of land was irrigated by it in the pre-partition districts of Gurdaspur, Amritsar and Lahore. The canal passing through the city of Lahore was its branch.³⁰ According to Palijo, this project first time created a dispute over the waters of Indus system between Punjab and Sindh.³¹ After it Sirhind Canal was opened in 1872 from the River Sutlej at Rupar, to protect existing cultivation in about three million acres lying in Punjab and other neighbouring Indian states.³² The Lower Sohag and Para canals³³ from the Sutlej were completed in 1882 to provide irrigation facilities to virgin lands in the

28 Bengali, *The Politics of Managing Waters*, 14.

29 Malik, *Indus Water Treaty in Retrospect*, 25.

30 Khan, *Pakistan: Geography, Economy and People*, 35.

31 Rasool Bux Palijo, *Sindh-Punjab Water Dispute 1859-2003* (Hyderabad: Centre for Peace & Civil Society (CPCS), 2011), 9-10.

32 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 1-15.

33 Later both canals were merged into the Dipalpur Canal of the Sutlej Valley Project.

southern Punjab. Sidhnai Canal from the Sidhnai weir on the River Ravi was opened in 1886 to irrigate the areas in Multan division. These canals brought all settled areas of eastern and central Punjab under the cultivation.³⁴ In Sindh, most of the earlier inundation canals were improved and provided with headworks to secure and extend supplies. Due to these measures, annual irrigation in Sindh increased from 1.5 million acres (6000 sq.km) in 1875 to 3.00 million acres (12000 sq.km) in 1900.³⁵ In North Western Frontier Province³⁶, (NWFP, now Khyber Pukhtunkhwa) the Lower Swat Canal was opened in 1885 to irrigate agricultural land in the tribal areas. It took off from Amandara Headworks on the Swat River with discharge of 1800 cusecs. Its commanded area was 1,340,000 acres.³⁷ The Kabul River Canal was completed in 1892 and Paharpur Canal in 1907. Upper Swat Canal took off from Munda Headworks on the Swat River. It was commissioned in 1914 with discharge of 1,800 cusecs to command an area of 276,000 acres.³⁸ These four canals were irrigating about half million acres of land in the west of the Indus in 1946. Early in the 20th Century, Ranbir and Pratab canals were constructed to irrigate about 150,000 acres land in the Jammu province of the Kashmir state.³⁹

Though all the Punjab canals were built primarily as food security and famine preventive measures yet they proved highly profitable financially too. So the government set upon a programme of irrigation to develop vast tracts of non-proprietary lands and crown wastes (bars) lay barren in

34 Khan, Fazal Karim, *A Geography of Pakistan* (Karachi: Oxford University Press, 1995).

35 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 16.

36 Under the 18th Amendment in the Constitution of Islamic Republic of Pakistan, the name of the province of NWFP was altered by the Khyber Pukhtunkhwa in 2010.

37 Malik, *Indus Water Treaty in Retrospect*, 49.

38 Sohail Ali Khan, *Apportionment of Waters of Indus River System between the Provinces of Pakistan* (Islamabad: Indus River System Authority, 1991), 19.

39 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 36.

southeast and western parts of the Punjab province in the closing decade of 19th Century. About 1890, two projects were sanctioned, one for the Chenab Canal (now the Lower Chenab) and other for the Jhelum Canal (now the Lower Jhelum).

Lower Chenab Canal (LCC) was the pioneer in this great irrigation development drive. It took off from Khanki Headwork on the River Chenab. Opened in 1892 with a discharge of 11500 cusecs (cubic feet per second) it irrigated vast barren tracts in Central Rechna Doab. Peoples from Amritsar, Jullundar and Hoshiarpur districts of eastern Punjab were settled in the canal command areas. They helped to develop new lands in districts of Gujranwala and Jhang. New colonies and towns were established like Gojra and Lyallpur (now Faisalabad). The project achieved its initial target of 2.45 million acres of annual irrigation within 20 years of its operation.⁴⁰ The Lower Jhelum Canal (LJC) was opened in 1901 with discharge of 5,300 cusecs. It takes off from the left bank of the Rasool Headworks on the River Jhelum. It commands 1,500,000 acres including 600,000 acres of crown waste land in Gujrat and Sargodha districts in Chaj Doab.⁴¹

After the commercial and economic success of the LCC and LCJ, attention was turned to crown waste lands then lying south of the Ravi River. This led to the construction of the Tripple Canal Project in Punjab. The main objective was to irrigate areas of Lower Bari Doab, lying South of the River Ravi. Since almost all of the winter flow of the Ravi was being used by the UBDC and the Sutlej by Sirhind Canal, the Beas appeared as the most suitable alternative to irrigate this area. A plan was made for the construction of a canal with its headworks at Harike, just below the merging point of the Beas and the Sutlej and submitted to the government for its approval.

40 Malik, *Indus Water Treaty in Retrospect*, 51.

41 Khan, *Apportionment of Waters of Indus River System between the Provinces of Pakistan*, 17.

The British government in India established Indian Irrigation Commission in 1901 to report on irrigation development. The Commission analyzed the Harike scheme and strongly opposed it on the following grounds: firstly, the Jhelum had much supplies than was used in areas between the Jhelum and the Chenab; secondly, the irrigation of Lower Bari Doab Canal regarded as the last possibility to use surplus waters of the Jhelum; and finally, the Sutlej water would be needed for the future development and extension of irrigation on the both sides of the river. The Harike scheme was reanalyzed and ultimately replaced by the Tripple Canal Project which would transfer surplus waters of the Jhelum to the Lower Bari Doab, by a series of link canals. Tripple Canal Project involved construction of three headworks and three canals. The headworks were at Mangla, Marala and Balloki on the Rivers Jhelum, Chenab and the Ravi, respectively. The corresponding canals were Upper Jhelum (UJC), Upper Chenab (UCC) and Lower Bari Doab (LBDC). The project facilitated transfer of surplus waters of Jhelum at Mangla to Ravi at Balloki by inter-river exchange for irrigation of barren wastes in southern Bari Doab. Its construction was started in 1909 and completed in 1917.⁴² The Upper Chenab Canal, which was constructed first, takes off from the Chenab River at Marala at the foot of the Himalayas. After irrigating the upper part of the Rechna Doab, it crosses the River Ravi near Balloki and becomes the Lower Bari Doab Canal. By the construction of the Upper Chenab Canal, the Lower Chenab Canal was starved so the Upper Jhelum Canal was constructed to feed the lower Chenab Canal. The Upper Jhelum canal has its intake at Mangla. It runs for a considerable distance parallel to the River Jhelum at the foot of the Salt Range. It irrigates parts of the Chaj Doab and discharges into the Chenab at Khanki to reinforce the Lower Chenab Canal. Thus the canal systems of the Jhelum, Chenab and Ravi have been interlinked.⁴³

42 Niranjana D. Gulhati gave 1915 as its completion year (Gulhati, 1973, 35).

43 Malik, *Indus Water Treaty in Retrospect*, 52.

Tripple Canal Project hailed as a great feat of irrigation engineering. It virtually used surplus Jhelum River water to irrigate lands 500 miles away across the three doabs in the Punjab. It has been a highly successful undertaking, technically as well as economically since its inception in 1917.

Immediately after the World War I, three important projects were put forward for the irrigation development in different areas of the Indus Basin. These included the Sutlej Valley Project; the Sukkur Barrage and Bhakra Dam. The Sutlej Valley Project (SVP) was another large undertaking in the 1920s. It consisted of three barrages at Ferozpur, Sulemanki and Islam and nine canals taking off the Sutlej proper and one headwork at Punjnad, (the merging point of the River Sutlej and the Chenab) with two off-taking canals. It commanded lands in north-eastern Punjab and princely states of Bikaner and Bahawalpur.

Ferozpur Barrage is located on the Sutlej River near Ferozpur town below its confluence with the Beas River at Harike. Three canals took off from it. First is Dipalpur Canal which is a non-perennial canal and opened in 1928. It took off from the right bank of the Barrage with discharge of 6100 cusecs. It commands 983,000 acres west of the Sutlej River in Sahiwal District. Second was Eastern Canal which took off from the left flank of the barrage. Its discharge was 3,320 cusecs. It commanded an area of 430,000 acres in Ferozpur district. It included 67,000 acres of land in the then Bahawalpur state through the Bahawalpur State Distributary. Third was Bikaner (Gang) Canal. It was the second canal to take off from the right bank of the Ferozpur Headworks. Its discharge was 2144 cusecs. It commanded an area of 651,000 acres in Bikaner state (now Rajisthan).⁴⁴

Pakpatan Canal, Eastern Sadiqia Canal and Fordwah Canal took off from the Sulemanki Headworks. Pakpatan Canal took off from the right bank. It was opened in 1927 with a discharge of 6600 cusecs. It commands an area of

44 Khan, *Pakistan: Geography, Economy and People*, 17.

1,261,000 acres in Sahiwal and Multan districts. Eastern Sadiqia Canal took off from the left bank of the Headworks. It was opened in 1926 with discharge of 4900 cusecs. It commands an area of 934,000 acres. Fordwah Canal also took off from the left bank of the barrage with discharge of 3400 cusecs. It was opened in 1927. It commanded an area of 425,000 acres. Both Sadiqia and Fordwah Canals irrigated lands in Bahawalpur State.⁴⁵

Three canals take off from the Islam Headworks. First was Mailsi Canal which was opened in 1928 with discharge of 4900 cusecs from the right bank. It was non-perennial canal. It commanded an area of 688,000 acres in Multan division. Second was Bahawal Canal which took off from the left bank of the Islam Barrage. It was opened in 1927 with discharge of 5400 cusecs. It commands an area of 648,000 acres in Bahawalpur State. Third was Qaim Canal. It also took off from the left bank in 1927 with a discharge of 5400 cusecs. Qaim Canal also irrigates the lands of Bahawalpur State.⁴⁶

Punjnad Headworks was built on the River Punjnad below the confluence of Chenab and the Sutlej Rivers. Two canals (Punjnad and Abbasia) took off from it. Punjnad Canal took off from the left bank with discharge of 9000 cusecs. It commands an area of 1339,000 acres and Abbasia Canal took off from the right bank. Both canals were opened in 1929.⁴⁷

As the Punjab was busy in the construction of Sutlej Valley Project (SVP) in 1932, at the same time Sindh completed a barrage across the Indus at Sukkur. Development of perennial canal irrigation in Sindh followed more or less the same technology as was evolved in the Punjab. The terrain topography and river morphology in Sindh were different from doab configuration in the Punjab. Since the Indus runs higher than the adjoining lands, canals can irrigate on both sides of the river like from Sukkar Barrage. It feeds as many

45 Malik, *Indus Water Treaty in Retrospect*, 52.

46 Malik, *Indus Water Treaty in Retrospect*, 53.

47 Malik, *Indus Water Treaty in Retrospect*, 52.

as seven canals; four from the left⁴⁸ and three from the right bank⁴⁹ with aggregate discharge of 47,700 cusecs. Area under their command is 7,500,000 acres which is the largest anywhere in the world. It was completed in 1932.⁵⁰

The remaining Bhakra Dam project which was proposed to irrigate lands of south-eastern Punjab and adjoining state of Bikaner from storage of 2.76 million acre feet (MAF) proved most controversial and was shelved till the contradictory claims of the Punjab and Sindh could be resolved. Despite conflicts over the use of waters of the River Sutlej, Punjab opened Thal Canal in 1947 and Sindh prepared project of Kotri Barrage on the Indus River to improve withdrawal of its inundation canals in lower Sindh.⁵¹

Trimmu Barrage with two canals was the largest undertaking after Sutlej Valley Project (SVP). It is located on the Chenab River below the confluence with the Jhelum. It serves two canals (Haveli Canal and Rangpur Canal), both opened in 1939. Haveli Canal took off from the left bank with discharge of 5,200 cusecs to deliver surplus water to River Ravi above the Sidhnai Headworks to feed Sidhnai Canal. The canal irrigates some area in its way to Sidhnai Headworks. It commands 1,011,000 acres mostly in Multan division. It was the first brick lined canal in the Punjab. Rangpur Canal took off from the right bank of the Barrage. It is non perennial canal. Its discharge is 2700 cusecs and commands 347,000 acres in Jhang District.⁵²

The Western Jumna Canal took off from the right bank of the Tajewala Headworks on the River Jumna with 5,500 cusecs discharge. The canal was primarily built as a food security measures in eastern districts of Punjab. Originally, it was a small canal built by Emperor Feroz Shah Tughlak in the 14th

48 The Eastern Nara Canal, Rohri Canal including Khairpur Feeders East and West.

49 The Northwestern Canal, Dadu Canal and Rice Canal.

50 Malik, *Indus Water Treaty in Retrospect*, 52.

51 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 39.

52 Malik, *Indus Water Treaty in Retrospect*, 52.

Century. It brought water to Delhi. Later it was renovated by Emperor Akbar in 1568.⁵³

The Jinnah (Kalabagh) Barrage was another major project that was built in 1947 on the Indus River as a component of Thal Irrigation Project for extension of irrigation over 1.47 million acres of Thal desert. It was the last irrigation project prior to independence in the Punjab. On completion of the Barrage further work was stopped because of the World War II.⁵⁴

Water Conflicts and Efforts of Resolution

Three basic principles of international law must be kept in mind before analyzing the various water disputes among the various provinces or states of the United India. The first principle is derived from the British Common Law which says that, 'A riparian owner or occupier has an unrestricted right to take and use the water of a stream for ordinary domestic purposes such as drinking, washing and for the want of its cattle'. The second principle is that, 'The irrigation projects that were built first have more right to draw from the river than the ones completed later'. This right is known as the historic right' of riparian. The third principle emanates from the Government of India Act 1935, Section 131 (6), which recognizes the principle that no province or state can be given an entirely free hand in respect of a common source of water such as an inter-province/state river.⁵⁵ This principle is based on the theory of limited territorial sovereignty and integrity which advocates the right of each riparian nation to utilise an international watercourse passing through its boundaries in such a way that its uses do not harm the interests of other riparian states. In essence, this theory guarantees rights of each and every riparian nation on a common watercourse. The principle of equitable and reasonable utilisation is the essence of this doctrine.

53 Malik, *Indus Water Treaty in Retrospect*, 52-53.

54 Khan, *A Geography of Pakistan*, 36.

55 Bengali, *The Politics of Managing Waters*.

The first principle has never been disputed and the second regarding historic rights, is often violated. For instance, India refused to release the historical water right of about 1.7 million acre feet through Central Bari Doab channels, Dipalpur Canal System and Bahawalpur State Distributary from Madhupur and Ferozpur Headworks on April 1, 1948. The third principle, that of 'equitable apportionment with the consent of riparian states' is the most difficult to establish because the goal of equitable distribution cannot be achieved without the consent of the all riparian units.

The water distribution issues can lead to active conflicts. Where water is scarce, it becomes a divisive factor in local economies and politics. And where society is divided by ethnicity, caste and class, such divisiveness can become explosive. Disputes over the sharing of waters of Indus River System did not exist as long as the waters flowed as ordained by nature. However, the construction of the system of barrages and canals for the diversion and storage of river water from 1859 onwards rendered water distribution a function of policy decisions. Not unexpectedly, these decisions became contentious on account of the fact that the benefits and costs of each decision are distributed differentially.⁵⁶

The dispute had its origins in the earlier part of the 20th Century when the Sutlej Valley Project was being planned in Punjab. Millions of acres of land in the Indus Basin were irrigated from the spills of the rivers and by inundation canals. These canals diverted supplies directly from the rivers during the flood periods without the diversion dams. Due to the recurrence of famines in Punjab, the British authorities started to expand irrigation facilities through the diversion dams across the rivers in the middle of the 19th Century. First of all, the area between the tributaries was developed because being smaller rivers; they were easier to control.⁵⁷

56 Bengali, *The Politics of Managing Waters*,161.

57 Malik, *Indus Water Treaty in Retrospect*, 56.

The Upper Bari Doab Canal on the Ravi was the first to be opened in 1859. It was followed by Sirhind Canal on the Sutlej in 1882, the Lower Chenab in 1892, and Lower Jhelum in 1901. The Bahawalpur and the Upper Swat canals were opened in 1908 and 1914, respectively. The Dipalpur Canal Project, consisting of the Upper Jhelum, the Upper Chenab, and the Lower Bari Doab canals was completed in 1915. In the post-World War I period, plans to harness the flow of the main Indus River were materialized with the construction of the Sukkar Barrage Project, the largest single irrigation project in the world, in 1932. The Sutlej Valley Project comprising 11 canals and four headworks at Ferozpur, Sulemanki, Islam, and Punjnad was completed in 1932. The Haveli Canal Project with headworks at Trimmu on the Chenab River came up in 1939 and the Kalabagh in 1947.⁵⁸

Under the guidance of the British engineers, irrigation was greatly extended through the construction of headworks on the rivers and through canals. Flourishing colonies were established. Cultivation of cotton, wheat, rice and sugarcane was expanded. New towns sprang into existence. Orchards and well-tended agricultural farms covered the countryside. More land is irrigated from the Indus River than from any other river system in the world. One dam planned before the partition was Bhakra Dam on the River Sutlej in the East Punjab. Before it was sanctioned, the downstream province of Sindh complained that operation of Bhakra Dam would adversely affect the functioning of its inundation canals⁵⁹ which would be violation of the principle of equitable and reasonable utilization.

Before the Sutlej Valley Project was sanctioned in 1921, keeping in view the principle of equitable and reasonable utilization, a concern was voiced by various units on the adequacy of available supplies. Bahawalpur State protested

58 Malik, *Indus Water Treaty in Retrospect*, 71.

59 Chaudhri Muhammad Ali, *The Emergence of Pakistan* (Lahore: Research Society of Pakistan, University of the Punjab, 1973), 317.

against any supplies being given to Bikaner State, as provided in the project, on the ground that the supplies were insufficient even for the needs of the riparian areas of Punjab and Bahawalpur State. At the same time, Punjab protested against the Sukkar Canal Project, which was also before the government for sanction, as it felt that there would be inadequacy for both Sukkar and Thal barrages. Bombay province, which then included Sindh, on its part protested against the Sutlej Valley Project because it feared that withdrawals for the project would leave inadequate supplies for the Sukkar barrage canals.⁶⁰ Almost from the start of the Sutlej Valley Project, it became evident that supplies for its canals were inadequate. These canals had been planned on the basis of average supplies occurring over a certain period of years. Without ample storage, average supplies were not dependable. The unusable peak flows distorted the picture. The result was that the canals, after construction, suffered overall shortages in half the year. In most years, they suffered extreme shortages during early Kharif when supplies were most needed, a situation which proved intolerable.⁶¹

After the World War I, questions about water sharing arose because of increasing withdrawals of river supplies as several projects were proposed in different parts of the Indus Plains. It called for the apportionment of the rivers waters among several riparians by the government. Six significant attempts have been made by the government before the independence to reach an agreement on water sharing in the Indus River Basin.

Sutlej Valley Tripartite Agreement (1920)

It was the first agreement in the Punjab for sharing of river waters. It was signed in 1920 by the Government of Punjab and Princely States of Bahawalpur and Bikaner to share waters of Sutlej and Beas rivers. It opened the way for the

60 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 38.

61 Khan, *Apportionment of Waters of Indus River System between the Provinces of Pakistan*, 18.

sanction of the Sutlej Valley Project (SVP) and Sukkar Project in Sindh.⁶²

Indus Discharge Committee (1921)

The Bombay government (Sindh was part of Bombay presidency till 1935) objected to Punjab's proposals for new projects impacting scope of irrigation development in Sindh. Princely States of Bahawalpur and Bikaner also staked their claims for irrigation supplies. Respective claims of the rival governments Vis: Punjab and Bombay were referred to the Secretary of State for India. He sanctioned construction of SVP and Sukkar Barrage with seven canals of aggregate capacity of 47,700 cusecs. Decision about other projects was to be taken after more reliable river flow data was available.

The Government of India appointed "Indus Discharge Committee" in 1921. A system of daily observation of river and canal discharges at different sites on the Indus River System and canals was initiated. Arrangements were also made between Punjab and Sindh to cooperate in discharge observation and in methods of keeping their record. Sindh also deployed resident engineers in the Punjab to monitor river discharges and canal withdrawals. The Committee in its report recommended implementation of Haveli Canal Project. But it pointed out that future projects in the Punjab should be considered carefully with respect to possible impact on Sindh water rights. It also recommended study of Bhakra Dam on the Sutlej for storage of flood waters and reduction of flood flows. To study this matter, a two-member committee was formed. Its members were Mr. Nicholson and Mr. Trench. It reported in 1930 that there should be no objection to construction of Bhakra Dam.⁶³

SVP Inquiry Committee (1932)

Operation of the SVP canals revealed that there was shortage of supplies because actual river flows fell short of

62 Malik, *Indus Water Treaty in Retrospect*, 58.

63 Malik, *Indus Water Treaty in Retrospect*, 59.

requirements especially in early Kharif period. A committee was appointed in 1932 to look into the problem of shortages. The committee recommended exclusion of some areas in Bahawalpur, construction of new feeder canals and adjustment in the command of certain canals.⁶⁴

The Anderson Committee (1935)

The distribution of waters of the Indus River System has been a source of controversy among various provinces and Indian states, especially between Sindh and Punjab, at least since 1919. All the eleven SVP canals with four barrages and Sukkar Barrage Project were commissioned. Bahawalpur and Khairpur States sought additional supplies. Punjab also asked for more water for Haveli Project. In 1935, some of the matters in controversy were referred by the Government of India to an eight-member committee of experts, six of whom were nominated by the interested units (namely, Bombay including Sindh, Punjab, NWFP, Bahawalpur, Khairpur and Bikaner) and the remaining two, including the Chairman, were independent members nominated by the Government of India.⁶⁵ This committee was named Anderson Committee, after its Chairman's name. The committee submitted a unanimous report on September 16, 1935. The Government of India then consulted the various units concerned and passed final orders on March 30, 1937. It increased irrigation supplies for Haveli and Thal Projects.⁶⁶ However, Sindh (which was under the Bombay presidency when the Anderson Committee report was released, but had attained the status of province in 1935) showed its apprehension regarding the effects of certain completed and contemplated irrigation projects in Punjab and formally lodged a complaint on June 7, 1941 to the Governor General of India. The complaint related to the following projects:

1. The Haveli Project—in operation;

64 Malik, *Indus Water Treaty in Retrospect*, 58.

65 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 39.

66 Bengali, *The Politics of Managing Waters*, 162.

2. The Thal Project—under construction;
3. The Bhakra Dam Project—in contemplation;
4. Twenty-four storage reservoirs with an assumed capacity of 500,000 acre-feet each, on the affluence of Indus, Jhelum, Chenab, Ravi, Beas and Sutlej rivers, and one of them, the Woolar Lake Scheme, on the Jhelum itself—in contemplation;
5. Feeders to transfer water from the Ravi to the Beas and from the Chenab to the Beas with a total assumed withdrawals of 23,000 cusecs at its highest—in contemplation.⁶⁷

In response, the Governor General appointed the Indus Commission to look into the complaint of Sindh and to report on the matters pertaining to the complaint.

Rau Commission (Indus Commission)

After the Government of India Act 1935 came into force on April 1, 1937, the development of river waters became a provincial subject. Henceforth, each province was free to undertake any work for development of river waters passing through its territory as considered expedient. The Governor General could intervene only on receipt of complaint by one province against the other. In response to the complaint submitted by the Sindh, first time in October 1939 and again in its final form on June 7, 1941, the Governor General of India appointed the Indus commission which is popularly known as “Rau Commission” after the name of its Chairman Justice B. N. Rau. The Commission had two chief engineers namely P. B. Hickey and E. H. Chave as the members.⁶⁸

Referring the British Common Law, American Supreme Court decisions, decisions of the Permanent Court of International Justice, and common practice in various countries, the Rau Commission laid down the following general principles for the distribution of the water of Inter-provincial rivers.⁶⁹

67 Bengali, *The Politics of Managing Waters*, 162-163.

68 Michel, *The Indus River: A Study of the Effects of Partition*, 129.

69 Bengali, *The Politics of Managing Waters*, 163.

1. The most satisfactory settlement of disputes of this kind is by agreement, the parties adopting the same technical solution of each problem, as if they were a single community undivided by political or administrative frontiers.
2. If once there is such an agreement that in itself furnishes the 'law' governing the right of the several parties until a new agreement is concluded.
3. If there is no such agreement, the rights of the several provinces and states must be determined by applying the rules of 'equitable' apportionment, each unit getting a fair share of the common river.
4. In the general interest of the entire community inhabiting dry arid territories, priority may usually have to be given to an earlier irrigation project over a later one.
5. For purpose of priority, the date of a project is not the date when survey is first commenced, but the date when the project reaches finality and there is fixed and definite purpose to take it up and carry it through.
6. As between projects of different kinds for the use of water, a suitable order of precedence might be (a) use for domestic and sanitary purposes (b) use for navigation, and (c) use for power and irrigation.⁷⁰

Rau Commission established priority of water allocation for Paharpur Canal and also confirmed allocation for the Thal and the Sukkar schemes as recommended by the Anderson Committee. The Commission submitted its report in July 1942. The Commission did find that upstream withdrawals would adversely affect operation of inundation canals in Sindh especially during September. The best way to counteract this effect was to construct barrages at Guddu and Hajipur (Hajipur Barrage was superseded by Kotri Barrage)⁷¹. The Commission also recommended that "compensation should be paid to Sindh from the Punjab province for damages likely to result from upstream withdrawals." It also laid down that the proposed dam at

70 Bengali, *The Politics of Managing Waters*, 163.

71 Michel, *The Indus River: A Study of the Effects of Partition*, 129.

Bhakra, on completion, must be so operated as not to cause material damage to the canals of the downstream province of Sindh. Its findings and recommendations were neither accepted by Punjab nor by Sindh.⁷²

Draft Sindh-Punjab Agreement (1945)

The Rau Commission placed an embargo on undertaking Bhakra Dam's construction before October 1, 1945, and suggested that, in the meantime, the representatives of Punjab and Sindh should sort out on a bilateral basis the issues of water sharing and related matters. At this stage the negotiations were opened between the two chief engineers of Sindh and Punjab to find a solution and reach an agreement. After prolonged negotiations between Sindh and Punjab a draft agreement was drawn on September 28, 1945. It was subject to settlement of the financial phase of the dispute—with respect to sharing of waters of Indus and Punjab's rivers. The draft agreement involved, construction of a barrage on the Indus at Guddu and link canals in Punjab with capacity limited to 19,300 cusecs from the Chenab and Ravi Rivers to the Sutlej for improving supplies for SVP canals. But the agreement could not be finalized. Ultimately it was decided to refer the matter to His Majesty's Government in England. Early in 1947, Government of India referred the case to the Secretary of State for India for a decision. The matter was still pending till the Indian Independence Act of July 1947 was passed which created two independent states of Pakistan and Bharat on August 15, 1947. Thus, due to the partition and its political and geographical effects, the water dispute remained unresolved.⁷³

72 Gulhati, *Indus Water Treaty: An Exercise in International Mediation*, 39.

73 Khan, *Apportionment of Waters of Indus River System between the Provinces of Pakistan*, 18.

The Issues related to the Water Conflicts

After a brief review of the history of water disputes in the Indus Basin, following issues have been traced which created tension among the provinces during the British Rule:

- There was insufficient storage capacity along the Indus Basin from 1920 to 1945, due to which a large amount of water could not be utilized and flowed to the Arabian Sea. This lack of storage capacity increased tension among the upper riparian and lower riparian provinces/states, since sufficient water was not available to meet the agricultural requirement throughout the year. This issue could be resolved through the construction of reservoirs;
- The existing canal system was not sufficient to meet the demands of the increasing population in the Indus Basin. As the new lands were being converted into agricultural lands which also increased the chances of conflicts among the provinces;
- Revenue generation from the agricultural lands was another issue of conflict. Provincial governments wanted to retain generated revenue because it was a main source of their economies. They wanted to convert more barren lands into agricultural lands and to develop water resources to irrigate those lands without taking into account effects and injuries on other provinces, which resultantly created conflicts and hostilities;
- Although, to achieve maximum agricultural output, the water from the canals was playing a significant role but the complex structure of canal system in the basin and demand of equal apportionment made water a political issue among the provinces.

Conclusion

Most of the Indus Basin is located in arid and semi-arid climatic regions. Due to variations of rainfall from place to place and year to year, agriculture is not possible without irrigation. Various forms of irrigation, such as wells, *sailab*, inundation canals and later on perennial canals, have been practiced in the Basin since time immemorial.

After the decline of Indus Valley Civilization, later dynasties like Shakas, Cholas, Pallavas, Bhoj and Pandyas contributed well to develop the Indus Basin. Later on the Arabs captured some parts of the Basin in the 8th Century and developed a good canal system to fulfil the requirements of agriculture. During the period of Delhi Sultanate and Mughals, irrigation infrastructure was enhanced and improved.

In the mid-19th Century, the British appeared as new rulers. Due to occurrence of frequent famines, they realized the imperative need of secure source of food supply and various irrigation projects were initiated to irrigate highlands between the rivers of the Punjab. First time in the history of irrigation development in the Indus Basin, the British engineers introduced a new concept of perennial canals. Under the supervision of the British engineers, the irrigation was greatly extended through the construction of headworks on the rivers and through canals.

Dispute over the water sharing started in the early part of the 20th Century when the Sutlej Valley Project was being planned in Punjab. After the World War I, questions arose about water apportionment because of increasing withdrawals of river supplies. It called for the apportionment of the river waters among several riparian by the government. Six significant efforts had been made by the government before the partition of India in 1947 to reach an agreement which includes the Sutlej Valley Tripartite Agreement (1920), Indus Discharge Committee (1921), SVP Inquiry Committee (1932), The Anderson Committee (1935), Rau Commission and Sindh-Punjab Draft Agreement (1945). Unfortunately, all those efforts could not produce any permanent solution.