

# Water Resource Status of Pakistan ( II )



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for Upper Indus catchment is snow and ice melting from the glacier area which contributes in the major flow of Indus River basin. This chapter also discussed about the specification (capacity, flow etc.) of surface water resources, supply, consumption and major water sector policies and problem.

## 1. Introduction

This chapter mainly discussed about the major water resources of Pakistan which include the surface water resources such as rivers, lakes, dams, barrages, and ground water resources. Another major water resource

## 2. Agricultural & Rural Infrastructure and Water Resources

The effects of climate change and global warming on Pakistan, the melting of glaciers



Figure (2-1) Rivers and Lakes in Pakistan

Source: Wikipedia, the free encyclopedia

in the Himalayas, threatening the volumetric flow rate of important rivers of Pakistan. In Pakistan, such effects are projected to impact millions of lives. As a result of ongoing climate change, the climate of Pakistan has become increasingly volatile over the past several decades; this trend is expected to continue.

Five main rivers join the Indus from the eastern side are: Jhelum, Chenab, Ravi, Beas and Sutlej; beside these 3 minor rivers – Soan, Harrow and Soan are also draining

into Indus. On the western side, a number of small rivers join Indus, the biggest of which is river Kabul with its main tributaries i.e. Swat, Panjkora and Kunar. Several other small streams such as Kurram, Gomal, Kohat, Tai, Tank, etc also join Indus on the right side. The total catchment area of Indus river system is 234,188 km<sup>2</sup> of which about 56% i.e. 127,688 km<sup>2</sup> lies in Pakistan.

### 2.1. Surface Water

Rainfall in Pakistan is markedly variable in

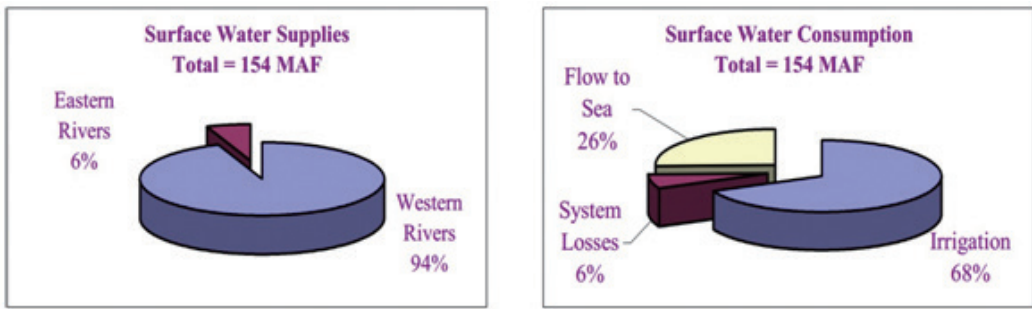


Figure (2-2) Pakistan surface water supplies and Consumption

Source: Wikipedia, the free encyclopedia

### RAINFALL DATA OF MAJOR CITIES 10 years average (1990-99)

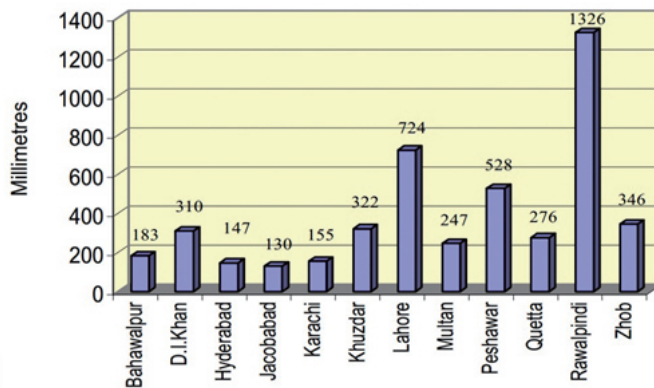


Figure (2-3) Rainfall data of major cities of Pakistan

Source: Pakistan Meteorological Department

magnitude, time of occurrence and its aerial distribution. However, almost two-thirds of the rainfall is concentrated in the three summer months of July – September. The mean annual precipitation ranges from less than 100 mm in parts of the Lower Indus Plain to over 750 mm near the foothills in the Upper Indus Plain

Pakistan lies in an arid and semi-arid climate zone. The entire Indus Plains (canal command areas) receive an average seasonal rainfall of 212 mm and 53mm in the kharif and Rabi seasons, respectively. The rainfall varies as we move from the north and northeast to the south of the country. The canal commands in the Upper and Lower Indus Plains receive 75 % and 85– 90 % of the annual rainfall respectively, during the kharif season.

Catchment area of the Indus Basin contains some of the largest glaciers in the world, outside the Polar Regions. The glacial area

of the upper Indus catchment is about 2,250 km<sup>2</sup> and accounts for most of the river runoff in summer. The snow and ice melt from the glacial area of the Upper Indus catchment supply approximately 80% of the total flow of the Indus River in the summer season. Snowmelt accounts for more than 50% of the flow in the Jhelum River. However, the Jhelum is much more dependent than the Indus on the variable monsoon. Pakistan's irrigation system contains two large reservoirs of water on the Indus River System, mainly the Tarbela Dam on river Indus in province of Khyber Pakhtunkhwa and Mangla Dam on river Jhelum in province of Punjab. Both dams have combined live storage capacity of 17.34 BCM.

## 2.2. Ground Water

The Indus Basin is formed by alluvial deposits carried by the Indus and its tributaries and is underlain by an unconfined aquifer

Table (2-1) Number of Water Resources in Pakistan

Items	Description in Numbers
Major Reservoirs	3
Barrages / Headworks	18
Link Canals	12
Canal Systems	45
Length of Watercourses	107,000 km
Length of Canals	56,073 km
Average Canal Water Diversion	17,34 BCM
Groundwater Abstractions	51,31 BCM
Tube wells	1,000,000.
Irrigated Area	44.5 Million acres

Source: Water and Power Development Authority (2012)

Table (2-2) Main Reservoirs of Pakistan

Reservoir	Original (MCM*)			2012 (MCM)			Loss (MCM)		
	Gross	Live	Dead	Gross	Live	Dead	Gross	Live	Dead
Tarbela Dam (Running Length 1378-1550)	1,433,3	9,522	4,811	9,534	8,177	1,356	4,798	1344	3454
Mangla Dam (R.L 1040-1210)	7,906	7,240	666	6,315	6,192	123	1,591	1048	543
Chashma Dam (R.L 637-649)	1,073	888	185	394	320	74	678	555	111
Total	2,331,2	1,765,0	5,662	1,624,3	1,46,89	1,553	7,067	2,947	4,108

Source: Water and Power Development Authority (2012) \*Million Cubic Meter

Table (2-3) Main Rivers of Pakistan

River	Average Annual Flow (1922-1961) MCM*	Average Annual Flow (1985-1995) MCM	Average Annual Flow (2001-2002) MCM
Indus	1,171,80.8	77,339.31	59,20,7.13
Jhelum	28,370	32,810.62	14,616.76
Chenab	32,070.53	33,92,0.75	15,270.51
Ravi	8,634.373	6,167.409	1,813.218
Sutlej	17,268.75	4,440.535	24.67
Kabul	32,07,0.53	2,886,3.48	2,331,2.81
Total	2,331,28.1	1,835,42.1	1,142,45.1

Source: Water and Power Development Authority (2012) \*Million Cubic Meter

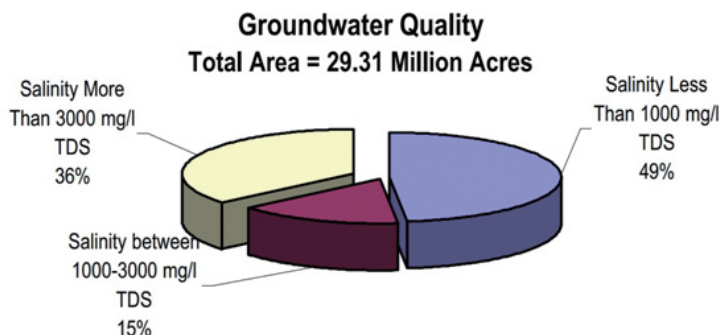


Figure (2-4) Ground Water Quality of Pakistan

Source: Water and Power Development Authority

covering about 15 million acres in surface area. In the Punjab about 79% of the area and in Sindh about 28% of the area is underlain by fresh groundwater, which is mostly used as supplemental irrigation water and pumped through tube wells. Some groundwater is saline and water from the saline tube wells is generally put into drains and, where this is not possible, it is discharged into the large canals for use in irrigation.

### 2.3. Water sector policy and Problems

The Indus Waters Treaty is a water-sharing treaty between India and Pakistan, brokered by the World Bank. Actually the Indus System of Rivers comprises three western rivers the Indus, the Jhelum and Chenab and three eastern rivers – the Sutlej, the Beas and the Ravi. According to this treaty, Ravi, Beas and Sutlej, which constitute the eastern rivers, are allocated for exclusive use by India before they enter Pakistan. The large canal irrigation system over the years has contributed to waterlogging and salinity, currently affecting 8% of the soil in the Punjab and around 15% in Sind and equivalent to an estimated loss of more than one third in annual yields on slightly saline areas and two thirds in moderately saline areas. According to an estimate by the Soil Survey conducted in 1981 for the government, around 8% of the gross command area was severely salt affected. A World Bank study estimates that around 25% of potential production of major crops is foregone due to salt salinity. The sedimentation load in the Indus River is the fifth highest in the world

and has contributed to loss of storage capacity in the Tarbela Dam reservoir at the rate of 14% every 10 years. Major international projects for water sector in Pakistan

- The Indus System Rehabilitation Programme (ISRP) Phases I and II was undertaken for the rehabilitation of surface irrigation and drainage systems. However, even with the completion of both ISRP I and ISRP II in 1993, more than 18,000 km of canals remained in need of rehabilitation.
- In the 1960s, the Government of Pakistan, with World Bank support, embarked upon a 10-year SCARP programme for controlling waterlogging and salinity through groundwater resources development. The programme consisted of providing 31,500 public tube-wells, 12,000 km of major drainage channels and 40,000 km of supplementary drains in 10 areas of Punjab and 16 of Sind.
- In 1997, with the help of the World Bank, the Asian Development Bank and the Japan Overseas Economic Cooperation Fund, the Government of Pakistan embarked upon a National Drainage Programme (NDP) aimed at promoting agriculture by reducing waterlogging and salinity.

### 3. Conclusions

There are total of three major water resources of Pakistan such as surface water, ground water and glacier snow melting. In case of surface water Pakistan has five main rivers joining the Indus River from the eastern

side are:

Jhelum, Chenab, Ravi, Beas and Sutlej; beside these 3 minor rivers – Soan, Harrow and Soan are also draining into Indus river. Tarbela Dam, Mangla Dam, Chashma Dam are the main reservoirs having the storage capacities of 1,433,3 MCM, 7,906 MCM, 1,073MCM. In Punjab about 79% and in Sindh about 28% of the area is underlain by fresh groundwater. Ground water is used for irrigation purposes but in some areas ground water quality is not too good. Catchment area of the Indus Basin contains some of the largest glaciers in the world having an area of 2,250 km<sup>2</sup> and accounts for most of the river runoff in summer. Almost 8% of Punjab and 15% of sindh area faced the major water problem known as water logging and salinity. Crop production can be increased up to 25% by removing such water logging and salinity problems. 💧

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