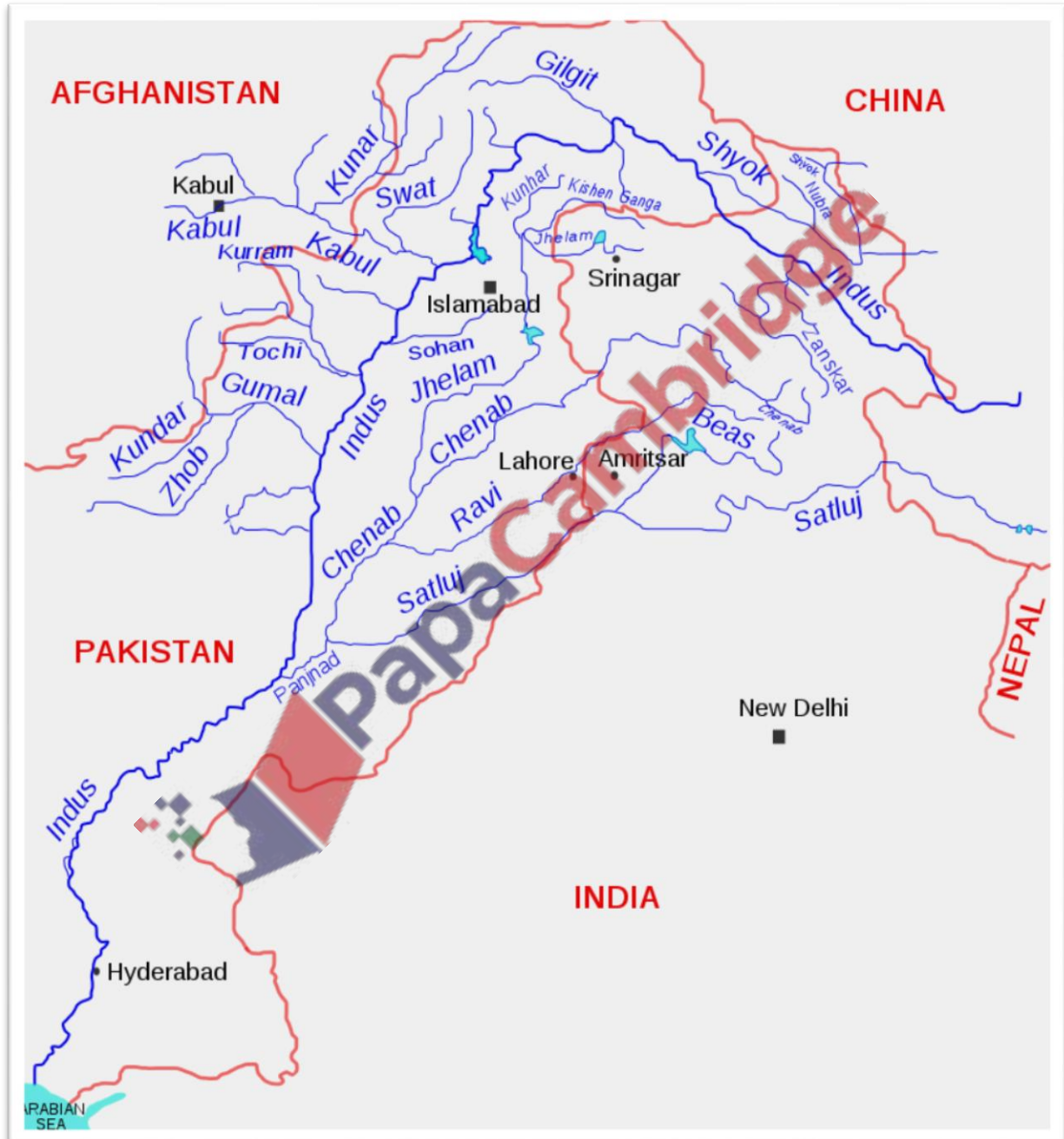


Chapter 3

Water Resources

River system of Pakistan



Eastern tributaries

The river system of Pakistan originates from the snow-covered Himalayan and the Karakoram range. The system comprises mainly five rivers that pass mostly through the Punjab province; therefore the name 'Punjab' — 'panj' meaning five and 'aab' meaning water. The five rivers of Pakistan are Jhelum, Chenab, Ravi, Sutlej and Indus.

Jhelum

River Jhelum is nearly 774 kilometres long and is the tributary of River Chenab. Jhelum originates from the south-eastern part of Kashmir valley and flows through Srinagar before entering Pakistan. Along its journey, it is joined by the largest tributary of the Neelum River near Muzaffarabad. River Jhelum also has many dams and barrages constructed on it, with one of the dams being Mangla which is the world's largest earth-fill dam and was constructed in 1967. It has a storage capacity of nearly 5.9 million acre-feet. Rasul Barrage is also built on Jhelum River as well as Trimmu Barrage.

Sutlej

Sutlej flows through the historic crossroad region of Punjab in northern India and Pakistan. It is located north of the Vindhya Range, south of the Hindu Kush segment of the Himalayas, and east of the Central Sulaiman Range in Pakistan. Some 550 kilometres long, Sutlej is also called as the Red River.

Chenab

The Chandra and Bhaga rivers in the upper Himalayas join to form the Chenab River. Chenab flows through Jammu and Kashmir. It is then joined by the Jhelum River at Trimmu, a flood control mechanism near Jhang and on moving further it merges with the Sutlej near Uch Sharif in Pakistan. Chenab River is nearly 960 kilometres long.

Ravi

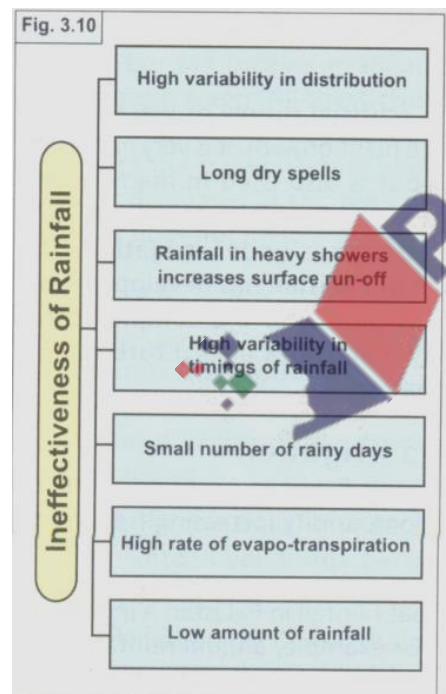
River Ravi, like many other rivers of the region, originates in the Himalayas. After it flows through south-west region of Indian Punjab, it moves along the Indo-Pak border and enters Pakistan and merges with Chenab. River Ravi is nearly 720 kilometres long. It's also called 'The river of Lahore' since the city of Lahore is located at Ravi's eastern bank.

Indus

The Indus river is the longest river in Pakistan, originating from the Himalayan region. It is also the world's 21st largest river in terms of annual water flow. With a total length of 3,180 kilometres, it is also Pakistan's lifeline.

Drainage Pattern of river indus

Indus River originates from the Tibetan plateau near Lake Mansarovar in China. It then runs through Jammu and Kashmir, enters the Gilgit-Baltistan (formerly Northern Areas of Pakistan) region and flows through the entire length of the country and merges with the Arabian Sea. The Indus River fulfils the water requirements of Pakistan and is the main support for agriculture. The main tributaries of Indus are Swat, Kabul, tochi, gomal, zhoob in the west and

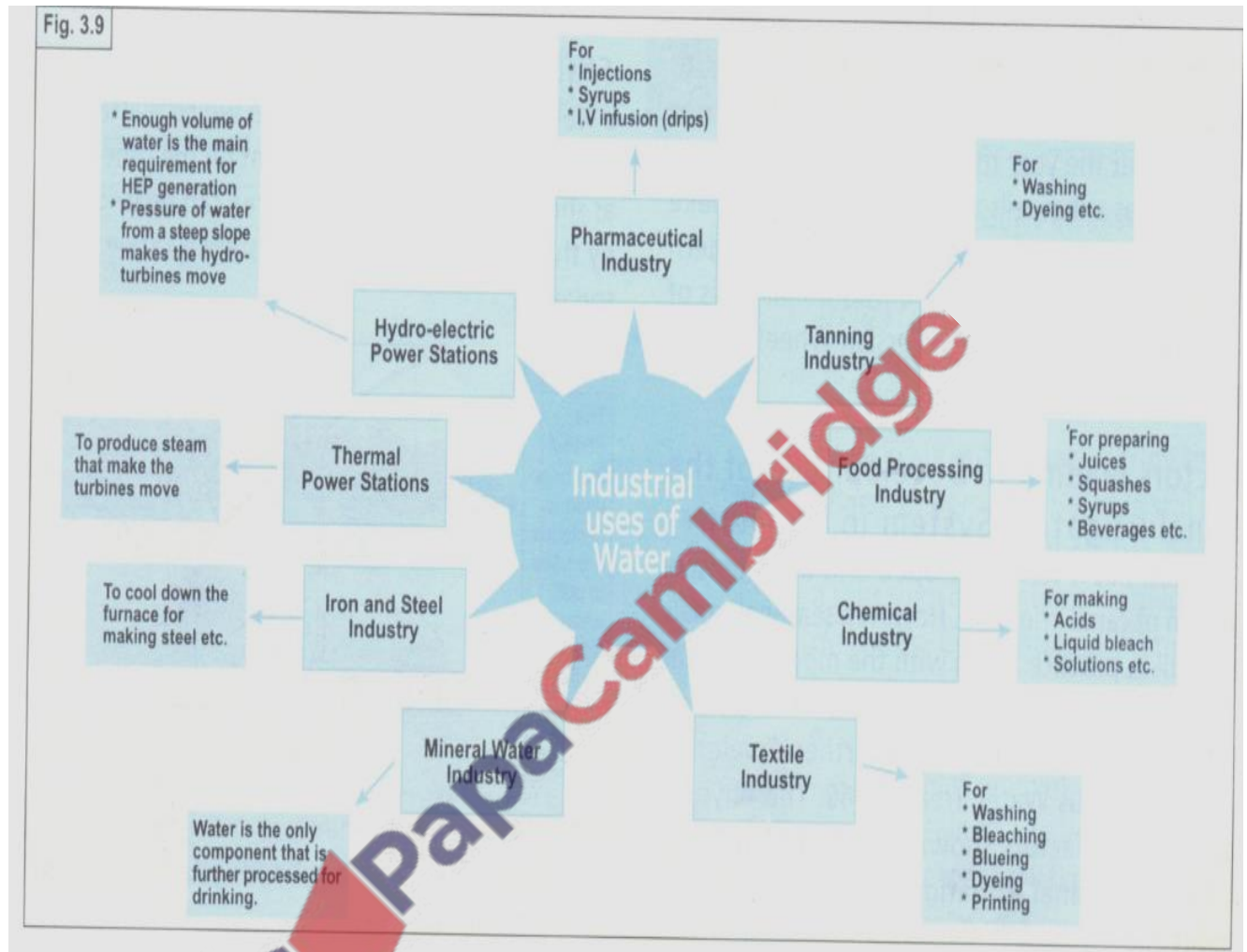


Rivers of Baluchistan

The drainage pattern of the rivers of Balochistan is as follows:

- Quetta, being a high altitude region has the central position in the drainage pattern of Balochistan.
- Rivers like the Zhob, Khandar, and the Kalachi drain into River Indus because they flow eastwards.
- The rivers Loralai, Chakar, Bolan and Mula are absorbed into the Kachhi Sibi Plain.
- The rivers Hab, Porali, Hingol and Mashkel drain into the Arabian Sea.
- There are many small rivers that flow westward and drain into shallow depressions called hamuns.

Uses of fresh water



Ground water

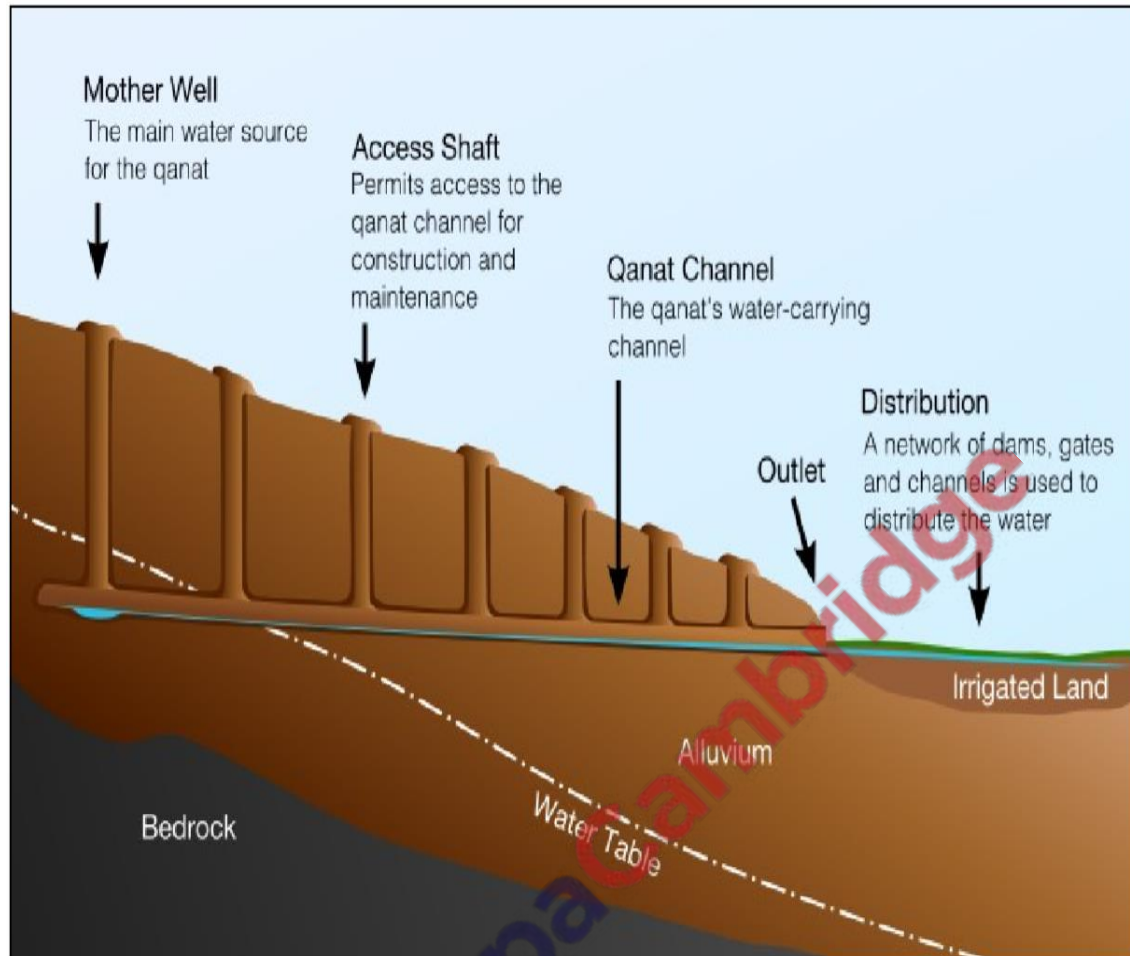
the water beneath the surface of the ground, consisting largely of surface water that has seeped down: the source of water in springs and wells

Irrigation systems

Small Scale Systems

Traditional methods

Karez



Karez water system is made up of a horizontal series of vertically dug wells that are then linked by underground water canals to collect water from the water surface runoff from the base of hills or mountain beneath a mountain/hill slope.

The canals channel the water to the surface, taking advantage of the gravity. The canals are mostly underground to reduce water evaporation. Vertical wells are dug at various points to tap into the groundwater flowing down sloping land from the source. These vertical wells are also used for maintenance of Karez

Persian wheel



This is a system of continuous supply of water and irrigated a comparatively larger area. In this method blind folded Bullock is used to move a horizontal wooden wheel. This wheel is geared to a field is vertical wheel at the distant end of the shaft. This carries the vertical metal attached to a chain of bucket. The bucket raise water from the well and is spill their contents into the channel landing to the irrigation field.

1. Simple lift irrigation

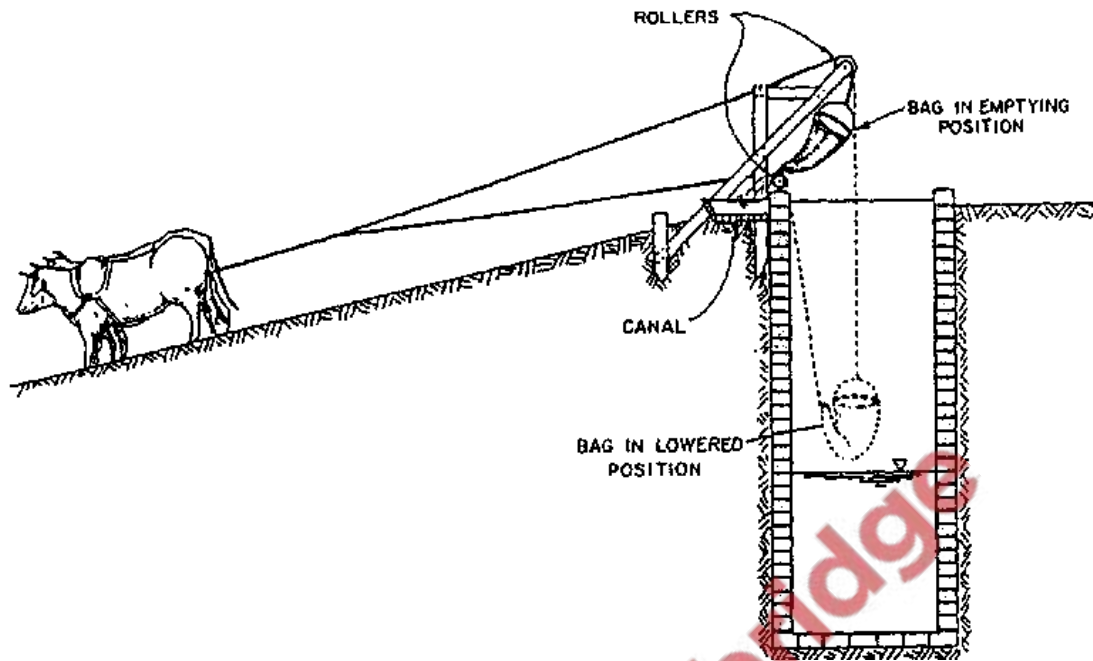
It is mostly practiced in the remote and back ward villages of Pakistan in this method people take out water from a Shallow well with the help of a rope and bucket. Through this system farmers can irrigate a small piece land ,it is a time consuming method of irrigation.

2. Shaduf



In the shadows system water is drawn from a Shallow well river organised by a bucket which is attached to a wooden pole on one side on one side and weight heavy rocks on the other side a small area a small can be irrigated by this method in some of the places also use of pulley to take water out from a well.

Charsa



In this method animal power is used to pull water from the well. In this method a bucket is suspended by a rope and with the help of animals people take out water from slightly deep wells.

1. Seasonal canals

these canals are only active during the rainy season they are mostly in the old flood plains of Punjab and Sindh. These canals are also found near the dam region.



2. Inundated canals

Long canals taken from large rivers are called inundation canals .They received water when the river is highly enough and especially when it is in floods.



3. Tank irrigation

Tank irrigation is practised by constructing mud banks across small stream to make a small reservoir which collect excess water during the rainy season These reservoir are sometimes covered with plastic and the water is used for irrigation domestic purpose live stock etc.



modern methods

1. perennial canals

These canals run throughout the year and are linked to dams and barrages for continuous supply. They irrigate large pieces land.

2. Tubewell

These are electrical or diesel powered machines which are used full water from the depth of 92 metres or more to irrigate large from lands. These also help in lowering the water table where by protecting the land from water logging and salinity.



3. Sprinklers spray irrigation

Sprinklers are devised attached to the public water supply or tubewells. They are centrally located in the field of irrigate/ water the plant mainly in Orchard and Gardens it is an efficient method of irrigation as water is not wasted but it is very expensive. This is rarely used to irrigate agricultural crops.



4. Tanker irrigation

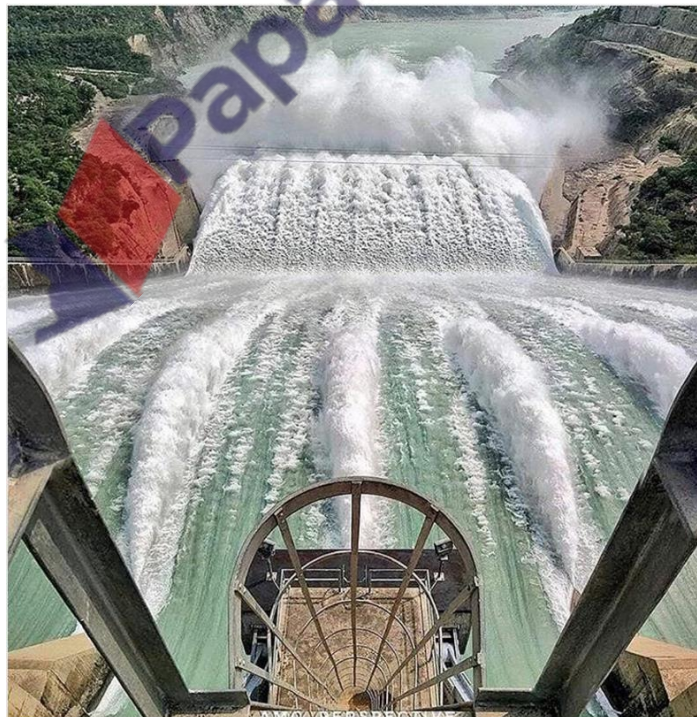
This is the most expensive method of irrigation. Tankers collect water from small water bodies(in land) and supply them to household in case of emergency

☐ Dams



Mangla dam

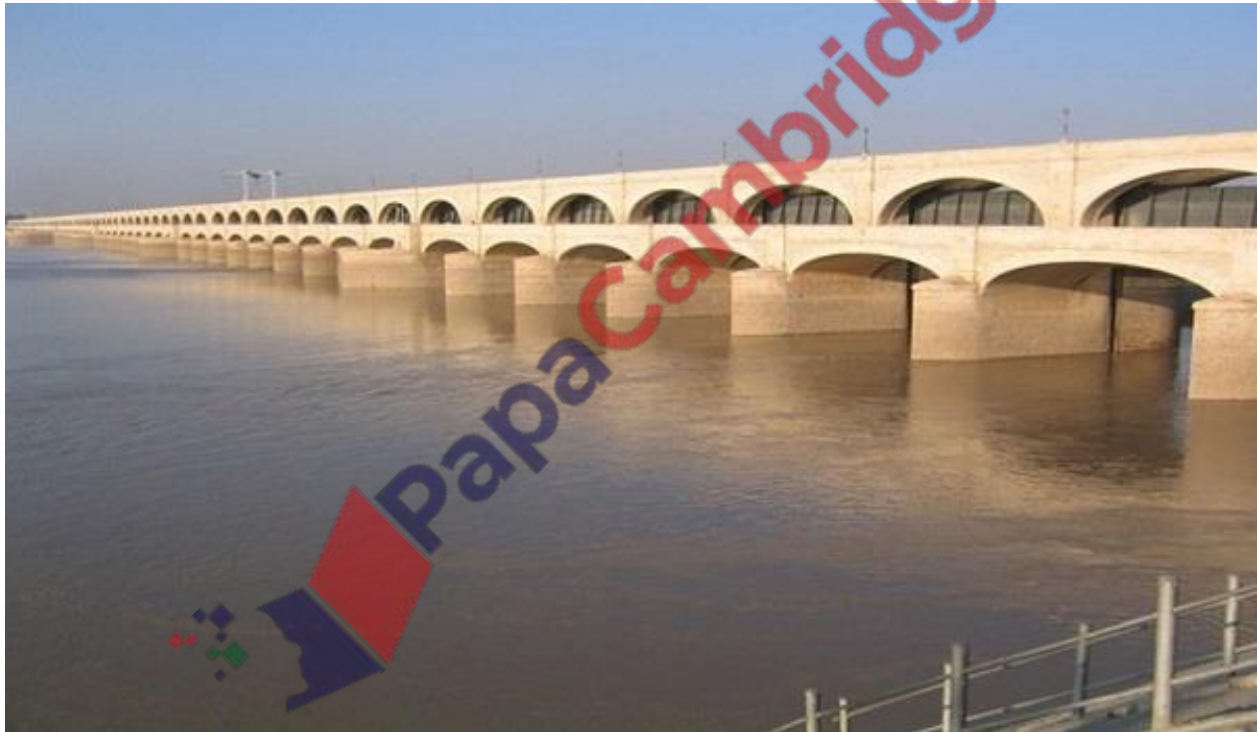
Tarbela Dam



Pakistan has two large dams (Tarbela and Mangla), while all other dams are either small or medium sized. Tarbela and Mangla are multipurpose dams which store water not only for irrigation but also for generating power. These dams have reservoirs because the dam wall holds up the water. Spillways are gates through which the water is allowed to go downstream due to either deficiency of water downstream or flooding upstream. A dam may break if it is filled beyond its capacity.

Both Tarbela and Mangla store water during the main rainy season (monsoons), which accompanies the melting of snow and ice (due to high temperatures in summers) in the Northern Mountains. The rainwater and melted snow drains into the rivers and ultimately ends at the reservoir.

Barrages



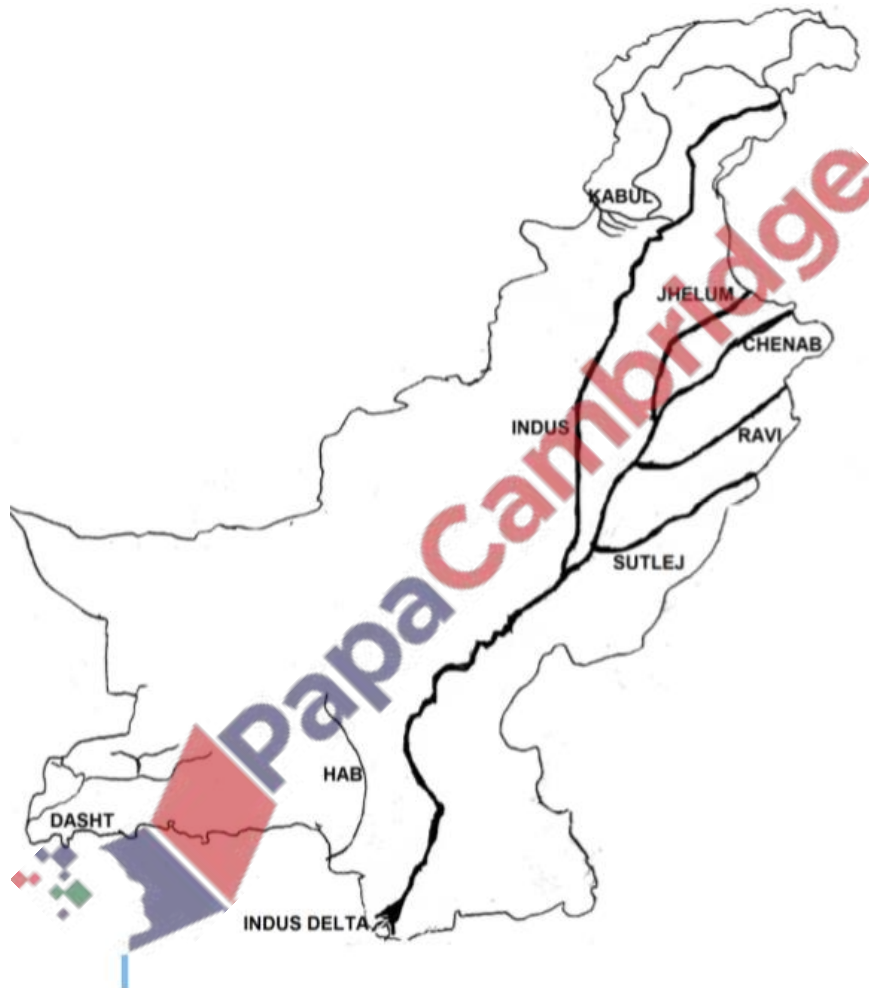
- Chashma barrage
- Rasul Barrage
- Marala barrage
- Qadirabad Barrage

Barrages are long structures similar to a dam. They divert water that is in the river into the canals. They have many dozens of gates, which either can be closed to create a lake with the embankments of a river serving as a container wall.

Or the gates of a barrage can be opened and allow water to continue its course in the river. Barrages have been built to transfer water between rivers via link canals, like

RasulQadirabad Link canal. Sukkur Barrage has 60 gates with total length of 4000 feet

INDUS WATER TREATY



After the partition of subcontinent the headworks (headworks of Madhopur on the Ravi and Ferozpur on the Sutlej were given to India). Canals from these headworks irrigated a vast area in southern Punjab

On April 1, 1948, India stopped the supply of water to Pakistan. Pakistan protested and India finally agreed on an interim agreement on May 1948. According to this the Pakistani government was to pay for the water it required. The agreement was not a permanent solution. Thus Pakistan approached the World Bank in 1952 to help settle the problem permanently.

Negotiations were carried out between the two countries through the offices of the World Bank. Finally an agreement was signed between India and Pakistan in September 1960. This agreement is known as the Indus Water Treaty.

This divided the use of water between the two countries. Pakistan obtained exclusive rights for the three western rivers, namely Indus, Jhelum and Chenab. India retained rights to the three eastern rivers; Ravi, Beas and Sutlej. The treaty also guaranteed ten years of uninterrupted water supply period during which Pakistan was to build huge dams, financed partly by long-term World

Bank loans, UK and USA aid and compensation money from India. Three multipurpose dams; Warsak, Mangla and Tarbela were built. Eight link canals were also built to transfer water from three western rivers into three eastern rivers. Five barrages were also made

- Chashma barrage
- Rasul Barrage
- Marala barrage
- Qadirabad Barrage
- Kotri barrage

Waterlogging and salinity



The rise of water table to the surface level is called water logging and the appearance of salty patches is called salinity.

It is mainly the outcome of canal irrigation in Pakistan. with the introduction of perennial canal water was available through out the year, resulting in the rise

of water table. salt in the soil also rise to the surface with water table.(water evaporate and salt deposited on the surface)
It effect 3.5 million hectares of agricultural land.

Solution

- 1) lining canal to control seepage of water
- 2) Canal closure on temporary basis so water can be use in the time of need only
- 3) Installing tube-wells to lower water tables
- 4) Planting Eucalyptus trees which roots absorb more water go deep down

