

PST

Class 10

Unit 6

Water resources

Q. Answer the following questions briefly.

1. Describe three positive impacts of water reservoirs on water issues

Following are the positive impact of water reservoir mentioned below.

Hydroelectric Power Generation: Dams and reservoirs produce hydroelectric power, providing a sustainable and renewable energy source. This reduces dependence on fossil fuels and helps meet the country's electricity needs.

Irrigation and Agriculture: Reservoirs store water for consistent supply to agricultural fields through canals, enabling multiple cropping cycles, improving productivity, and ensuring food security.

Flood Control: Reservoirs store excess monsoon water, reducing the risk of downstream flooding and protecting communities, property, and crops.

They also support drinking water supply, drought mitigation, and overall water management.

2. What is meant by expensive irrigation?

Expensive irrigation refers to the high costs involved in maintaining and operating Pakistan's large-scale irrigation infrastructure (canals, dams, barrages, tube wells, etc.).

The chapter mentions under Disadvantages of the extensive irrigation system that:

Maintenance of large irrigation infrastructure (canals, dams, pumps) is costly and requires frequent government investment.

It involves high energy consumption for pumping water, which increases costs.

Overall, the system is capital-intensive and places a heavy financial burden on the government.

3. Analyse the role of dams in flood control?

Positive Impact:

Dams and barrages store excess water during the monsoon season (July–September), when heavy rainfall and glacier melt cause high river flows.

This controlled storage prevents sudden downstream flooding, protects lives, property, and agricultural land.

Examples like Tarbela and Mangla dams help regulate water release.

Negative Impact

If poorly maintained or water is released at the wrong time, it can worsen flooding or damage river ecosystems.

Overall, dams play a critical role in flood mitigation by acting as buffers against seasonal extremes.

4. Define the following terms:**Salinity & Waterlogging**

Salinity: The accumulation of high salt content in the soil due to irrigation water (which naturally contains salts). Poor drainage causes salts to build up over time, reducing soil fertility and damaging crops. The chapter notes this as a major problem in areas with excessive irrigation.

Waterlogging: When the water table rises too close to the root zone of crops due to excessive irrigation and poor drainage. It damages plant roots by cutting off oxygen supply, leading to crop failure. It is listed as one of the key disadvantages of the irrigation system.

Both issues often occur together in Pakistan's irrigated areas.

5. List three advantages of Pakistan's extensive irrigation system

Advantages of extensive irrigation system:

Improved Agricultural Productivity: Provides a steady supply of water, enabling farmers to grow crops throughout the year and increase yields (multiple cropping cycles).

Food Security: Ensures consistent water for staple crops (rice, wheat), supporting Pakistan's growing population and reducing hunger risks.

Economic Development & Community Stability: Supports millions of rural livelihoods dependent on agriculture, contributes significantly to GDP, and reduces vulnerability to droughts and climate fluctuations.

Other advantages include hydropower generation, flood control, and crop diversification.

6. How does seasonal fluctuation affect the flow of water?

Monsoon Season (July–September): Heavy rainfall causes a significant increase in river flow (especially in Indus and its tributaries like Jhelum, Chenab, Ravi, Sutlej). This recharges reservoirs but can cause flooding.

Winter and Spring (October–April): Low rainfall and reduced snowmelt lead to a decrease in river flow. Water supply is limited.

Summer (May–June): Increasing temperatures cause glacier/snow melt, raising water flow in rivers and streams.

These fluctuations make water management challenging — excess in monsoon, scarcity in dry periods.

7. Any three suitable measures to reduce water wastage

Effective Irrigation Methods: Promote modern techniques like sprinkler and drip irrigation instead of flood irrigation to reduce water loss.

Usage of Rainwater: Encourage rainwater harvesting at homes and communities for domestic and groundwater recharge.

Education and Awareness: Run public awareness campaigns to promote water conservation and efficient use in agriculture and households.

Q answer the following questions in detail.

1. Write a Detailed Note on Surface and Groundwater Resources in Pakistan

Surface Water Resources

Surface water mainly comes from the Indus River System, which is the backbone of Pakistan's water resources.

i. Rivers

Indus River: Pakistan's largest and most important river. It originates from the Himalayas and has many tributaries (Jhelum, Chenab, Ravi, Bias, and Sutlej). It significantly contributes to surface water resources.

Jhelum River: A principal tributary of the Indus. It flows through Punjab and Azad Jammu & Kashmir. It is vital for irrigation and hydroelectric production.

Chenab River: Another major Indus tributary flowing through Punjab. It supports both electricity generation and irrigation.

Ravi River: Originates in the Himalayas. It plays a limited role in electricity and irrigation.

Sutlej River: Originates from Tibet. Its use is limited due to the Indus Water Treaty.

Bias River: Originates in the Himalayas but merges with the Sutlej on the Indian side before entering Pakistan.

ii. Dams

Tarbela Dam: One of the world's largest earth-filled dams on the Indus River. It serves multiple purposes — flood control, hydroelectric power, and irrigation.

Mangla Dam: Located on the Jhelum River. It is a major reservoir for water storage and electricity production.

Surface water is highly seasonal, with high flows during the monsoon (July–September) due to rainfall and glacier melt, and lower flows in winter and spring.

Groundwater Resources

Pakistan relies heavily on groundwater, especially in areas with limited surface water access. Tube wells and hand pumps are the main extraction methods.

Major Aquifers:

Indus Basin Aquifer: The greatest groundwater source in Pakistan. It covers the whole Indus plain and fulfills the majority of the country's agricultural water needs.

Baluchistan Plateau Aquifer: Vital for local residents in Balochistan. It promotes agriculture and supports survival in arid regions.

Punjab Aquifer: Major source of irrigation in Punjab. However, excessive extraction is causing dropping water tables and increased salinity.

2. What are the advantages of the Irrigation System of Pakistan

Pakistan has one of the world's largest irrigation systems, mainly based on the Indus River and its tributaries. Its advantages are:

Improved Agricultural Productivity

Reliable water supply allows multiple cropping cycles per year, dramatically increasing yields of crops like wheat, rice, cotton, and sugarcane.

Food Security

Consistent water supply ensures production of staple foods for Pakistan's rapidly growing population, reducing the risk of food shortages.

Community Stability

Reliable water reduces vulnerability of rural populations to droughts and climate fluctuations, supporting social stability.

Hydropower Generation

Dams within the system generate electricity, reducing dependence on fossil fuels.

Flood Control

Dams and barrages store excess monsoon water and help control floods (e.g., Tarbela and Mangla).

3. Evaluate the Importance of Different Types of Water Reservoirs in Obtaining Sustainable Solutions to Water-Related Issues

Water reservoirs (dams, barrages, etc.) are central to sustainable water management in Pakistan. Their importance can be evaluated through positive and negative impacts:

Positive Impacts / Importance:

Hydroelectric Power Generation: Provide clean, renewable energy, reducing reliance on expensive and polluting fossil fuels.

Irrigation: Store water for year-round supply, enabling consistent agriculture despite seasonal fluctuations.

Flood Control: Store excess monsoon water and release it gradually, protecting lives, property, and crops from floods.

Drinking Water & Domestic Supply: Ensure reliable water for households and industries.

Economic & Social Benefits: Support livelihoods, economic growth, and community development.

Negative Impacts (Challenges for Sustainability):

1. Disturbance of natural river flows and aquatic habitats.
2. Displacement of people and loss of agricultural land during construction.
3. Risk of water quality degradation if not properly managed.

Conclusion on Importance: Reservoirs are highly important for sustainable solutions because they help balance seasonal fluctuations, provide multiple benefits and support climate resilience.

4. Suggest Some Sustainable Solutions to Address Water Pollution, Water Shortage, and Water Waste in Pakistan

For Water Shortage:

1. Construct more small dams, ponds, and reservoirs.
2. Promote rainwater harvesting at household and community levels.
3. Adopt modern irrigation techniques (drip and sprinkler irrigation) to reduce losses.
4. Desalination plants along coastal areas.
5. Strict groundwater management to prevent over-extraction and promote aquifer recharge.

For Water Waste:

1. Line canals to prevent seepage losses.
2. Use water-efficient appliances and fix leaks.
3. Public awareness campaigns on water conservation.
4. Promote water-efficient crops and farming practices.

For Water Pollution:

1. Build facilities for treating wastewater and industrial effluents before discharge.
2. Regulate industrial pollution through strict laws and monitoring.
3. Reduce use of chemical fertilizers and pesticides in agriculture.

SLO-Based Questions with Answers

Chapter: Water Resources (Unit-06)

1. Define the following terms:

- a) **Aquifer:** An underground layer of rock or soil that holds groundwater.
- b) **Waterlogging:** Rise of the water table too close to the surface/root zone of crops due to excessive irrigation and poor drainage. It cuts off oxygen to plant roots and damages crops.
- c) **Salinity:** Accumulation of excess salts in the soil due to irrigation water and poor drainage. It reduces soil fertility and crop productivity.
- d) **Desalination:** The process of removing salt from seawater to make it usable for drinking and agriculture.

2. Name the major rivers of Pakistan and briefly describe the importance of the Indus River.

Major rivers: Indus, Jhelum, Chenab, Ravi, Sutlej, and Bias.

Indus River is Pakistan's largest and most important river. It has many tributaries and is the main source of surface water for irrigation, hydropower, and domestic use in the country.

4. Differentiate between Surface Water and Groundwater Resources.

Surface Water: Water present on the surface in rivers, dams, lakes, etc. Main source is the Indus River and its tributaries.

Groundwater: Water stored underground in aquifers. It is extracted through tube wells and hand pumps. Pakistan relies heavily on it for irrigation, especially in areas with limited surface water.

5. Identify the two major dams of Pakistan and mention their location and main purposes.

Tarbela Dam: Located on the Indus River. One of the largest earth-filled dams in the world. Used for irrigation, hydropower generation, and flood control.

Mangla Dam: Located on the Jhelum River. Used for water storage, electricity production, and irrigation.

6. State the main sources of groundwater in Pakistan.

Indus Basin Aquifer (largest and most important)

Balochistan Plateau Aquifer

Punjab Aquifer

Describe the seasonal fluctuations in the flow and quality of water in Pakistan.

Monsoon (July–September): Heavy rainfall causes maximum river flow and helps recharge reservoirs. Water quality may decline due to flooding and pollutants.

Winter & Spring (Oct–April): Low rainfall and reduced snowmelt lead to decreased river flow.

Summer (May–June): Glacier melt increases river flow.

These fluctuations create water scarcity in dry months and flood risks in monsoon.

7. Explain the importance of the Indus Basin Aquifer.

It is the greatest groundwater source in Pakistan. It covers the Indus plain and fulfills the majority of the country's agricultural water needs. It supports irrigation and drinking water supply for a large population.

8. Describe three positive impacts of water reservoirs (dams).

Hydroelectric Power: Generate cheap and renewable electricity.

Irrigation: Provide stored water for year-round farming.

Flood Control: Store excess monsoon water and prevent downstream flooding.

9. Explain why Pakistan's extensive irrigation system is the backbone of its agriculture.

Pakistan has one of the world's largest irrigation systems based on the Indus River. It enables multiple cropping, ensures food security, supports millions of farmers, and contributes heavily to GDP.

10. Explain the disadvantages of Pakistan's extensive irrigation system.

Waterlogging and Salinity

Over-extraction of groundwater leading to falling water tables

Expensive maintenance and high energy consumption

Unfair distribution and water theft

Environmental degradation and habitat loss

Evaluate the role of dams and reservoirs in solving water-related issues.

Positive Role:

Store water for irrigation and power generation

Control floods

Mitigate droughts

Negative Role:

Displacement of people

Sedimentation reduces capacity over time

Disturbance of river ecosystems

Conclusion: Dams are very important for sustainable water management but must be planned carefully with environmental considerations.

11. Suggest six sustainable solutions to water problems in Pakistan.

Promote drip and sprinkler irrigation to reduce wastage.

Rainwater harvesting at household and community levels.

Construct small dams, ponds, and check dams.

Treat wastewater before discharging into rivers.

Public awareness campaigns on water conservation.

Line canals to stop seepage and modernize the irrigation system.

12. Analyse how climate change affects water availability.

Climate change causes erratic rainfall, faster glacier melting, and longer dry spells. This increases seasonal fluctuations, leading to more floods in monsoon and severe shortages in dry seasons.

13. Compare advantages and disadvantages of the irrigation system.

Advantages: Higher crop yield, food security, economic growth, flood control.

Disadvantages: Salinity, waterlogging, high maintenance cost, environmental damage.

Balanced management is required for sustainability.

14. Discuss the importance of water management for sustainable development.

Good water management ensures food security, industrial growth, hydropower, and environmental protection. It is essential for Pakistan's economic progress and the well-being of its people.