

Water Resources

ENV 107

Freshwater is an irreplaceable Resource

- Access to water is
 - A global health issue
 - An economic issue
 - A women's and children's issue
 - A national and global security issue

Most of the Earth's Freshwater Is Not Available to Us

- **Hydrologic cycle**

- Movement of water in the seas, land, and air
- Driven by solar energy and gravity

- People divided into

- *Water haves*
- *Water have-nots*

We Use a Large and Growing Portion of the World's Reliable Runoff

- 2/3 of the surface runoff: lost by seasonal floods
- 1/3 runoff usable
 - Domestic: 10%
 - Agriculture: 70%
 - Industrial use: 20%
- Fred Pearce, author of *When the Rivers Run Dry*

Long-Term Severe Drought Is Increasing

- Causes
 - Extended period of below-normal rainfall
 - Diminished groundwater
- Harmful environmental effects
 - Dries out soils
 - Reduces stream flows
 - Decreases tree growth and biomass
 - Lowers net primary productivity and crop yields
 - Shift in biomes

Is Extracting Groundwater the Answer?

- *Groundwater that is used to supply cities and grow food is being pumped from aquifers in some areas faster than it is renewed by precipitation.*

TRADE-OFFS

Withdrawing Groundwater

Advantages

Useful for drinking and irrigation

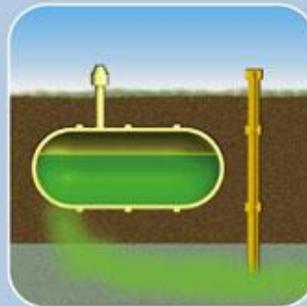
Available year-round

Exists almost everywhere

Renewable if not overpumped or contaminated

No evaporation losses

Cheaper to extract than most surface waters



Disadvantages

Aquifer depletion from overpumping

Sinking of land (subsidence) from overpumping

Aquifers polluted for decades or centuries

Saltwater intrusion into drinking water supplies near coastal areas

Reduced water flows into surface waters

Increased cost and contamination from deeper wells

Is Building More Dams the Answer?

- *Building dam and reservoir systems has greatly increased water supplies in some areas, but it has disrupted ecosystems and displaced people.*

Large Dams and Reservoirs Have Advantages and Disadvantages

- Main goals of a **dam** and **reservoir** system
 - Capture and store runoff
 - Release runoff as needed to control:
 - Floods
 - Generate electricity
 - Supply irrigation water
 - Recreation (reservoirs)

Large Dams and Reservoirs Have Advantages and Disadvantages

- Advantages
 - Increase the reliable runoff available
 - Reduce flooding
 - Grow crops in arid regions

Large Dams and Reservoirs Have Advantages and Disadvantages

- Disadvantages
 - Displaces people
 - Flooded regions
 - Impaired ecological services of rivers
 - Loss of plant and animal species
 - Fill up with sediment within 50 years

What is a Dam ?

Dam:An artificial barrier usually constructed across a stream to retain water for hydropower, irrigation, flood management, etc.

Kaptai Dam



What is a Barrage ?

Barrage: A structure built on a river mainly to divert its flow by closing gates. During flood the gates remain open and the barrage functions as a bridge.

Teesta barrage



Terminologies

Inundation: The overflow of waters at upstream lands may be occasioned due to placement of dam or other intervention (fringe area in the Kaptai reservoir). But often no distinction is made between flooding and inundation.

Water Logging: Prolonged water level setup at a depression due to absence of adequate drainage route (Beel Dakatia).

Drainage Congestion: Water level setup due to inadequate drainage opening or unfavourable downstream condition (urban drainage in Dhaka city).

Geographical location of Bangladesh

The geographical location and average land levels of Bangladesh are conducive to Flood, Erosion, Storm Surge

- **Average inundation 22%; 68% area inundated in 1998**
- **Over 3000 km river bank will be eroded by 2025**
- **About 1/4 th of the country susceptible to tidal surges**



Bangladesh

<https://chandrashekharasandprints.wordpress.com/2009/11/20/poisoning-bangladesh/>

References

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