



Water resources

Water resources:

- Use and over-utilization of surface and ground water
 - floods, drought, conflicts over water,
 - dams-benefits and problems
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Water resources

- Water is a very important renewable resource. Water plays an important part in sustaining biodiversity. It affects the climate of a place. About 71% of earth's surface is covered by oceans which contains about 97.4 per cent of the total water present on earth. The overutilization of water in irrigation can cause soil erosion and its degradation. Thus water management is important for crop yield and other activities. The continuous circulation of water from the earth to the atmosphere and back is called water cycle.



Water resources

- About 85 per cent of water from the available resources is consumed by Agriculture in India. The agricultural sector consumes maximum water worldwide. Only 8.5 per cent water is used for domestic and industrial purposes. Availability of water differs from place to place and time to time. In India bulk of rainfall happens during the monsoon period from July to October. Therefore for the large part of the year there is scarcity of surface water supply.

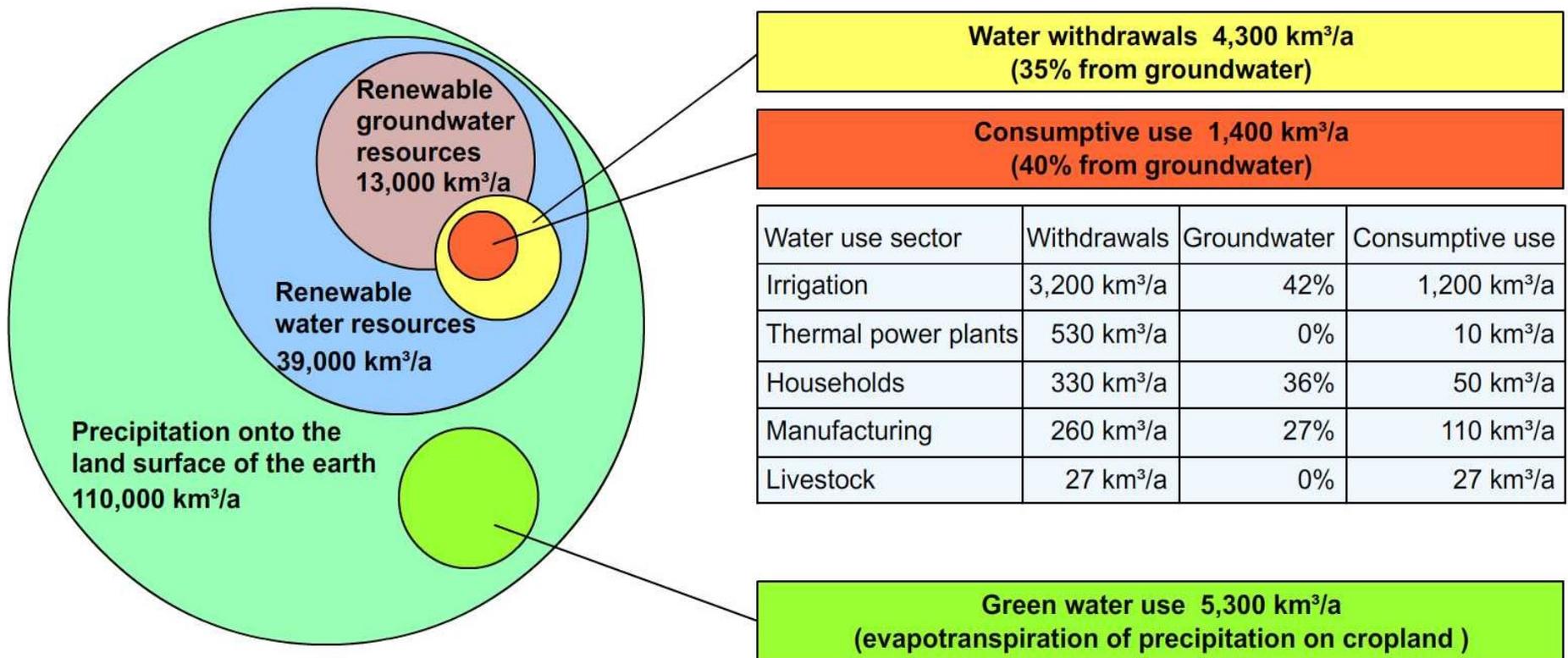


Water resources

Type of water source	Percentage of total water
Oceans and Salt Lakes	97.41
Fresh water	
• Ice Caps and Glaciars	1.984
• Ground water	0.592
• Lakes	0.007
• Rivers	0.0001

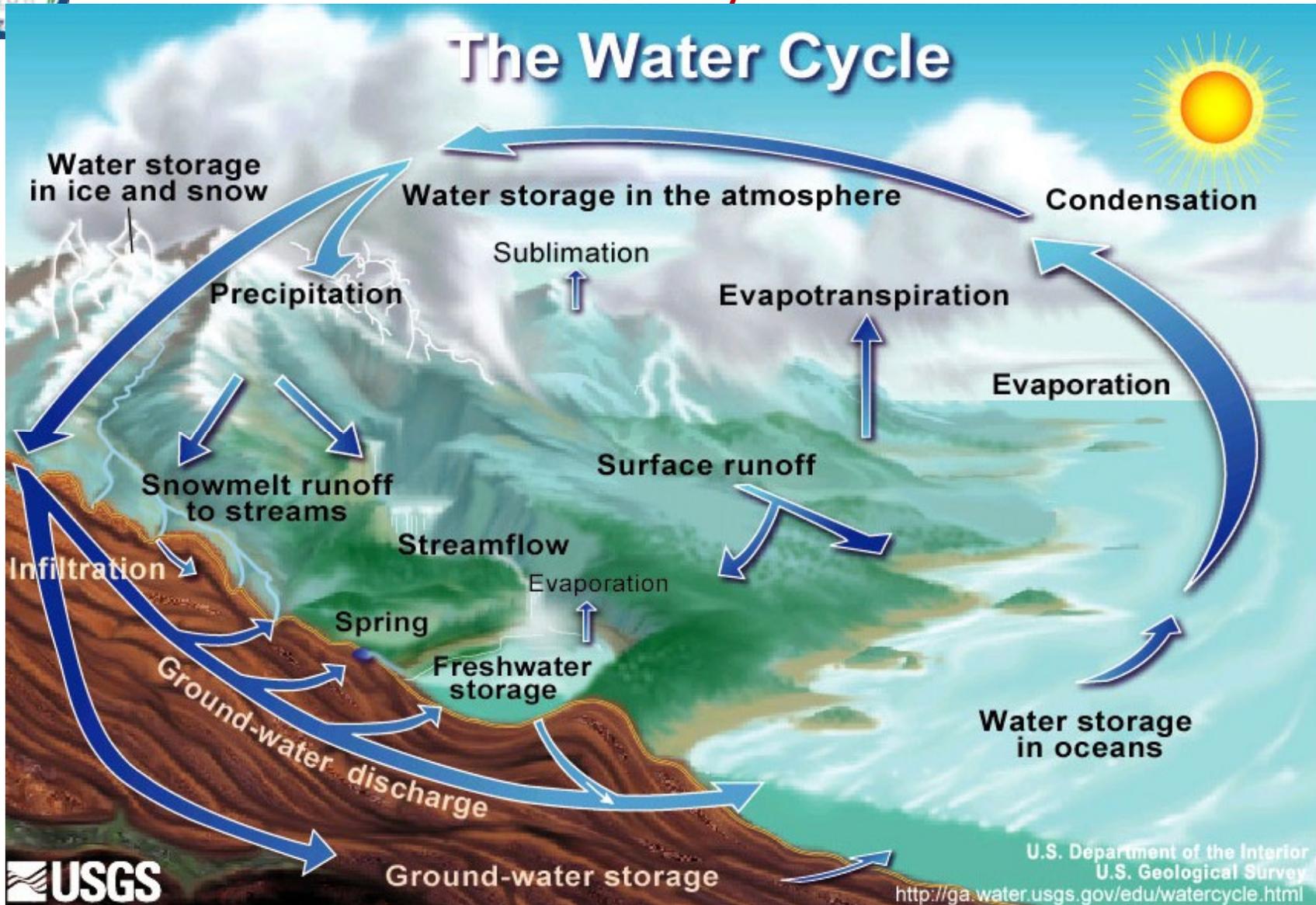


Global Values of Water Resources and Water Use



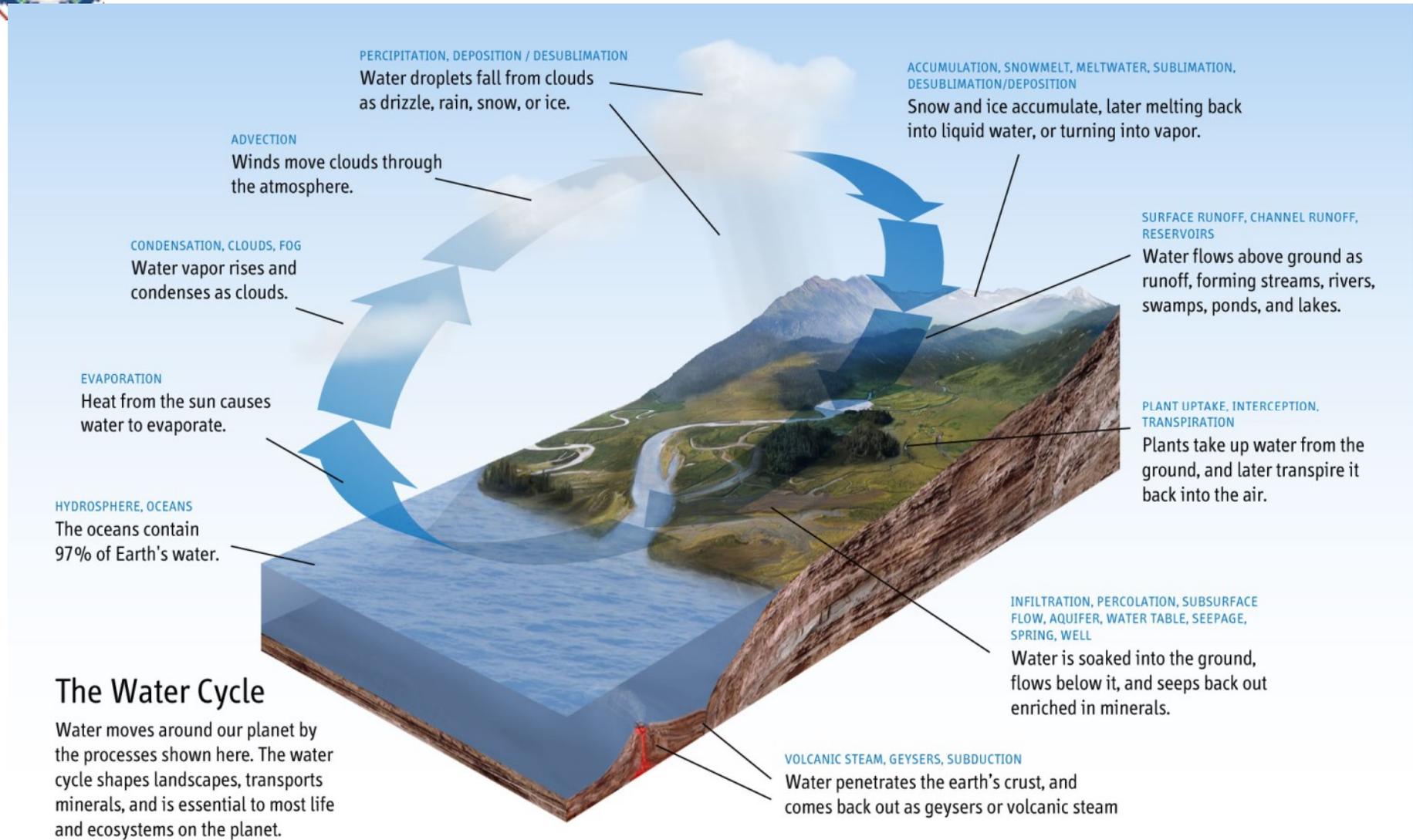


Water Cycle





Water Cycle



The Water Cycle

Water moves around our planet by the processes shown here. The water cycle shapes landscapes, transports minerals, and is essential to most life and ecosystems on the planet.



Indian Ocean





Antarctic Ice Cap





Glacier





Water resources

- Water is very important natural resource which forms the basis of life on earth. It is the most important requirement for the existence of life on other planets. Human beings use the water in daily life for different purposes. The demand of water in India is given in the following table.



Demand of Water In India

Sector	Demand of water (Billion Cubic Meters)			
	Year 2010	%	Year 2025	%
Irrigation	688	84.62	910	83.26
Drinking Water	56	6.89	73	6.68
Industry	12	1.48	23	2.10
Energy	5	0.62	15	1.37
Others	52	6.39	72	6.59
Total	813	100	1093	100

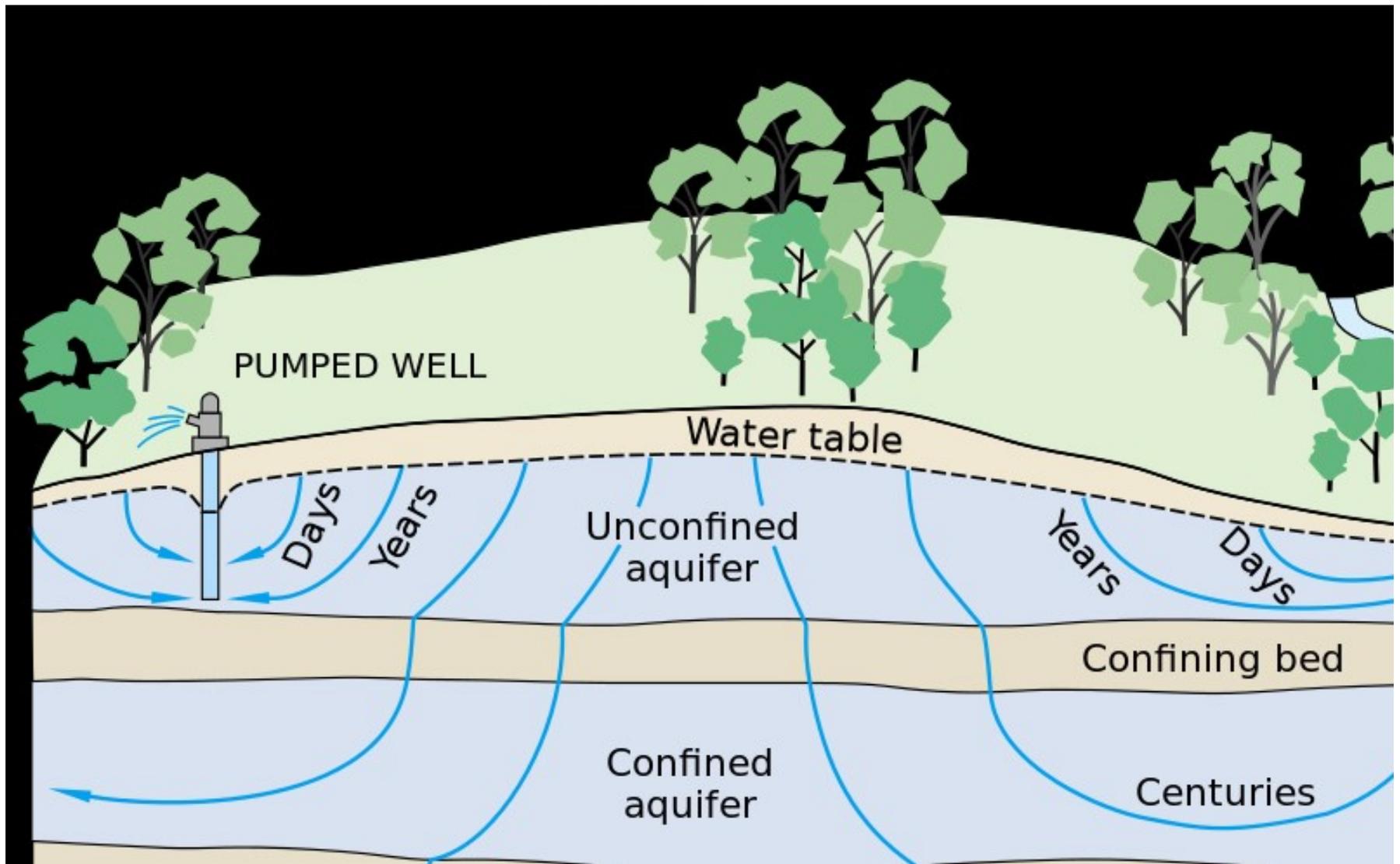


Groundwater

- About 9.86% of the total fresh water resources is in the form of groundwater and it is about 35-50 times that of surface water supplies.
- Till some time back groundwater was considered to be very pure.
- However, of late, even groundwater aquifers have been found to be contaminated by leachates from sanitary landfills etc.



Groundwater





Tubewell Irrigation





Effects of Over-exploitation of Groundwater

- Excessive pumping of ground water causes porous formations to collapse resulting in subsidence
- Heavy pumping can lower water table and cause shallow wells to dry-up
- Overuse of freshwater reservoirs along coast lines allows salt water to move into reservoirs degrading the water quality and making it unsuitable for domestic, industrial or agricultural purposes.



Surface water from Rivers & Lakes

- There is a very limited stock of usable water, 0.007 per cent surface water (rivers, streams and ponds) and about 0.6 per cent groundwater.
- Clean water is essential for healthy environment to support life systems on this planet. The sustainable use of available and exploitable water resources is most important for India as rainfall distribution is confined to 3–4 months in a year. Besides, global and local climatic changes occurring due to global warming, deforestation, loss of topsoil, etc. have harmful effect on the monsoon pattern in India.



Surface water from Rivers & Lakes

- India is fortunate to have good rainfall (average 200 cm in a year) but 70 per cent of it is wasted. Our country faces severe problems of floods, and droughts and highly polluted water resources. Therefore, it is necessary to do rainwater harvesting to store rain water.



Effects of Over-exploitation of Surfacewater

Overutilization of surface-water can cause

- Decrease in flow of water in rivers
- Drying of ponds and lakes specially during summers
- Reduction in wetlands and green lands
- Migration of public due to scarcity of water.



Rivers and Lakes in India





Lake





Layou River





Naini Lake, Nainital





Dal Lake, Jammu & Kashmir





Ganga River at Haridwar





Brahmaputra River





Chilika Lake





Floods

- A flood is an overflow of water, whenever the magnitude of flow of water exceeds the carrying capacity of the channel within its banks.



Causes Of Floods

- Heavy rainfall or sudden release of water from dams often causes floods in the low lying areas along rivers or coastal areas.
- Prolonged heavy rainfall can also cause the overflowing of lakes and rivers resulting in floods
- Reduction in carrying capacity of river channels due to accumulation of sediments or obstructions built on flood ways.
- Deforestation, overgrazing, mining increases the run-off from rains causing floods.
- Removal of dense forest cover over the hilly area leads to occurrence of floods.

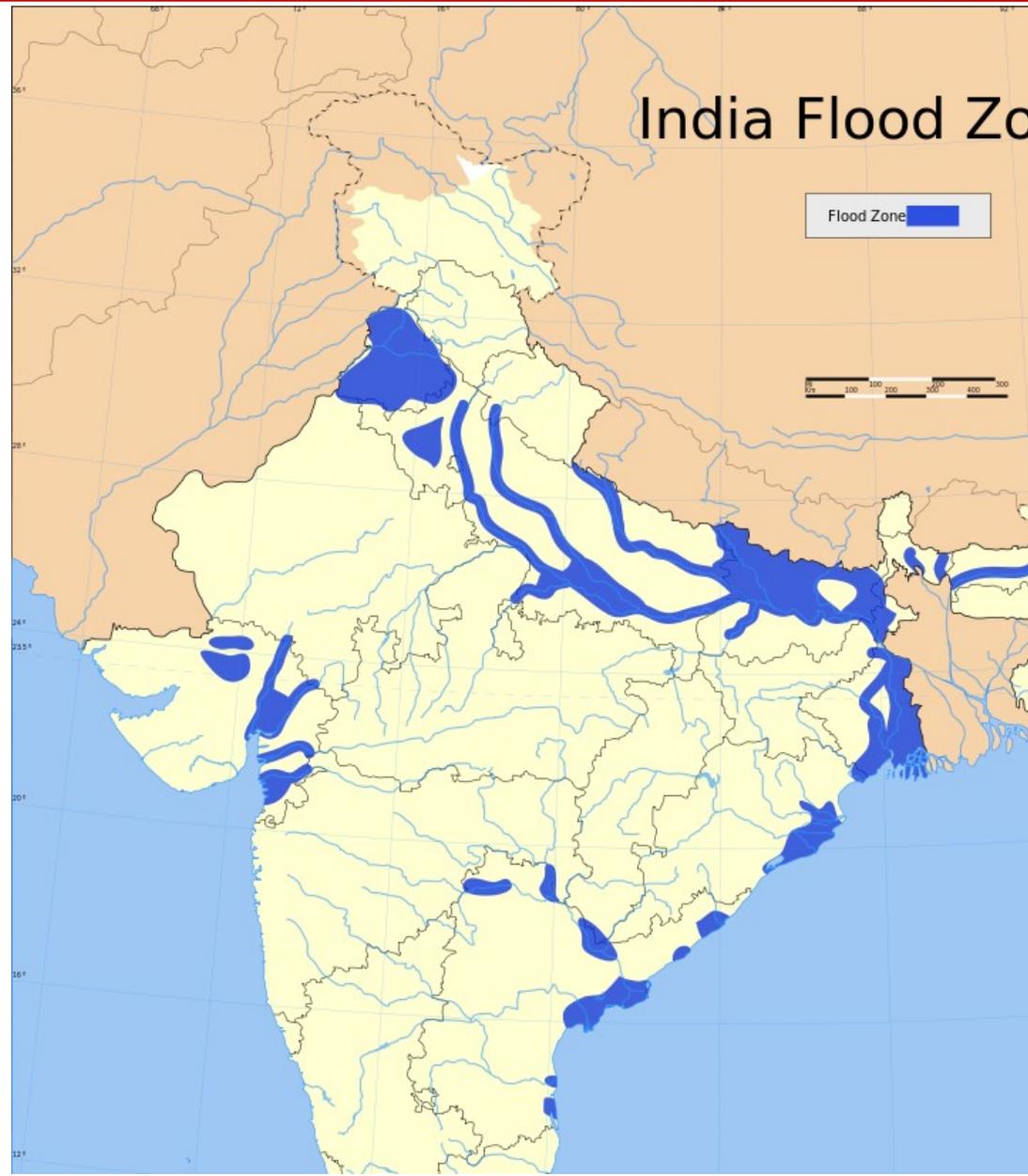


Effects Of Floods

- Water spreads in the low lying areas around the rivers and plains and submerges them
- Plain surfaces get eroded and silted with mud and sand thereby affecting cultivable land areas.
- Destruction of society in some coastal areas also occurs.



Flood Zones in India





Floods in India





Floods in India





Management Of Floods

- Floods can be controlled by constructing dams or reservoirs
- Channel management and embankments also control floods
- Encroachment of flood ways should be banned
- Flood hazard may be reduced by forecasting or flood warning
- Flood hazard may be reduced by reduction of runoff and this can be achieved by increasing infiltration through appropriate afforestation in the catchment area.



Droughts

- Drought is scarcity of water. Drought occurs due to:
- Inadequate rainfall
- Late arrival of rains and
- excessive withdrawal of groundwater
- Scarcity of water for normal needs of agriculture, livestock, industry or human population may be termed as drought.
- Drought is understood from dry weather which persists long enough to produce a serious hydrological imbalance, leading to damage of plants, animals and human life.



Droughts and Water Crisis





Drought





Types of Droughts

- Droughts are classified into four types:
- Meteorological Drought occurs when the total amount of rainfall is less than 75% of normal rainfall. This drought will be severe if the rainfall is less than 50% of the normal rainfall
- Hydrological Drought occurs when the total amount of rainfall is less than the average rainfall. It is generally associated with reduction of statistical average of water reserves available in the source such as aquifers, lakes and reservoirs.



Types of Droughts

- Agricultural Drought occurs due to the shortage as well as the timing of overall rainfall. This form of drought reduces groundwater and reservoir levels. Agricultural Drought affects cropped plants.
- Socio-economic Drought occurs due to reduction in the availability of food and social security of people in the affected areas. Socio-economic drought leads to famine.



Causes of Droughts

- When annual rainfall is below normal and less than evaporation, drought occurs
- High population also leads to drought. Population growth leads to poor land use and worsens the situation
- Intensive agriculture and over-exploitation of water resources by digging wells or bore-wells for high productivity has turned drought prone areas into desert.



Causes of Droughts

- Deforestation leads to desertification and drought. Deforestation leads to the top soil exposed to erosion by heavy rains, wind and the sun. Thus the top layer of soil rich in nutrients gets washed away making the soil unproductive. Eroded soils exhibit a droughty tendency.



Effects of Droughts

- Drought causes hunger, malnutrition and scarcity of drinking water. It also degrades the quality of drinking water
- Drought causes widespread crop failures leading to acute shortage of food thereby adversely affecting human and livestock populations
- Drought indicates the initiation of desertification
- Raw materials for agro-based industries are critically affected during drought thereby retarding industrial and commercial growth.
- Drought accelerates degradation of natural resources
- Drought leads to large scale migration to urban areas thereby creating slums.



Management of Droughts

- Indigenous knowledge in control of droughts and desertification is very useful for dealing with drought problems
- Rainwater harvesting program is very useful technique used to conserve water and control drought
- Construction of large capacity reservoirs is essential in drought prone areas



Management of Droughts

- Modern irrigation techniques (drip irrigation) is very useful to conserve water and avoid wastage
- Afforestation activities improve the potential of water in drought prone areas
- Mixed cropping and dry farming are suitable methods that minimize the risk of crop failure in dry and drought prone areas.



Conflicts over water

- Water is essential for our existence and is fast becoming scarce. Rapidly increasing population and limited water resources give rise to conflicts over water. Conflict through use: Unequal distribution of water leads to inter-state or international disputes.



Conflicts over water

International conflicts

- Conflict over water from the Indus between India and Pakistan
- Conflict over water from the Colorado river between Mexico and USA
- Conflict over water from the Shatt-al-Arab between Iran and Iraq
- Conflict over water from the Bhramaputra between India and Bangladesh



Conflicts over water

National conflicts

- Sharing of Cauvery water between Karnataka and Tamilnadu
- Sharing of Krishna water between Karnataka and Andhra Pradesh
- Sharing of Siruveni water between Tamilnadu and Kerala



Big Dams - Benefits

- Dams are constructed to store water for irrigation, hydroelectric power generation and flood control.
- Dams are used to control flood and store flood water
- Dams can also be used for diverting part or all of the water from river into a canals.
- Dams are used for agricultural purposes.
- An important use of Dams is for hydroelectric power generation
- Dams are also used for recreational purposes
- Navigation and fishery can be developed in the dam areas



Major Rivers and Dams in India





Tungbhadra Dam







Sardar Sarovar Dam





Big Dams - Benefits

- Dams can store huge amount of water. Hence reduce the danger of flooding.
- Generate electricity.
- Supply water for irrigation.
- Provide drinking water.
- Their reservoirs are a source of income for many and can also be used for swimming, fishing, boating, etc.
- They fulfill the demand for water and power shortage.



Big Dams – Problems

- Displacement of indigenous tribal communities.
- Loss of non-forest land
- Loss of forests, flora and fauna
- Landslides, sedimentation and siltation occurs
- Stagnation and waterlogging around takes place around dams
- Breeding of mosquitoes etc. and spread of vector-borne diseases like malaria
- Reservoir Induced Seismicity (RIS) causes earthquakes



Big Dams – Problems

- Water logging and salinity due to over irrigation
- Reduced water flow and silt deposition in rivers
- Salt intrusion at river mouth
- Since the sediments carrying nutrients gets deposited in the reservoir, the fertility of the land along the river gets reduced
- Due to structural defects or faulty design of the dam may cause sudden dam failure leading to collapse and destruction to life and property.
- Micro-climatic changes take place.

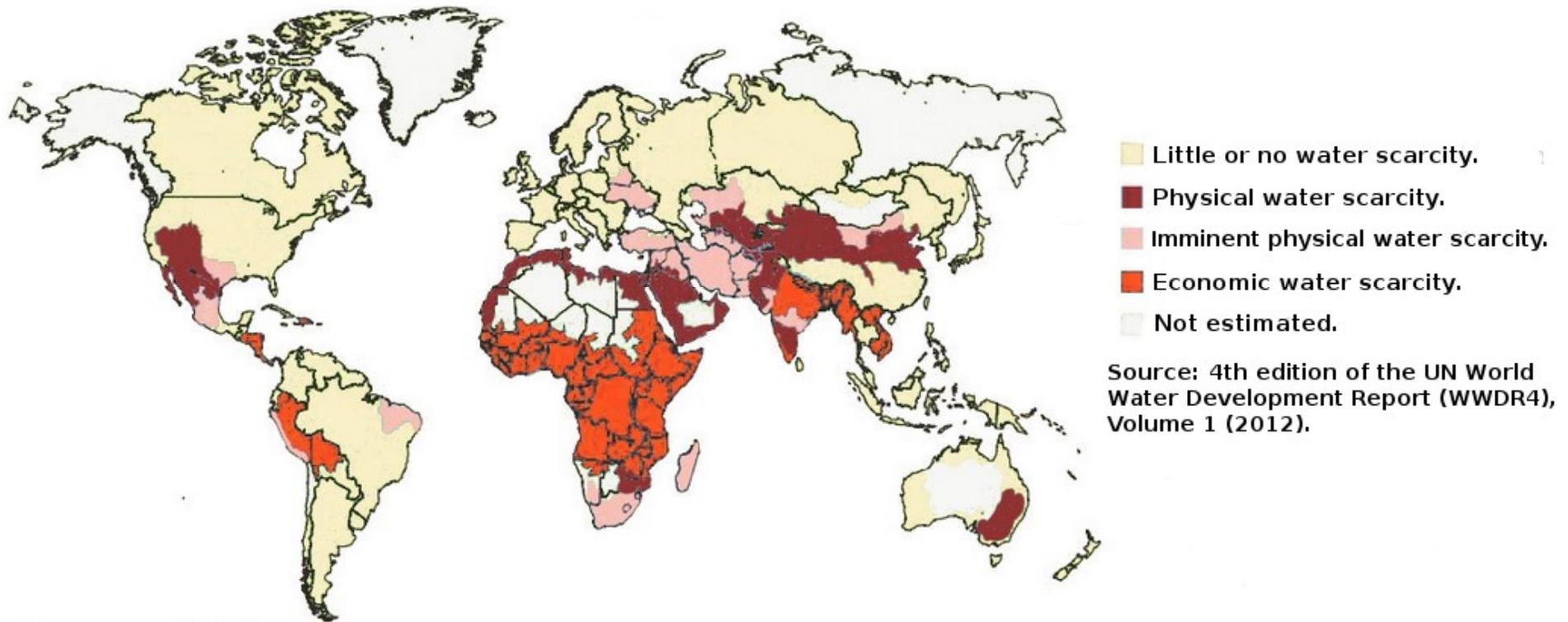


Big Dams – Problems

- Destruction of fertile agricultural land.
- They are very costly. Construction of the Tehri dam incurred costs as high as 3000 crores.
- Rehabilitation requires a lot of financial help as well as thousands of hectares of land for settlement of the displaced communities.
- They affect the migration and spawning of fishes.



Water Scarcity





Water Pollution





Geyser





The Great Geyser



10/31/2020

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