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Geography

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WATER RESOURCES

The main sources of fresh water are Surface water and Ground water. Let us first learn about supply and distribution of water resources.

Distribution and Supply

There are plentiful quantities of water available on the earth and less than one percent of it is liquid water. Most of the water is in oceans (approximately 325 million cubic miles) and it contains 35g/l of minerals, salts, hence it is unsuitable for drinking and irrigation and industrial purpose. The quantity of water is not declining, however, the requirement is increasing in a huge scale. Presently, world population is about 7.8 billion. The quantity of potable water is decreasing due to the contamination. We have already learnt that about 2.4 million cubic miles (10 million cubic kilometers) of the world's freshwater is available in aquifers located underground. Out of the remaining, 28,500 cubic miles (119,000 cubic kilometers) is from rain fall, 1,200 cubic miles (5,000 cubic km) from reservoirs, 21,830 cubic miles (91,000 cubic km) from lakes and 509 cubic miles (2,120 cubic km) are from rivers. The distribution of water is related with its political boundaries, economic development and wealth. Some countries are severely suffering with shortage of clean water for their overpopulation and cannot afford for necessary infrastructure to purify & transport and unable to meet the standards set by World Health Organization. As previously learnt, water never really diminishes away but changes its form. This can be explained by water cycle that has been already discussed in previous courses. However, here we will discuss briefly, how the movement of water takes place in and around the earth. The sun drives the entire water cycle and is responsible for its two major components: condensation an evaporation. When the sun heats the surface of water, it evaporates and ends up in the atmosphere as water vapor. It cools and rises, becoming clouds, which eventually condense into water droplets. Depending on the temperature of the atmosphere and other conditions, the water precipitates as rain, sleet, hail or snow. Some of this precipitation is captured by tree canopies and evaporates again into the atmosphere. The precipitation that hits the ground becomes runoff, which can accumulate and freeze into snow caps or glaciers. It can also infiltrate the ground and accumulate, eventually storing in aquifers. An aquifer is a large deposit of groundwater that can be extracted and used. This runoff also comes from snowmelt. Finally, some of this runoff makes its way back into lakes and oceans, where it is again evaporated by the sun. You have already learnt about the detailed

mechanism of water cycle in the block- Energy Flow and Material Cycling. Water cycle is a part of water distribution and supply. Potable water is available and collected either from underground water or surface water. Mostly, it is free from pathogens, chemical toxicants, colorless and free from suspended solids. Water from underground is accessed by bore well or drilling borehole. In general ground water is free from toxic chemicals and available in good quality but sometimes it may contain iron and magnesium salts due to anaerobic conditions. These will be removed by oxidation process by aeration. 37 Surface water is also accessed by pumping, canal system by building barrages Water Resources across rivers and building dam across a valley near catchment ar ea and before supply to the usage it will undergo purification in a treatment plant. 2.2.2 Surface and Groundwater Surface water is a body of water exist above the ground in a stream, river, lake, wetlands, reservoir, and ocean. Surface water constantly be a part of water cycle, where the water movement happens to and from the surface of the earth by the process of precipitation and evaporation and seepage of water into the ground. According to the EPA, about sixty eight percent of public water system source is from a surface water. The surface water resources are useful for performing vital functions for the environment and human beings. Most of the fresh surface waters systems assist ecosystem functions and provide habitat for diverse plant and animal species. Surface waters also support number of human uses, such as potable water, livestock, irrigation, sewage treatment, industrial uses, hydropower, and amusement. Fresh surface waters also determine the extent and condition of various available water resources, which includes ground water, wetlands, rivers and coastal systems. Ground water, which is accessed by drilling borewells, because water is present inside the rock pores and spaces under the ground surface. The surface water and ground water depend on each other for replenishing because surface water will seep down to reach underground to replenish ground water, whereas ground water can resurface upwardly on the ground to recharge surface water bodies, such as springs. Both are inextricably linked with each other. Surface water is classified in to three types. Firstly, perennial water bodies, in which surface water is available throughout the year and also recharge the ground water. Secondly, ephemeral, in which water is available only in some seasons, such as lagoons and creeks. Thirdly, man-made surface water structures such as constructed dams and wetlands. Monitoring surface water can be done by both satellite imagery and surface measurements. The rate of flow can be measured by calculating the quantity of water flowing down per unit of time. Monitoring surface water and vegetation around it helps to regulate the impact of anthropogenic activities and

climate change. The extent of surface water provides the information about stressors of environment and human beings such as withdrawal for drinking purpose, irrigation and industrial usage, point source & non-point source pollution, air deposition and removal of ground water. It also depends on the design of drainage, quantity of precipitation, duration of precipitation, melting of snow and rate of evaporation. Other monitoring indicator is the condition of water such as physicochemical and biological indicators like temperature, salinity, nutrients, contaminants and pathogens. In case of ground water, the extent is available measurable quantity with reference to volume that indicates thickness of aquifer. The extent is depending on depletion of aquifers, dry perennial streams, salt water intrusion and withdrawal of ground water. This can lead to soil erosion, floods and alter the aquatic ecosystems. The condition of ground water depends on physicochemical properties like flow pattern, direction & chemical contaminants, speed, bacteria, virus and pathogens. The condition of ground water is affected by stressors like pesticides, fertilizers, mining operations and sometimes unintentional release of chemicals and affect the quality of available water and ecosystem. In spite of all these ground waters is a significant resource of water particularly in the regions where less water supply or non-available surface waters. Ground water is comparatively clean and dependable and drawn in the dry seasons with less pollution.