

INTRODUCTION

HYDROLOGY AND WATER CYCLES, DYNAMICS OF POND WATER

MANAGEMENT

Water covers about 75% of the earth surface and it accounts for about 35% of the world's plant production. Aquatic system contributes nearly 80% of the world's animal production. Freshwater contribute about 0.31%. Many of the large rivers of the world lie in the tropical and sub-tropical zones. While oceans, seas, and saline water constitutes 97.69% and few usually contains higher nutrient concentrations than the sea water

WATER

Water is a universal solvent. Water composition constitutes dilute solutions of alkali and alkaline earth bicarbonate and carbonate, sulphate and chloride, with variable quantity of largely not dissociated silicic acid which is often present in excess of sulphate and chloride.

There are also a number of minor constituents in true solution, some of them being of great biological interest and a variety of colloidal materials, both inorganic and organic. Several gases are also found in natural water. Water contains larger or smaller concentration of all elements found in the earth crust and in the atmosphere. Furthermore, most of the organic compounds synthesized by living organisms may be found in water. Some of the more common substances found in water are:

Gases

The gases that can be found in dissolved form in water include oxygen, carbon dioxide, nitrogen, ammonia, hydrogen sulphate and methane.

Mineral Constituents

Mineral constituents of water include calcium, magnesium, sodium, potassium, iron, manganese, aluminium, zinc, copper, molybdenum, sulphur, chlorine, fluorine, iodine, boron and silicon. These elements are usually present as ions or complex organic or inorganic molecules. Soluble organic

Soluble Organic Matter

Water soluble organic matter include sugar, fatty acids, humic acids, tannin, vitamins, amino acids, peptides, protein, plant pigments, urea and many other biochemical compounds.

Suspended Inorganic Matter

The suspended inorganic matters in water include colloidal clay and coarse suspension of soil particles. Colloidal or suspended particles are remains of organism in various stages of decay, living phytoplankton, zooplankton, fungi and bacteria.

TYPES OF WATER

1. Lotic: flowing water e.g. rivers and streams
2. Lentic: static or stagnant water e.g. ponds and lakes.

HYDROLOGY

This is the study of the geological, chemical, physical and climatical aspect of water resources, aims at funding, mobilizing and regulating water for domestic irrigation and hydroelectric purposes. But geological factors and the chemical, physical conditions decide the environment for aquatic organism, and much of hydrology is necessarily included in limnology.

SCOPE OF HYDROLOGY

Hydrology is a very broad science; it is an inter-disciplinary science, because it borrows heavily from many other branches of science and integrates them for its own interpretations and uses. The branches of science required for hydrological investigation are: physics, chemistry, biology, geology, fluid mechanic, mathematics, statistics and operation research. Hydrology in the atmosphere cuts across the domain of hydrometeorology, meteorology and climatology. In the hydrometeorology; it is beyond the domain of pohanology (surface stream), limnology (lakes), cryology (snow and ice), glaciology and oceanology.

Also, in the lithosphere, hydrology relates to agronomy, hydrogeology and geomorphology. It also affects plants and animals; therefore it extends to Plant ecology, Agriculture, Forestry, Watershed management, Fish and Wildlife preservation, Insect control, Coastal works etc.

RELEVANCE OF HYDROLOGY

The subject has its application in Fisheries, Public health and Water pollution. Hydrology is confined to study of Geology, Chemistry, Physical and Climate aspect of water, resources, aims at finding, mobilizing and regulating water quality for domestic, irrigation and hydroelectric purpose.

The course is of economic important in the tropical Africa.

1. Most of the large lakes and rivers are the most convenient means of communication across great expanses of difficult countries. Even now, railways, motors and air routes, ship still provide transportation on long stretches of Lake Victoria, Tanganyika, Malawi, River Nile, Zaire and Niger.

2. Extraction of Minerals: most marine beaches are depository of useful heavy minerals like Earnet, Rutie, gold, Titanium, Platinum and common salt, calcareous shell deposit and mineral.
3. Fishing and agriculture using this water for irrigation which enables the world to provide food. Though aquatic habitat provide 35% of the world's production. Production contributes nearly 80% of the world animal both for domestic and commercial use using modern advance methods.
4. Also serves as power source for hydroelectric power generation to operate hydroelectric generating plant, also to turn Turbines and other thermos.
5. provide employment directly or indirectly for researches and teachers who teach basic bio-subjects such as evolution of fauna and flora in term of zoology, ecology, nutrient cycle, physiology and brioche changes
6. Man is able to study the cause and cure of certain disease of man and animals caused by aquatic organism (water borne bacteria infections) i.e. relevance of limnology to tropical health is verified.
7. Man study the aquatic habitat for easy manipulation in term of drinking water, fish continuing having studied the physiochemical and zoogeography of aquatic.
8. life start in water, hence the study of aquatic habitats or organism to truce its origin, to know about the living surface and factors that make its very existence a reality and to know the populations of others animals and compare their relative abundance in term of number, size weight and length in relation to age and growth and interdependence for food

9. Economically, water serves as a source of attraction to tourist locally and internationally generating revenue. Also provide Man one of the high ranked protein - fishing also supply a poly unsaturated fatty acids, easily digested. The game of fish is another interesting aspect as different people from different parts of the world display different sizes fish to different quality.
10. For scientific purpose in developing a mathematical models as relationship or parameters are expressed in mathematical formula using computers e.g. relationship between temperature and oxygen. Technologically, study angles had enable man to modify its mode of living making boats, ship, and borer and to contain his body to even swim like fish.

HYDROLOGICAL CYCLE

Hydrological cycle is simply the whole continuum of water circulation. Water in liquid and solid form covers most of the crust of the earth, and by complex process preserved by gravity and the action of solar energy; an endless exchange of water in vapour, liquid and solid forms takes place between the atmosphere, the oceans and the earth crust. Water circulates in the air and in the ocean as well as over and below the surface of the land masses.

Therefore, hydrology cycle has no beginning or end, water evaporates from the oceans and land and becomes a part of the atmosphere, the evaporated moisture lifted and carried into atmosphere until it finally precipitated to the earth; either on land or in the oceans. The precipitated water may be intercepted or transpired by plants, or may run over the ground surface and into the stream, or may infiltrates into the ground. Much of the

intercepted and transpired water and the surface run-off return to the air through evaporation. The infiltrated water may percolate to deeper zones to be stored as ground water which may later flow out as springs or seep into the streams as run-off and finally evaporates into the atmosphere to complete the hydrological cycle. Thus, the hydrological cycle undergoes various complicated processes of evaporation, precipitation, interception, transpiration, infiltration, percolation, storage and runoff.

The amount of evaporation, precipitation, runoff and hydrological qualities are not evenly distributed on the earth either geographically or moment.

About 70% to 75% of the precipitation is returned to the atmosphere by evapotranspiration and direct evaporation while the remaining 30% becomes runoff. About $\frac{1}{4}$ of the runoff is diverted, $\frac{2}{3}$ of the diverted is fed back into the stream and eventually goes to the oceans for storage and evaporation, and the remaining $\frac{1}{3}$ is consumed and return to the atmosphere directly.

The quantities of water going through any arc of the hydrologic cycle can be evaluated usually by the hydrologic equation which simply states as **$I - O = \Delta S$** .

Where I is the total inflow of water during a given period of time in a given area, and the total precipitation over the area during the period.