FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

WATER:
The Engine of Life on Planet Earth and Driver to Sustainable Development Goal

By

PROF. REUBEN JIYA KOLO
B.Sc. (Zaria), M.Sc. (Ibadan), PhD (FUTMinna)
Professor of Water Resources, Aquaculture and Fisheries Technology

INAUGURAL LECTURE SERIES 48

8TH DECEMBER, 2016

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

WATER:

The Engine of Life on Planet Earth and Driver to Sustainable Development Goal

By

PROF. REUBEN JIYA KOLO
B.Sc. (Zaria), M.Sc. (Ibadan), PhD (FUTMinna)
Professor of Water Resources, Aquaculture and Fisheries Technology

INAUGURAL LECTURE SERIES 48

8TH DECEMBER, 2016

This 48th Inaugural Lecture was delivered under the Chairmanship of:

Professor M. A. Akanji, FNSBMB, FAS
Vice-Chancellor
Federal University of Technology, Minna

Published by:
University Seminar and Colloquium Committee
Federal University of Technology, Minna.

8th December, 2016

Design + Print:
Global Links Communications, Nigeria
✆: 08056074844, 07036446818

PROF. REUBEN JIYA KOLO

B.Sc. (Zaria), M.Sc. (Ibadan), PhD (FUTMinna)

Professor of Water Resources, Aquaculture and Fisheries Technology

INTRODUCTION

I give thanks to God for inserting this memorable day in His calendar for my life on this planet, earth. I stand before you all to present/communicate to you the concise summary of my research work over the past thirty years of my academic career. I have chosen **'Water- the engine of life on planet earth'** because of its universality and importance to life. My lecture is going to be in four major parts: - 1. Water as a resource. 2. Resources in water. 3. The role of water in plant, animal and human life. 4. My contribution in the area of water research.

It is needless for me to define water at this forum. The origin of water on the Earth's surface, as well as the fact that it has more water than any other rocky planet in the Solar System, are two of long-standing mysteries concerning our planet. However, I will like to bring to your attention the Bible account of the origin of water, water bodies and rain.

"In the beginning God created the heaven and the earth. And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters".

"And God said, let there be a firmament in the midst of the waters, and let it divide the waters from the waters. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament: and it was so".

"And God said, let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. And God called the dry land Earth; and the gathering together of the waters called he Seas: and God saw that it was good". (Genesis 1: 1,2,6,7,9,10) KJV.

"These are the generations of the heaven and of the earth when they were created, in the day that the LORD God made

the earth and the heavens, And every plant of the field before it was in the earth, and every herb of the field before it grew: for the LORD God had not caused it to rain upon the earth, and there was not a man to till the ground. But there went up a mist from the earth, and watered the whole face of the ground". (Genesis 2: 4, 5, 6) KJV.

From the foregoing quotations, it is believed that water is a creation of God and therefore a natural resource whose benefits to mankind and all other living things have never been doubted, hence the increase in the intensity of drumming of the slogan, 'Water is life'. It is often said, "water has no enemy", which means that whether you like it or not you will use water in one form or another in the course of living a normal life.

When a leaf falls from a tree, it withers and dries up because it is separated from the tree which is its source of water – source of life. There is no living organism, humans, animals, plants and micro-organisms that can survive without water. There is no life without water, because water is life. An organ in the human body, tissues, cells or organs will begin to degenerate, wither and eventually die off when there is lack of water in the body for a long period of time. Water is the driving force in the transportation of nutrient materials, oxygen, other gases, blood cells and in the elimination of waste products and carbon-dioxide. Water is so important that human beings cannot ignore it despite the saying that some people or things are 'termed' hydrophobic.

The issues of clean, safe and adequate water have become so important that UNESCO made water education as one of her priorities theme in her phase 8 **(2012 – 2016)** strategic plan. Water education is being advocated in all quarters ranging from illiterate through to primary, tertiary institutions and government agencies. The curriculum for water education to be incorporated into post primary education has been drawn, all because of the importance of water. The establishment of

UNESCO Category II Regional Water Resources Research Centre with its Headquarters at the National Water Research Institute (NWRI), Kaduna shows the premium placed on water for all the international organizations.

1. WATER AS A RESOURCE

A resource is defined as something of value or that can bring about something of value. Water as a resource has been used and could be use in several facets such as domestic chores (drinking, washing of clothes, dishes, flushing toilets, cooking, sanitary purposes etc); industries, hydro-electric power generation; transportation; waste disposal; agricultural production (irrigation, aquaculture, horticulture, animal husbandry); recreational (boating, fishing, swimming); natural habitat for aquatic life (plants, animals, especially fishes); and other natural resources (salt, sand, minerals mud); ecological importance as its serves as a link and also as a separating medium between the continents of the world. Water as a resource is also of spiritual importance to some religious worshippers (i.e. Osun worshippers, Celestial church, etc). Some people believe on the healing virtue of some natural water bodies. For example, some pilgrims to Israel wash themselves in the Dead Sea purposefully for healing of their ailments, while some do water baptism by immersion in River Jordan and other rivers in our country. In Islam some believe that "Ruwan bagaja" heals.

Water is a natural resource which make up oceans, seas, lakes, rivers, streams, springs, icepacks, ponds, precipitation, aquifers, wells, pools, lagoon, estuaries, creeks, snow and dew. Stream water is also a renewable resource to some extent through constant supply in form of rainfall, dew and snow.

2 RESOURCES IN WATER

The resources in water deal with the physical composition/components of water bodies. The physical composition of water bodies could be grouped into two parts: -

(a) The living components which consist of plants and animals.
(b) The non-living components which range from total suspended solids, soluble or dissolved solids, sand, mud through to dead decaying logs of woods or organic matter.

The living components which could be plants and animals are further grouped into microscopic plants and animals. The microscopic groups are generally called plankton, which is sub-divided into phytoplankton- plant-like microscopic organisms and zooplankton- animal-like microscopic organisms.

The phytoplankton are the primary producers of any aquatic ecosystem because they are the group of organisms that can manufacture their own food through the process of photosynthesis. They also serve as food for the higher organisms in the aquatic (water) ecosystem. Examples of groups of phytoplankton are the Bacillariophyceae, Chlorophyceae, Cyanophyceae, Desmideaceae etc. The zooplankton which are animal-like microbes feed on the phytoplankton. However, they in turn serve as food for the higher organisms. Typical examples of zooplankton groups are Copepods, Cladocerans, Rotifers, Protozoans etc.

Water bodies also sometimes contained higher plants generally called aquatic macrophytes. The aquatic macrophytes could be divided into floating, submerged, rooted emergent and rooted sub-emergent macrophytes. The plant components of water bodies are sometimes referred to as aquatic flora.

2.1 The animal components

The animal components of the water bodies range from minute worms to higher mammals such as Hippopotamus. These are grouped into sedentary, clinging and free-swimming. In these groups we have the bacteria, worms, insect larvae, insects, snails, fishes, reptiles, amphibians and mammals. The animal

components of the water bodies are generally referred to as aquatic fauna.

There are group of animals in the aquatic ecosystem that live close/or in water overlying the sediments of the water bodies. They are referred to as benthic organisms or benthos.

The plant and animal components of the aquatic ecosystem both interact and form what we call food chain or food web which is the feeding relationship or energy transfer between them.

2.2 The non-living components of water bodies

This component ranges from total dissolved solids, total suspended solids through to dead log of wood in the water bodies. This also includes benthic sediments which in turn consist of decaying organic matter such as decaying leafs, dead decaying animals, decaying plants, logs of woods, sand, mud, and minerals- such as 27 minerals contained in the sediments of the Dead Sea. All these physical components of water bodies influence the quantity and quality of the water bodies, which brings us to the issue of water chemistry.

2.3 Water chemistry - The physico-chemical parameters of water bodies

Water is known as a universal solvent because it can dissolve almost all the compounds known to man. Its acceptance, reactions, effects, behaviour to compounds, elements, its properties and characteristics is what is referred to as water chemistry. There are some basic properties of water which influences the chemistry of water bodies. These basic properties include water density, latent heat of fusion, and latent heat of vaporization, surface tension, solvent action/properties, and viscosity. Other physico-chemical parameters of water bodies include water temperature, dissolved oxygen, hydrogen ion (pH), BOD, COD, hardness, alkalinity, electrical conductivity, carbondioxide, etc. Heavy metal composition also affects the chemistry of water. Some of them are essential (beneficial) metals while some are deleterious (poisonous). They could also