



Full Length Research Paper

Environmental Pollution and Sustainability

*Dr. Engr. Gana A. J., COREN Regd, MNSE, MNICE, Istructe Lond (U.K.) ICE Lond (U.K) and
Engr. Toba A. Peter

¹Civil Engineering Department, College of Science and Engineering, Landmark University, Omu-Aran, Kwara State.

²Civil Engineering Department, Federal Polytechnic Bida, Niger State

Corresponding author's e-mails: phildebo123@gmail.com, doctorgana@yahoo.com

Abstract

Today, all over the world there is a great concern and worry as to what will become of the earth, considering the inherent effect of the ever increasing environmental pollution that has adversely distorted the ecosystem, thereby spurring but the international communities, the government, generation public, cooperate bodies, policy makers, professionals and even politicians to take adequate measures aimed at addressing environmental problems. This paper discussed on environmental pollution and sustainability. It presented what our environment is made up, its ever-increasing problems and challenges facing our environment from different perspective. The purpose of this paper is timely; with a consideration that due action is ripe for the proper implementation of environmental planned strategies (Techniques) and tools for addressing environmental menace in different part of the world, by different government, public and private sectors. The obtained results in this paper are rich enough to provide adequate solutions to many environmental problems in different parts of the world, especially in African countries.

Keywords: Environmental Pollution, Sustainability.

INTRODUCTION

The arrival and reproduction of man on earth has caused a lot of impact and havoc on the Biosphere (environment) which supports life and sustains various human activities. Due to man unchecked actions, for example large scale deforestation of forest for residential and agricultural land uses has changed the habitat organism living in the forest. The hunting of animal by man as led to the extraction of certain animal species. Man has also developed new types of domesticated animals as well as plants to serve his own needs.

The rapid increase in activates today in many cities without proper planning and control is the outcome of slums that has penetrated in our physical environment. This is evident particularly in housing sector, transport, water supply, sanitation, power supply and even in employment sector. Those that are presently not employed are equally polluting our environment by engaging themselves in different harmful activities (stealing, pollution, idleness, Etc.) since there is nothing to keep them busy always in the society. The problem of environmental degradation and pollution of water, air, and

noise is always on high increase in many cities without proper check, which evidently has resulted in low standard of living in many of our cities and town in Africa.

DISCUSSION ON ENVIRONMENT AND POLLUTION

Environment

The word "environment" may mean different thing to different people. Scientifically, the Physical, environment is different from social or economic. Environment means" that which surround or that which envelop the earth and it consist of the entire ecosystem. Scientifically, the four spheres or division of the earth VIZ:- Lithosphere, Hydrosphere Biosphere, and Atmosphere. This could be broken to include the water body and life therein, landmass, forests, grassland, deserts, animals, man himself and all the interactions taken place among those group. Environment is also defined as the circumstances surrounding or regions in which everything exist. Everything external to the organism is included in it. It

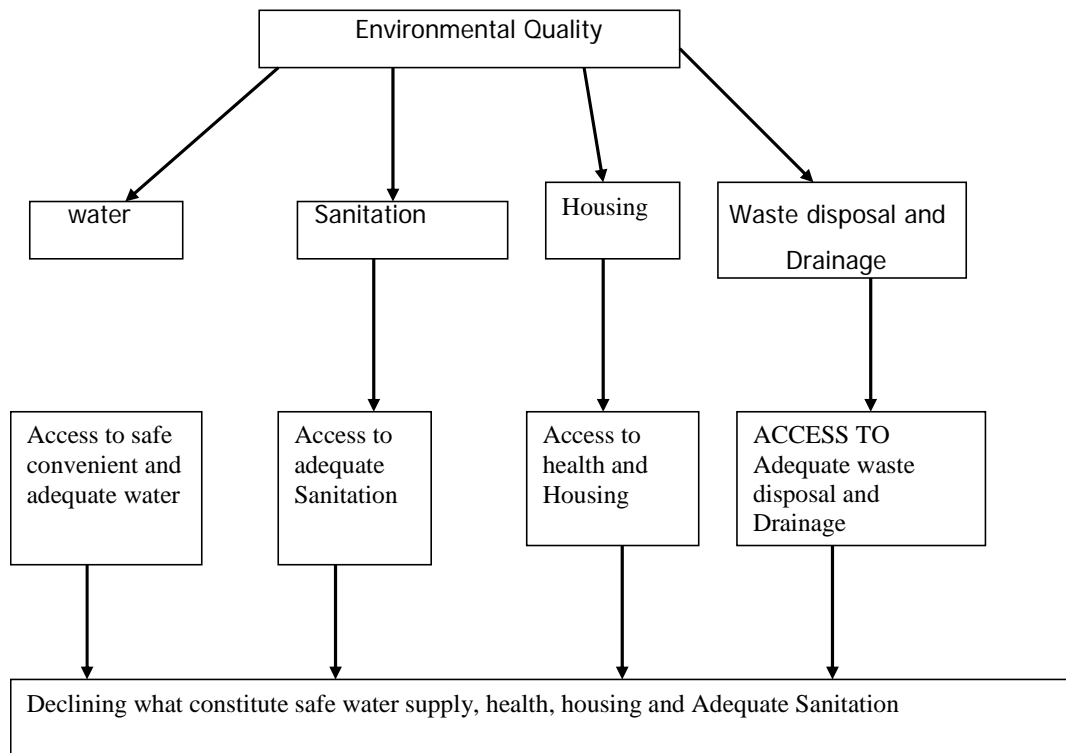


Figure 1. Showing different components of Environmental quality

also includes open field, mountains, forest, Deserts, snow, Seas, River, Lakes, Wells, Springs, Atmosphere Etc

Environmental quality and its effects

Environment quality is a product of many factors that reduce the quality of an environment from what it should be in the physical outfit. General factor such as land degradation, pollutions of water and Air, noise, Sanitation, over pollution, slums, etc, usually reduced the quality of an environment. Since environmental quality involves standard, Samuel et al (2008) provided a simple approach for ensuring the quality of an environment with illustrative sketch as shown above (figure 1) Samuel et al (2008) also added that the main concerned for the environment are the following:-

- i. How the Atmosphere, the rivers and the oceans are being polluted
- ii. How people might be causing global warming.
- iii. How people are destroying the world’s forests and other wilderness areas.
- iv. How people are endangering the survival of other species
- v. How people are being careless with toxic (life-threatening) washes.

Research also added that the above measuring technique is applicable in many countries of the world. In

addition, the account for environmental differences in many countries is based on the following:-

- i. Climatic condition.
- ii. Topographic and fertility of the soil.
- iii. Availability of industries
- iv. Commercial centers and parks

Diagram

Pollution and general view

The urban environment is usually polluted by three major sources, VIZ, Water, Air, and Noise. The world development report of 1992 highlighted the general effect of pollution on health. It also noted that the Tropical forest- the primary source of livelihood for about 140 million people are being lost at the rate of 0.9% annually. The above facts clearly speak for themselves about the alarming rate and situation that many developing countries are facing, including Nigeria due to environmental Degradation.

Types of pollution within urban environment

- 1. Water pollution: water become contaminated from disease bearing human wastes and also become polluted through industrial influent.

The classification can also be in the order:-

(a) **Water communicable disease:** infection related to water supply and sanitation are many and their relationship is complex. However, in many Africa countries, a conception system for understanding disease related to water and sanitation has been developed.

(b) **Water related infections:-** water related disease is one which is in same gross way related to water in the environment (Bodies of water) and the impurities within water.

Transmission Route Of Water Related Infections (water borne route)

Water borne transmission occurs when the pathogen is in the water, which is infected by a person or animal which may then become infected.

(c) **Water-wash route:-** Water wash disease is the one whose transmission will reduce by an increase in the volume of water used for hygienic purpose irrespective of the quality of that water.

Diseases Cause By Water- Washed route are numerous. An example of such are: Typhoid, Eholeva, Darrheas, Ascarrasis, cholera, Dysentries, polio, infection Hepatitis, bacillary, eye infection, craw-craw, house bone, fever, etc.

(d) **Water based route:-** A water based disease is one in which the pathogen spend a part of its life cycle in a water snail or other aquatic animal. The diseases are due to infection by parasite worm which depends on aquatic intermediate hosts to complete their cycles.

Diseases cause by water based Route: Diseases cause by water based is as followed: Guinea worm, Schishomiasis, paragommense, clonorchvasis, etc.

(e) **Insect vector route:-** This is spread by insect which lives either in water or lives near water.

Diseases cause by insect vector Route:- sleeping sickness, malaria, River blindness, filaviasis, mosquito bone, viruses-yellow fever etc.

(f) **Excreta –Related infection:** An excreta –related infection is one which is related to human –excreta (i.e. urine and faeces).The two transmission mechanisms for this are:

i Transmission via infected excreta: in this case pathogen is release into the environment through faeces or urine of infection individuals.

ii Transmission by an excreta – related insect vector: an insect which visit excreta to breed or to feed may mechanically carries excreta pathogen to food or an insect vector of a non-excreted pathogen and may preferably breed in feacally polluted sites.

Air pollution

Air pollution means the presence of any abnormal material or property in the air that reduce the usefulness of the air resources. The term pollution may be referred in context with outdoor open atmospheric conditions, localized air condition, and enclosed space conditions.

Sources of Air Pollution

1. Fuel burning operation for heat and power generation in large steam electric generating plant, in-residence, in hotels, clubs, hospitals and in different processing of laundries, Drycleaners, garage and service station.
2. The refuse burning operation in different ,municipalities industries and residential apartment
3. Burning of fuels for modes of transportation which includes trucks, buses motor vehicles, rail using petrol, diesel and gasoline's.
4. Industrial and commercial process emission in different manufacture process namely metallurgical plants, chemical plants, refineries mineral production, etc.

Cause of air pollution

1. increase in population and traffic
2. Development of industries
3. Development of automobile engineering
4. Thermal and nuclear generation
5. Development of agriculture etc.

Forms of air pollutions

1. Smoke
2. Dust
3. Gases
4. Particulate matter from industrials, power generation plants, road-way dust. Etc.
5. Hydrocarbon- from automobile exhaust
6. Sulphur compound
7. Nitrogen compound
8. Carbon compound
9. Fluorine compound
10. Chlorine compound

Effects of air pollution

Effects on human health

Air pollution

- | Air pollution | Effect on human health |
|----------------------|--|
| 1. Sulphur dioxide | Causes suffocation, respiratory disease, Irritation of eyes and throat |
| 2. Hydrogen Sulphide | danger of respiratory paralysis |
| 3. Hydrogen Fluoride | Cause skin disease |
| 4. Carbon Monoxide | Causes lungs diseases and slow poisoning leading to death |
| 5. Oxidants | Causes lungs diseases. |

Effects on Materials

- i. Causes deterioration of building materials
- ii. Causes corrosions of metals
- iii. Causes discoloration of paint, Cement colour, etc.

iv. Causes reduction of strength of materials

Effects on vegetation

- i. Plants may be dried up
- ii. The yield of crop may decrease
- iii. The quality of crops may decline or may be affected by disease
- iv. The growth of vegetation may stop and the quality may be inferior or may be affected by disease
- v. The quality of fruit may become inferior or the quality may also decrease
- vi. The forests area may get destroy gradually
- vii. The growth of trees may become stunted or they may dry up completely

Noise pollution

Violent noises may cause temporary or permanent impairment of hearing. Noise is also of the major causes of stress and many of the other human afflictions associated with tension, anxiety, accident proneness, high blood pressure and other diseases. The noise produce in urban area due to industrial activities, increases in traffic etc, cause tension and stressed related disorders.

Adverse effect of noise

- i. it can cause loss of sleep
- ii. it can increase blood pressure
- iii. it can cause irritation of mind
- iv. it can cause digestive disorder
- v. it can develop hypertension
- vi. sudden loud noise can cause heart failure
- vii. The prolong exposure to noise may result into temporal deafness or nervous back down
- viii. it affect attitude and psychological reaction
- ix. it can spoil the essence of music and speech
- x. it can creates uncomfortable living conditions
- xi. it usually interferes with speech communication.

Sources of noise

- i. Domestic noise
- ii. Public noise
- iii. Traffic noise
- iv. Construction noise
- v. Industrial noise

Environmental–Human settlements –Culture - Education

There is a great relation between environment, human settlement, culture and education. A country like Nigeria is a typical example of environmental developments, technological advancement, Religions diversities, large or

small scale industries, increase in infrastructural development, tribal differences, marriages etc. All the above are factor that goes along with environment, human-settlement, culture and education

Other specific forms of pollution

Human wastes

Investigations by the central and state boards for prevention and control of water pollution show that the major sources of human wastes of natural water courses includes coastal waters, and the discharge of community wastes from human settlements. This is due to lack of waste water treatment facilities and dumping of untreated household and industrial wastes into canals and rivers. The world development report of 1992 started that unsafe water is a source for many cases of diarrhea diseases, which, as a group kill more than 3 million people, mostly children, and also cause about 900million people are affected with round worm infection, and 200million with schistosomiasis.

Industrial Pollution

Increase in industrialization without proper planning and control lead to indiscriminate dumping of industrial waste into the surrounding of environment. One of the principal origins of seepage from the improper use and disposal of heavy metals is synthetic chemical pollutants and toxic metals. Some of them usually find their way into the food chain disrupting or impairing the natural biotic cycle and threatening population of organisms with extinction.

Overcrowding

In urban areas there is high rate of overcrowding in houses as many of the families live in single rooms (e.g. Lagos and Abuja in Nigeria) accommodation and in many cases there are no separate places for passages, kitchen and even store. Such situations usually lead to indoor pollution. The main reason for overcrowding in urban areas is due to the emergency of slums and also as a result of the distress migration of low socio-economic pollution from rural to urban areas.

Lack of civic amenities

Even though the percentage of urban population is different in many countries, some countries are still unable to provide adequate and proper civic amenities for its population. This is evident particularly in housing, transport, water supply, sanitation, power, and even employment.

Solid waste

As population in urban area increases, the dimension of

the solid waste problems also multiply. The quantum and type of waste generated in any urban area are function of the size and character of the urban center. The solid waste generated in any urban center can be categorized into:-

a. House and commercial waste or refuse: Research as shown that in most countries house and commercial wastes can be graded as a whole per capital, and they varies between 0.1 kilograms and 0.6 kilograms (Bhinde,1990)

b. Hospital Waste:- disposal of health care and slaughter house wastes require special attention since they can create major health hazards.

c. Industrial Wastes:-as the level of industrialization increases, wastes also increases. The toxic, non-organic and non-biodegradable wastes, packing materials and paper also increases as product from many industries that ends up causing pollution within environment.

Vehicular pollution

Studies have proved that about 40or60 percent of the total air pollution of urban center is caused by automobile exhaust alone. Carbon monoxide is a major product of incomplete combustion of fuel in automobiles. it is highly toxic, fumes and gases are usually emitted by automobiles. The fumes and gases constitute a further unpleasant by product of the motor vehicles that can affect human's health.

Land Degradation

Land degradation is threatening in many countries of the world. Land degradation includes degradation, deforestation and decertification, which are closely related to deteriorating the environment. Land degradation gives rise to loss of productive soil and it reduces the capacity of soil to support its important uses. It occurs mainly from:

- Removal of vegetative cover, especially in forest cereals where serious development has not reached
- Removes top soil during land site clearing by construction industries.

viii. Soil Erosion: the common types of soil erosion in different parts of the world today are sheet and gully erosion which are on the high occurrence, and the types of damages causes by them are as follows:

- a. Destruction of forest.
- b. Destruction of grassland which holds the soil together
- c. Destruction of farmland
- d. Damage of socio –economic infrastructure and settlement areas. This has affected the foundation of many buildings
- e. Poor highway drainage outlet
- f. Collapse of roads, culvert and situation of drainage systems and reservoirs,

Flooding

Floods have become common occurrences in many parts of the world during a heavy down falloff rain. During raining season, the flooded water sometimes ends up becoming a pool for dumping waste that result into environmental pollution. Flood most of the time ends up destroying lives and properties during its occurrence.

Impacts of construction industries

The natural environment of the construction industries consist of physical, chemical and biological resources. The impacts of construction activities on the natural environment includes changes in the landscape, water quality, treats to wild life and forest.

Poverty problems

There is a high rate of poverty in many African countries today, as a result of unemployment and uncontrolled growth, leading to the establishment of slums. Poverty is the most appropriate word with which to describe the human condition in many countries today. The world commission on environment, and development states:- poverty pollutes the environment, creating environment stress in a different way . those who are poor and hungry will often destroy their immediate environment in order to survive. They will over use marginal land and in growing numbers, they will crowd into congested cities.(Nest, 1987). This is the growing situation of many people who don't have anything to earn a living.

Sustainability

The word "sustainability" originates from an ancient principle in forestry that is simply not to gain more timber from the forestry for centuries. In 1987 the "brundland commission" set up by the United Nations (UN) published their report as "our common future" and defined "sustainable development" for the first time as "development that meets the need of the present without compromising the ability of the future generation to meet their needs" sustainable also comes from the Latin world "sustainer" meaning "to bear ". Sustainability can be translated simple as long – term compatibility. In engineering profession sustainability is seen in there-dimensional view as illustrated in figure (II)

Different world scholars equally believe that sustainability is hanging on four major pillars namely:

- a. Ecological configuration
- b. Economic activities and output (i.e. Monetary system)
- c. Good governance and politics (i.e. Equity and efficiency)
- d. Institutional capacity and performance of Education

Since sustainability embrace all aspect of human's life, a

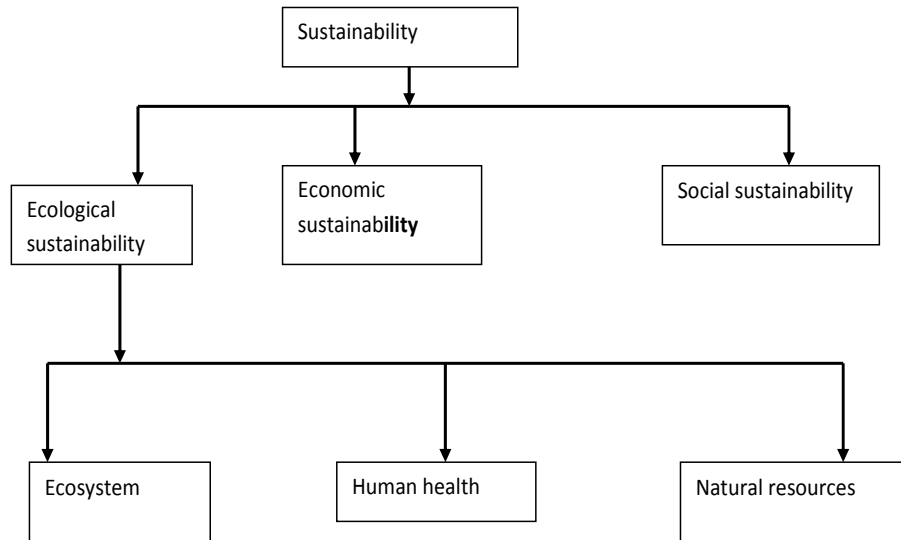


Figure 2. Showing sustainability components of Human environment

trilling question that is always ask is what should be sustained and develop in our environment? A few areas that usually possess challenges are:

- i. **People:** child survival, equity, equal opportunities for everybody, etc.
- ii. **Economy:** wealth creation, productive sector, consumption etc.
- iii. **Society:** social capitals, states, wealth, regions, etc.
- iv. **Good governance:** leadership and politics.
- v. **Education:** a lot has been written and said on education in different countries of the world, especially in African countries. Knowing fully well the sustaining values of Education, it is still good to bear our understanding on it. Herbert Spencer, an English philosopher (1820-1903) said the following on education:
 - i. The great aim of education is not knowledge but action”
 - ii. “Real education is the one that will bring changes to the people, not information”
 - iii. “Real Education is a process of enquiring and composed of acts or recognition rather than transfer of information”
 - iv. “Education is critical for promoting sustainable development”

Future higher education

Future higher Education has pivotal towards sustainability. This can be down through research and the training of specialists and leaders in all fields!

Preventive Strategies For Environmental Pollution

There are numerous strategies world- wide for

preventing environmental pollution. A few of these are briefly highlighted below:

Water pollution

- a. improve quality of drinking water
- b. Prevent casual use of other un- approved sources
- c. Increase quality of water used
- d. Improve accessibility and of domestic supply
- e. Improve hygiene
- f. Strict laws should be passed to control water pollution by individuals and different bodies
- g. Safety measures to be implemented to prevent oil spillage.
- h. Chemical waste should be converted to harmless biodegradable substances before being dumped into the rivers and streams
- l. Refuse should be burnt in an incinerator with built- in devices to prevent water pollution.

Water Based Route

- a. Decrease the need for contact with infected water
- b. Control small populations
- c. Reduce contamination of surface waters by excreta

Insect Vector Route

- a. Improve surface water management (drainage)
- b. Destroy breeding sites of insects
- c. Decrease need to visit breeding sites
- d. Use mosquito netting.

Air Pollution

Air pollution can be controlled by passing strict laws that

will make motor vehicles to comply with anti-pollution regulations

- b. By making people to be aware of the causes and dangers of air pollution
- c. By improving machineries so that more efficient fuel combustion occurs.
- d. Control by ventilation- suitable ventilation system should be provided in kitchen of every house, so that the gases produced by burning of wood, coal, oil, etc. can be exhausted very quickly
- e) Control by vehicle rules- the design of vehicle should be such that complete combustion of fuel takes place in the engine
- f. Control by forestation- planting of trees should be planted at parks and public place
- g. Control by zoning – the areas of the town or cities should be divided into different zones, such as residential zone, industrial zone, trade zone, etc. the industrial zone should be far from the residential zone. The planning of the zone should follow the rules and provisions made for those zones.
- h. Bags filters or fabric filters
- i. Cyclone collectors
- j. Cyclonic scrubbers

Noise pollution

- a. Domestic noise can be control by operating radio, television, etc. at low volume.
- b. During festival or other functions, loudspeaker should be operated within permissible limit and the time of operation should also be maintained.
- c. To control the noise caused by traffic, the speed limit should be strictly imposed. The vehicles which usually cause loud noise due to automobile fault should not be allowed on high way roads.
- d. The industrial noise may be avoided by keeping the industrials far from residential areas.
- e. Design of noise proof doors and windows:- All the open spaces of doors and windows should be properly plugged and packed. The glazed window with double or triple panes of glass usually provides excellent sound insulation. The air spaces of the edges of such panes should be filled with sound absorbing material.
- f. Ear protection aid: The air production aid like soft plastic and rubber ear plugs, head phones should be provided for workers working in industries.
- g. planting of trees: The present of trees between the source of noise and the residential areas reduces of the noise.
- h. Treatment of walls, floors, and ceilings, floating floors suspended ceiling considerably reduce the noise. Acoustical tiles, and other porous materials if fixed, on walls, floors and ceiling also help to reduce noise level.
- i. Use of silencers of filters: This method is applicable to the control of noise from ducts and exhausts. Glass wool

or mineral wool covered with a sheet of perforated metal for mechanical protection may be used.

- j. Town planning: The city may be divided into various zone3s, and residential zones may be located away from the place of sources of noise like factories, main roads, workshops, bus stations], railway, etc.
- k. legislative measure: Very exhaustive legislations may be formulated and effectively enforce especially during festival and marriage functions.

Environmental planning

Environmental planning is a system that is usually employed in addressing common environmental problems. The process of environmental planning generally involves wide area of coverage. A few areas of coverage for the purpose of this paper are discussed below:

Zoning Planning

The residential area, industries, commercial areas etc. may be located in different zones, considering the topography, meteorology, and wind and water direction for such environment.

Road Alignment or road space: This should be properly planned so that traffic flows can be smooth and unwanted traffic jams within cities and towns can be prevented during the peak hours of the day.

Waste Material: All wastes, including liquid solids or gaseous wastes that are generated in the environment should be properly handled, collected, treated and disposed off from the environment.

Damages caused during developmental periods should be restored as far as possible by maintaining open areas, trees plantation, forest reserve, flat terrains, etc.

Noise pollution areas: They should be restricted by using proper construction materials, and in the surrounding by proper planning, plantation or artificial screening, and maintaining low noise level at the source itself.

Planning for sewerage and other wastes disposal system for cities and township, such that pollution due to sewage and other wastes is avoided or prevented generally. The process usually ensure that the environment is self, livable, comfortable, healthy and attractive to live in and it is also easier to maintain it from pollution abatement.

Designing the Environment: Designing the environment is a process of inventing physical things, which usually display a new physical order, and organizing it to response to a new function. Anlekaw (1987) defined design, broadly to include all principles, technical information and imagination to defined specified requirement, economically and efficiently. The specified

requirement includes all constraints imposed by the design conditionality i.e function aesthetics, finance, structural integrity, available materials, Governmental policies, statutory controls, socio climatic factors and environmental factors. Interplay of all the above conditions are generated by the influence of weather, vandalism, ambient conditions, etc. some of which cannot be reasonably controlled as design is meant to create a conducive environment for the activity we wish to perform in them, even in the numerous constraints and stresses generated within the environment.

Better Environmental Planning On Projects

Every environmental Engineer should take interest in environmental infrastructure and facilities which should follow a holistic approach. For example, it is always a better approach to commence environmental impact assessment very early and continue through the project conception, baseline studies, pre-feasibility and feasibility studies, to design, construction, commission, operation, and maintenance stage.

Research and development

Adequate research and development of sustainable environment development. Such effort should not be limited to pure science and technology, but should also include political will and implementation, social values, economic and commercial consideration and public perceptions. Consistence and adequate research and development will result in the "6Rs"

- i) Replace unsustainable activities with sustainable, polluting activities with clean process and efficient process with more efficient ones
- ii) Re-use and recycle products to conserve resources
- iii) Renewable resources used whenever practicable
- iv) Re-structure institutions (both Government and non-Governmental organizations) to incorporate commitment to philosophy of sustainable development
- v) Reduce consumption of resources and production of wastes
- vi) Restore land, water, Air, and ecosystems.

Educating and creating public environmental awareness

Environmental Engineers and other related Engineering professional bodies have a vital role to pay in mobilizing the public for action aimed at improving the quality of man's physical environment. This can be achieved by organizing relevant programmers, seminars, workshops, public debates, etc. on environmental issues. The role of the medial profession cannot be over emphasized here.

There is the need for a better understanding of issues of the environment by media Practitioners, news editors, features editors, news producers etc. in print and electronic media, to enable them improve on their unique roles in the global efforts on sustainable development.

CONCLUSION

The importance of improved life living standard, especially in African countries in the area of water pollution, air pollution, noise pollution, and solid waste disposal in urban cities has long been identified, and loudly spoken in many ways, nearly all developing countries are currently engaged in substantial programs to improve the quality of life of the people, both in rural and urban cities. This paper therefore throws a clarion calls and challenge to the government of different countries, especially in Africa, at Federal, state, Local levels, all NGOS and Stakeholders, professionals, and individuals to rise up and save our precious environment from further destruction Now!

Questions of note

- i. Who should our environment be sustained for?
- ii. How long should our environment be sustained?
- iii. Who should be involved in sustaining environment?
- iv. Where do we start?

Answers

- i. The future generations
- ii. Many generation to come
- iii. Everybody, inspective of position, titles, achievements locations etc.
- iv. Where we are now!

REFERENCES

- Asamnew A (2004). Water Supply (II) for Environmental Health science students. East African. Pp. 7-14.
- Awalla COC (2013). Global Environmental sustainability (pgs 27-30) printed by Good seed publishers Nsukka, Nigeria
- Awalla COC (2013). Global Environmental sustainability. Goodseed publishers, 100 Enugu Road, Nsukka, Enugu State. Pp. 63 – 67. .
- Basak NN (2003). Environmental Engineering. Tata M C Graw Hill publishing company Limited, New Delhi, India. Pp. 64-76.
- Bhinde (1990). Industrial and commercial wastes treatment
- Garg SK (2004). Environmental Engineering (vol. II)sewage disposal and Air pollution Engineering. Romesh chander Khama Deihi, India. pp. 751-770.
- Joseph B (2005). Environmental studies Tata MC Graw Hill publishing company Limited, New Delhi, India. Pp. 118-168.
- Kao CS (2008). Environmental pollution control Engineering. New Age international limited, New Delhi, India. Pp. 145-215.
- Samuel et al (2008). Environmental quality standard
- United Nations (un 1987) Published report on sustainable development

Weiner RF, Mathews RA (2003). Environmental Engineer (pgs 51-57)
(4th Edition) published by Elsevier, New Delhi, India.
World development report (1992). Effects of pollution on health.