

Utilizing Biological Tools for Sustainable Environmental Pollution Management

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Abstract

The paper intends to highlight the utilization of biological tools for sustainable environmental pollution management. This is because the constant alteration and modification of environment by man has brought about a negative change in the environment as the failure and inadequacies of developmental process brings about environmental challenges by way of pollution. It is therefore important to bring to bear how biological tools could be used to correct these anomalies. The use of biological methods to deal with environmental pollution can bring about eco-friendly environment and improved economic and financial benefits. Among the recommendations is that educational and awareness programs should be organized to control pollution as good hygienic practices can prevent disease.

Key words: *Biological Tools, Environment, Pollution*

Introduction

Man depends on his environment for survival by adapting better and more successfully to his environment through modifying, altering and constantly changing his environment to help him suit his needs at all times and that need is constantly changing, the zeal to change his environment depends more on culture and the constant growing population, although human population in different parts of the earth develop at different speeds they all tend towards increasing the carrying capacity of the environment which in no doubt is not unconnected with the recognition of the role of the environment in facilitating optimal social functioning. For some time now the world has been in an ecological overshoot as human population has increased and people's demand on environmental resources is becoming more than the earth's supply capacity. An increase in population and rapid economic growth makes excessive demands on natural resources and natural ecosystems which has a negative impact on both humans and other living systems and have brought about a change in the balance of natural cycles (Hawken, 2007). This increases the production of wastes and the use of toxic materials leading to pollution which has become a thing of great concern. In Nigeria there are changes going on in the environment as a result of urbanization, civilization and industrialization leading to high migration of people from rural to urban areas, there are also issues of fast population growth, poor disease management, poor waste management, poor hygiene and sanitation, deforestation, desertification, and other anthropogenic activities, these activities increases the production of wastes and toxic materials leading to environmental pollution in Nigeria. The failure and inadequacies developmental process brings about environmental challenges such as pollution.

The term environment can be defined as the sum total of all the external conditions influencing the growth and development of an organism (Gana and Toba, 2015 Nwanne, 2013). That is, all the physical, chemical, biological, social and cultural features of the habitat in which man finds himself. It provides all life support systems with air, water and land as well as the materials for fulfilling all development aspirations of man (Lawanson, 2006). Environment represents a wealth of resources which must be protected through sustainability as it provide the basis for exploits for agricultural, industrial, commercial, technological and tourism development of a society.

Pollution is the introduction of a contamination into the environment (Webster.com, 2010). It can also be defined as the introduction of substances into the environment in an amount above the carrying capacity of that environment in such a way that it cause hazards and harm to its ecological system, Pollution represents a problem common to economy and public health (Ghanemi & Boubertakh, 2014). Pollution is created by human anthropogenic activities such as industrial and commercial waster, agricultural practices and other everyday human activities that release wastes or pollutants which are substances or energy that adversely alters the environment by changing the growth rate of species. Pollution can be in the soil or land, water and air. Pollution can eventually lead to Climate change, global warming, genetic modification, land degradation, depletion of ozone layer, depletion of biodiversity, greenhouse gas emissions and depletion of natural resources

Environmental pollution is caused by diverse human anthropogenic activities and other economic development activities. Environmental contamination due to waste mismanagement has become a global issue and the activities that emanated from technology, agricultural practices, transportation, urbanization, industrialization, mining, construction, production and use of pharmaceuticals and personal care products etc which are meant to suit man's needs unfortunately contribute immensely to the environmental degradation and pollution which could adversely affect or harm humanity, fauna and flora, biodiversity and ecosystems (Owa, 2014; Ifeanyi, 2002). Some of the leading factors of environmental pollution in Nigeria observed by Jande (2005) and Aja (2005) include unrestricted use of pesticides, insecticides, herbicides and indiscriminate dumping of refuse, excreta and animal dung as well as spillages from refineries, large scale bush burning. Public awareness about environmental management for public health is still at low levels, favouring environmental degradation and contamination which has impacts on economic values of any society.

In other to prevent pollution and to conserve and reuse resources there is need for sustainability and sustainable development which focuses on ensuring the people's comfort that leads to healthy society, there is also the need to balance competing needs and the needs to protect the environment (Kates *et al.* 2005; World Commission on Environment and Development, 1987). Sustainable development can be conceived within the concept of growth, advancement, conservation and preservation of the gains of development for the benefit of the present and future. Three aspects of sustainable development has been in recognition that is, economic, social and environmental (Ahmad, Abuakar and Yau, 2018). Environmental sustainability is meeting our current needs without jeopardizing the right and the ability of future generations to meet theirs (Boubaker *et al.*, 2018; Gbenda, 2012). Environmental sustainability

forms one of the pillars of sustainability development (Leke and Leke, 2019). Environmental pollution with its health impacts is a key issue for sustainable environment (United Nations General Assembly, 1987). In Nigeria Environmental pollution is becoming a primary concern and this is caused mostly by anthropogenic activities and poor environmental culture, problems of environmental pollution range from poor urban planning and lack of essential waste management facilities to inefficient industrial practices which put the environment in jeopardy (Ezeabasili, 2009; Pona *et al.*, 2021).

Human activities that leads to clean water and food availability, energy production and clean environment is critical for human life and health causing a direct, strong impact on well-being and environment. Estimates from the World Health Organization, (2017) show that about a quarter of the diseases facing mankind today occur due to prolonged exposure to environmental pollution and most of the environmental pollution related diseases are not easily detected. The targets of SDG 3 cover and focus on various aspects of healthy life and healthy lifestyle. UN, (2015) expressed it as, to ensure healthy lives and promote well-being for all at all ages. It is therefore the focus of the article to x-ray the effect of pollution and proffer remedy to this menace that is eating not only Nigeria but the whole world up using the knowledge of biology.

Effects of environmental pollution on human and his environment

In Nigeria the constant modifying, altering and changing of environment in the name of development, industrialization and other anthropogenic activities in many areas without proper planning brings about various pollution related problems that result in environmental degradation, public health deteriorations, food and economic instability, this also have negative effects on air, soil and water quality and destabilizing the divers existing life forms of the ecosystems.

Health implication: In Nigeria population growth, rapid urbanization, poverty and the inability of governments to provide necessary needs of her citizens has lead to increase in the number of slums where there are no waste management systems and eventually pollution (Land, Water and Air) in towns and cities, this make the people to be vulnerable to both communicable such as diarrhoea, cholera, some respiratory diseases, some gastrointestinal diseases and non-communicable diseases such as cancer, Jaundice, typhoid, encephalitis, hepatitis, poliomyelitis, skin infection, hair loss, liver cirrhosis, renal failure, neural disorder and other health endangering challenges. Water pollution leads to damage to human health. Disease carrying agents such as bacteria and viruses are carried into the surface and ground water and health hazards result (Haseena *et al.*, 2017). Poor people are at greater risk of disease due to improper sanitation, hygiene and water supply.

Socio-economic implication: The socio-economic development implications of high levels of pollutions are that, there is a reduction in the biodiversity of the natural environment and food security is undermined as a result of soil contamination. For instance, oil spills create undesirable changes in the natural elements thereby impinging on various social and economic activities (Imevbore, 1979). Poor quality water destroys the crop production and infects our agricultural products with various diseases thereby causing food insecurity which is hazardous for the biodiversity and human life. Industrial activities such as timber and logging and oil exploration have led to devastation of farmlands causing food insecurity and reduction in economic

activities. Even the over exploitation of these important natural resources (timber and logging) affect the sustainability of biodiversity. The economic impacts of the pollution are very important; as such reducing pollution becomes crucial for financial stability.

Ecological implication: Pollution brings about reduction in productivity in the biomass and diversity of communities especially when large amount of toxic materials are released into the environment. This waste can cause species of plants and animals desired as food by man to disappear from the environment. This lead to ecological imbalance as land, water and air is altered. Plants nutrients and other substances that support the growth of plant life could be in excess causing algal bloom in water and excessive weed growth on land. The algal bloom makes water to have odour, taste and sometimes colour. The ecological balance of biodiversity and the environment at large is altered. Industrial activities have led to devastation of farmlands, increased water channel sedimentation, water contamination, lack of access to safe drinking water and loss of bio-diversity (Bassey, 2008; Ifeanyi, 2002). Insufficiency in electric power production makes people depend on power generating plants for energy supply which pollute the air with their fumes and noise this causes hearing impairment, respiratory diseases, cancer etc.

Generally pollution influences the quality of the life of a society and their development. It is therefore important to proffer solutions in such a way that health, economic and environmental sustainability is maintained. There is need to strike a balance between a sustainable development and pollution control through use of biological tools to control and manage environmental pollution especially those areas relevant to economy, environment and human health.

Utilizing Biological Tool for Sustainable Environmental Pollution Management and Control

The use of biological methods to deal with environmental pollution can bring about eco-friendly environment and improved economic and financial benefits more than the traditional methods which might be costly and with less benefits. the use of biological method in solving the problem of disposing industrial wastes is beneficial in managing wastes and emissions, and also converting industrial wastes to raw materials for other sectors as pollutants will become a resource to produce other elements that would be used, for instance in industry or agriculture.

The knowledge of biology gives insight into the solution of a lot of social problems among which are environmental pollution, environmental conservation and control, disease control, waste management and control, hygiene, health issues, population control and family life, vaccinations against infections of various diseases, pest control, climate change etc which can help ensure a safer, healthier, more prosperous and environmentally sound world, while simultaneously contributing to social, economic, political development, cultural progress, tolerance, and international cooperation, thereby bringing about rise in income levels and improved standards of living. Pollution control, prevention and management are very important in sustainability and sustainable development and crucial for ecosystem and human health. Other methods of pollution management and control such as use of excessive chemicals and energy have been employed but they cause a lot of side effects. The biological process is seen as promising and sustainable, the bio-parts of pollutants are degraded through microbial activities, where complex organic matters are degraded, and nutrients such as nitrogen and phosphorus are removed.

All land pollution can be averted by proper planning and proper usage of natural resources. For instances, animals could be allowed to graze on mountainous or wooded areas unsuitable for buildings or crops. Using organic and sustainable farming techniques can eliminate the need for chemical applications, demanding better quality products, environmentally ethical practices from industries and a shift toward sustainable energy, Clean energy, such as wind or solar power, can slowly begin to replace coal or nuclear plants.

Bioremediation deals with removing the contaminants or organic wastes by biologically degrading them under controlled conditions to an innocuous state, or to levels below concentration limits from the environment (Sharma, 2012). Some of the microorganisms used in bioremediation techniques includes: *Nitrosomonas*, *Mycoccus*, *Xanthofacter*, *Nocardia*, *Pennicillium*, *actinobacter*, *Rhizoctomia*, *Mycobacterium* (Singh *et al.*, 2014). The process of bioremediation involves biotransformation and biodegradation by converting the contaminants to non-hazardous or to less hazardous substances (Singh *et al.* 2014). This techniques brings about an eco-friendly environment, it is also effective and efficient and more economical (less cost) than traditional methods such as incineration and others, as well as environmentally friendly.

Biological recycling is the recycling of polluting agents depending on the wastes they produce (CO₂, organic products, mineral chemicals, etc) to reintegrate them either to the ecological system or to industrial processes, bacterial cultures, fungi cultures or algae cultures should be incorporated into specific compartments within installations or in the natural environment such as agricultural soils. The wastes would be passed via these compartments to be clarified and purified. The clarification and purification principle is based on the properties of bacterial, fungal and algal cultures to consume or assimilate elements that are included within the wastes and incorporate them within their metabolism and this would help to avoid spreading these wastes in the rivers and the air for example. In addition, these biological organisms not only use the wastes in their metabolisms, but may also use them to produce elements that can be used in some industries.

Bio-fuel is a gaseous, liquid or solid fuel that contains an energy content derived from a biological or plant sources. Examples are rapeseed methyl ester, biogas, gasohol and others. As there is increased fossil fuel (coke, coal, kerosene, aerosol, diesel, petrol/gasoline and other petroleum products) combustion from motor vehicles, heavy duty machines, power plants, etc, there is increasing demand of fuels not only in Nigeria but globally, the gases emitted from fossil fuel (carbon monoxide, ozone and nitrous oxides, lead-based compounds, Carbondioxide, methane, Chlorofluorocarbons (CFCs, etc) into the atmosphere can produce a high level of pollution which are toxic and harmful to man and his environment and also threatens his health this eventually leads to global warming and climate change, there is therefore need to encourage the production of bio-fuels in Nigeria. The organic matter that makes up living organisms provides a potential source of trapped energy that is beginning to be exploited to supply the ever-increasing energy demand around the world. Nigeria as a developing country may be considered a top destination for bio-fuel production in terms of cost effectiveness production.

Through Genetic modification breeding produce improved animals, plants and crops through developing organisms with new traits that would be more likely to achieve the purposes

of organisms with eco-friendly status as much wastes that could cause pollution will be minimal which means more efficient organisms with better properties.

Other biological methods include the use pollution control devices which include Dust collection system e.g. bag houses, cyclones, electrostatic precipitators, scrubbers, sewage treatment e.g. sedimentation (primary treatment), activated sludge bio filters (secondary treatment, also used for industrial waste water), aerated lagoons, constructed wetlands (also used in urban runoff); industrial wastewater treatment e.g. ultra filtration, API oil-water separators, bio filters, dissolved air flotation (DAF), powdered activated carbon treatment; vapour recovery system and phyto-remediation.

Conclusion and recommendations

Pollution results from population growth, waste (discharge of domestic and agriculture wastes), anthropogenic activities (excessive use of pesticides and fertilizers) and urbanization and its prevention and management are a key to sustainability. Bacterial, viral and parasitic diseases are spreading through polluted environment and affecting human health. The best way to deal with pollution is to prevent it from being created in the first place. Understanding how waste is produced and how it can be minimized, or even prevented, is the first step to reduce waste and protect our environment; in that way, in order to increase the efficiency of a process there is need to reduce the amount of pollution generated by a process (industry, agriculture, or consumers) and manage the impact of pollutant emitted on the environment (Sherman et al. 2016)

Pollution prevention is very important in environmental management hierarchy that includes prevention, recycling, treatment, and disposal or release. Pollution prevention therefore requires a cultural change which encourages more anticipation and internalizing of real environmental costs by those who may generate pollution.

It is therefore, recommended that:

1. Utilization of biological tools in managing and controlling environmental pollution should be encouraged as will bring about clean and improved eco- friendly environment, economic boost, food security, healthy life and well-being in other to attain the SDG 3 goal.
2. water quality should be examine on regular basis to avoid contamination and its destructive effects on human health;
3. there should be proper waste disposal system and waste should be treated before disposal, that is, domestic and agriculture waste should not be disposed of without treating;
4. Educational and awareness programs should be organized to control pollution as good hygienic practices can prevent disease;
5. Government pronouncement and actions on environmental sustainability must reflect linkages with other policies of development in order to ensure structural harmony and therefore, achieve full impact if success is to be ensured

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