PERSPECTIVES ON BIODIVERSITY LOSS AND THE CHALLENGES FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

The need to preserve and conserve biodiversity is a contemporary issue at the local, national and global levels. Biodiversity is a major source of food, clothing, shelter and other necessities of life. The resources include agriculture, forestry, fisheries, pastorial activities and the ecological complexes in which they occur. This research relies mainly on secondary sources of data. Thus, the article describes the varieties of species, their relative frequency, their genetic diversity and their ecological complexes. These means of livelihood are depreciating all over the world in Nigeria at unprecedented rate. Therefore, this paper examines the reasons why species are rare, vulnerable, endangered or extinct. The study identifies the natural causes of biodiversity loss as development within the gene pool, environmental failure, as well as inter-specific competition and substitution. Findings from the study revealed that the anthropogenic causes of biodiversity loss include dangerous agricultural practices, lumbering, forestry, grazing, bush burning, urbanization and industrialisation among others. The article describes biodiversity loss as a challenge to sustainable development. Hence, it recommends educational, environmental, regional, posterity, institutional, ecological and simultaneous approaches for biodiversity conservation and sustainable development.

Keywords: Biodiversity, Conservation, Extinction, Species, Vulnerability

INTRODUCTION

Biodiversity refers to the variety and variability among living organisms and the ecological complexes in which they occur. It encompasses all species of plants, animals, micro-organisms, macro-organisms, ecosystems, and the ecological processes of which they are part (see Kayode, 2010; Pearce and Morgan, 1994; Wilson, 1992; and World Wild Fund for Nature (WWF), 1989). The Natural Environment Research Council (2006) defined biodiversity as the sum of life's variety on earth, including genetic variation within and between species. In other words, biological diversity (biodiversity) can be explained as varieties of natural resources including animals and plants species and their genes as constituted or contained in the ecological systems (Adejemilua, 2001). It refers to the

variability among the living organisms from all the sources including *inter alia,* terrestrial marine and other aquatic ecosystems and ecological complexes of which they are the part; and this includes the diversity within the species, between the species, and of the ecosystems (Gang, 2010).

Biodiversity include the varieties and variabilities of different species of plants, animals and other living organisms of various species. Some of these species have low diversity, and as such they are not common. These are called the rare species. Others are vulnerable because of their high level of susceptibility to ecological conditions like habitat changes, ecological changes, diseases, attack and predation. Likewise, many species are endangered because they suffer loss, they have dangerously low level of gene and they are drastically reduced in number. Hence they are commonly referred to as living dead. Another component of biodiversity is the extinction of species. These are the ones that have gone into oblivion.

WWF (1989) regarded biodiversity as the wealth of life on earth, the millions of plants, animals and micro-organisms, the genes they contain, and the intricate ecosystem they help to build into the living environment. Biodiversity resources include forestry, agriculture, pastoral activities as well as fisheries. In accounting for biodiversity, we recognise the role of the many millions of microbes and invertebrate species, representing, perhaps 95% of total species and genetic biodiversity, critically underpinning the services that biodiversity provides, and the linkages between them (Dillys, David, Jessica, Matt and Joana, 2011).

Miller (2002) classified biodiversity under genetic, species, ecological and functional diversity. Biodiversity encompasses three major components:

i. The variety of different species
ii. Genetic variation within species
iii. The diversity of the world's ecosystem and habitats.

Rana (2013) described biodiversity in terms of its three fundamentally and hierarchically related levels as ecosystem, species and genetic diversity. Furthermore, he classified the importance of biodiversity under the direct and indirect utilities. The direct usefulness according to him includes food, medicine, wood and ornamental benefits. Whereas, the indirect merits include carbon fixation, pollination, maintenance of water cycle, soil formation and protection from erosion, maintenance of essential nutrient cycles, as well as regulation of climate change. Others are recreational, aesthetic, socio-cultural, educational and historical treasures.

Wright and Boorse (2011) perceived, the millions of species of plants, animals and microbes as biological wealth comprising of species for food and raw materials, sources for medicine, recreational, aesthetic and scientific worths. In the same vein, Nelson (2007) recognised wildlife as an important component of biodiversity. He opined that in many countries around the world. Biodiversity is under increasing pressure from internal and external forces. In his case study of Tanzania, he found out that the country is blessed with diversity of flora and fauna species. He identified the benefits of biodiversity as economic, social, scientific, historical, cultural and aesthetics. Likewise, he posited that biodiversity resources in the country (Tanzania) are suffering great loss as a result of natural and anthropogenic forces. Consequently, he recognized the pre-requisites to biodiversity conservation as local community involvement in biodiversity management, as well as the involvement of government, non-governmental organizations, and international organisations.

The convention of biodiversity – a legally binding agreement signed at the Earth Summit in Rio de Janero in 1992 – has as its objectives the sustainable use of biodiversity, the

Leena and Luna International, Chikusei, Japan.
(株)リナアンドルナインターナショナル, 筑西市,日本
ISSN: 2186-8476, ISSN: 2186-8468 Print
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conservation of biodiversity, as well as the equitable sharing of benefits derived from genetic resources (Intermediate Technology Development Group, 1996). Miller (2002) enumerated the factors that increase biodiversity as evolution, physically diverse habitat, moderate environmental disturbance, small variation in environmental condition, as well as the middle stages of succession. He also highlighted the factors that tend to decrease biodiversity as environmental stress, environmental disturbance, extreme environmental condition, severe limitation of essential nutrients, introduction of allien species, as well as geographic isolation.

Most of the world's biodiversity is found in Southern countries where people greatly depend on natural resources but suffer from high levels of rural poverty and often weak governance (Swinderska, Roe, Siegele and Grieg-gran, 2011). There are clear evidences that biodiversity is reducing at an alarming rate (See Rana, 2013; Joseph, 2009; Garg, 2010; Santra, 2011; Western 1999; Don, 1990; Ferrey, 2004; INDP, 1992; and Miller, 2002 for greater details). The rapid decline of biodiversity has been clear to scientists for decades (Rana, 2013). Dearden and Mitchell (2009) proclaimed that changes in biodiversity due to human activities were more rapid in the past 50 years than at any time in history. Consequently, they suggested sustainable man-environment interaction and judicious use of environmental resources for the conservation of biological diversity.

The rate of biodiversity loss does not appear to be slowing. Species are now vanishing faster than at any other time in earth's history. Habitats are degraded when they can no longer support associations of plants and animals in a natural condition (Joseph, 2009).

Adejemilua (2001) submitted that dozens, or hundreds of species are lost per day, and that humans are already living with the consequences of extinction of many species. Moreover, many threatened species of birds and animals are in the international convention of nature red list. Stuart and Moura (1998) opined that deforestation is a major cause of biodiversity loss. They emphasized on climate change as a major consequence of biodiversity loss and they suggested afforestation/reforestation plantation programmes, biodiversity-driven forest conservation, reduced impact logging techniques, rehabilitation of degraded land, as well as sustainable management of livestock as sustainable options for the governance of forests and forestry. Other approaches to biodiversity conservation are regional, ecological, environmental, historical, institutional, and sustainable development techniques.

IMPORTANCE OF BIODIVERSITY

Biodiversity has contributed tremendously to the development of mankind and the environment (see John, 1992; Wilson, 1988; WWF, 1989; Ibimilua, 2013; Vermeulen, 2004; and Swiderska, 2004). It serves as source of food, income, clothing, nutrients, employment, and traction. Other benefits of biodiversity are ecotourism, transport, source of fuel, medicine, construction, utensils and tradable goods. Biodiversity also performs regulating services like disease and flooding control, as well as cultural services such as recreational services. Cunningham and Cunningham (2006) posited that biodiversity plays irreplaceable roles in ecological systems in the areas of food, drugs and medicines.

Biological diversity plays a significant role in the environment. For instance, the forest helps us to keep the soil fertile. It contributes to the regulation of the atmospheric process and it provides essential habitat for wildlife to survive. Similarly, the wildlife plays social, cultural, economic, recreational, ecological, psychological, educational, medicinal, genetic, aesthetic and scientific roles in the environment. Generally, the importance of biodiversity cannot be overemphasized. It serves as source of energy for the maintenance of the ecosystem.

Biodiversity is a critical factor in maintaining the stability of natural systems and enabling them to recover after disturbances such as fires or volcanic eruption (Wright and Boorse, 2011).

In the recent decades, many scientific studies on biodiversity and national development have pointed out that biodiversity is a key issue in the attainment of sustainable development (see Kanagasabai, 2010; Swiderska, 2004; Vermeulen, 2004; Western, 1999; Miller, 2002; Garg, 2010; Achudume, 2003; Ibimilua, 2013, Borrini-Feyerabend, 1997; and WWF, 1989). For instance, Kanagasabai (2010) identified the benefits from biodiversity as contributions of human food supplies, provision of useful drugs and medicine, ecological benefits, as well as aesthetic and cultural gains. Other values recognized by him are economic, educational, historical and scientific worths. Similarly, Wright and Boorse (2011) categorized the value of natural species under the broad titles of sources of food and raw materials, sources of medicine and pharmaceuticals, recreational, as well as scientific and aesthetic merits.

Indeed, there are so many classifications of the values of biodiversity in environmental literature (see Ibimilua, 2013; Jefferies, 1997; Wilson, 1992; Western, 1999; Pearce and Moran, 1994; Achudume, 2003; and Vermeulen, 2004). For example, Joseph (2009) classified it under the broad headings of consumptive, productive, medicinal, material, cultural, social, ethical, aesthetic and environmental values. Likewise, Dearden and Mitchell (2009) catalogued the values under extrinsic, intrinsic, economic, ecological and ethical sub-titles. Similarly, Garg (2010) enumerated the importance and values of biodiversity as productive, consumptive, social and cultural, scientific and educative, ethical and religious, potential and option, as well as ecosystem service benefits. In all, biodiversity resources are beneficial to man and his environment.

CAUSES OF BIODIVERSITY LOSS

Researches have confirmed that natural and anthropogenic forces are responsible for biodiversity loss (See Western, 1999; Wilson, 1985, Ibimilua, 2013; Kayode, 2010; and Achudume (2003). Nevertheless, human influences are mostly accountable for the decline. Natural causes of the reduction include natural extinction, development within the same gene pool, inter-specific competition, environmental failure, as well as environmental hazards. Natural perils such as landslides, volcanic eruptions, hurricanes, famine, earthquakes, floods and droughts have caused drastic reduction in biological diversity.

In our contemporary world, today, there is much concern about loss of species diversity, especially loss of genetic diversity due to human activities (Achudume, 2003). Several human activities are accountable for biodiversity loss. Examples of them are dangerous agricultural practices, lumbering, forestry, poaching, grazing, bush burning, urbanization and industrialization. Others are mining and dereliction, indiscriminate waste disposal and oil spillage. There is no denial of the fact that developmental activities are always associated with environmental degradation (Santra, 2011).

A number of empirical artifacts tend to support the view that human interference with the environment are mostly responsible for biodiversity loss. For example, Siyanbade (2007) identified such causes as land uses and land use change, over-exploitation, allien introduction, pollution and toxification. Also, Asthana and Asthana (2013) identified expansion of agriculture, cattle ranching, firewood collection, and timber harvesting as major anthropogenic causes of biodiversity loss. Similarly, Don (1990) observed that slash and burn subsistence cultivators and loggers are mostly responsible for biodiversity loss.

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Related empirical literature posited that rapid depletion of natural resources, growing population, industrialization, urbanization as well as encroachment of protected areas by loggers are contributory factors to biodiversity loss (see Joseph, 2009; Western, 1999; Wilson, 1985; Achudume, 2003; Nelson, 2007; Ademiluyi and Solanke, 2004; and Ibimilua, 2013 for greater details). Specifically, Joseph (2009) listed the prominent threats to biodiversity as habitat degradation and loss, pollution, global environmental change, invasion of non-native species, as well as overexploitation of resources. Additionally, Kanagasabai (2010) recognized the direct causes of biodiversity loss as habitat loss, sustainable use of biological resources, environmental pollution, as well as conflict in policies. He identified the underlying causes as international trade, population growth, poverty, as well as species introduction.

Borrini-Feyerabend (1997) opined that biodiversity loss is caused by a combination of demographic, economic and political factors. That is, the interactive relationship of population, environment and development. He declared further that loss of biodiversity is caused by population growth, poverty, environmental exploitation, advancement in technology, and poor environmental management. To Wright and Boorse (2011) the reasons for the decline in earth's biodiversity are habitat change due to conversion, fragmentation, simplification, and intrusion. Other factors identified by them are accidental introduction, pollution and overexploitation.

Moreover, climate change is a contributory factor to the decline of biodiversity. A significant relationship exists between climate change and biodiversity loss. Climate change is responsible for increasing frequency of environmental hazards like flooding, drought, desertification and pollution. All these problems affect biodiversity in many ways. Changes in air, land and water quality affect biodiversity and food availability. Other causes of biodiversity loss are environmental degradation, global warming technological advancement and over exploration. Similarly, illegal logging is responsible for biodiversity loss. Apart from the fact that it destroys the ecosystem, it contributes to global climate change. Ferry (2004) declared that timber exploitation is a great threat to biodiversity.

Researchers have found out that habitat loss, overhunting deforestation, road construction, the use of pesticides, supply of infrastructure, toxic wastes, pests and diseases, weed interference, land scarcity and pressures on available land, and depletion of other natural resources are causes of biodiversity loss. Asthana and Asthana (2012) attributed biodiversity loss to expansion of agriculture, shifting cultivation, cattle ranching, firewood collection as well as timber harvesting. Again, the work of Garg and Garg (2013) has been particularly important in providing explanations for the loss of biodiversity. According to them, nuclear hazard and radioactive pollution can damage genes and it can cause the disappearance of biodiversity.

EFFECTS OF BIODIVERSITY LOSS

The loss of biodiversity has serious implications for man and his environment. Depending on the type or cause, biodiversity loss is responsible for the disturbance of the ecological balance of the environment, health hazard as well as interruption of hydrological balance. Biodiversity loss has great effect on the standard of living. The general decline in biodiversity is a major cause of food insecurity among urban and rural populations. It is a major challenge to sustainable development and it weakens attempts to achieve the millennium development goals. Human actions are fundamentally and to a large extent

irreversibly changing the diversity of life on Earth (Swiderska, Roe, Siegele and Grieg-Gran, 2010).

Biodiversity loss has accompanying consequences on the flora and fauna components of the environment. In the case of vegetal loss, the greatest threat is on forest resources. They are at the mercy of loggers, ranchers, poachers and local farmers. Logger cut off trees prematurely, randiers overgraze the vegetal covers, while poachers burn the bush in hunt for wild animals. Researches have revealed that unsustainable deforestation and hunting are having adverse effect on biological diversity (see Ibimilua and Ibimilua, 2014, Western, 1999; Wilson 1985; Nelson, 2007, and Ibimilua, 2013).

Biodiversity loss is responsible for loss of medicinal plants, loss of soil fertility, loss of agricultural crops, loss of habitats as well as environmental degradation. It is a major threat to vulnerable and endangered species and consequently, a risk to nature-based tourism. With biodiversity loss, soil is proned to erosion, disease outbreak is imminent, and the hydrological balance is disturbed. Biodiversity loss causes disease outbreak, climate change and environmental degradation. Consequently, it is a threat to environmental sustainability.

Other impacts of biodiversity loss are reduction of internally generated revenue to the government and the residents, increase in the rate of unemployment, loss of habitat, drought, desertification and general reduction in the quality of the environment. In his own contribution, Garg (2010) recognised the impact of biodiversity loss as financial loss, environmental imbalance, destruction of recreation and tourism business as well as reduced varieties.

Biodiversity loss has great effect on the standard of living. It puts the natural environment on pressure and it disturbs its ecological balance. It is responsible for the reduction of natural forces of control of erosion, habitat loss, increased watershed instability, runoff of eroded soil, as well as accelerated flooding. Erosion of native biodiversity is manifested as species extinction, restriction of geographic range, unusual population fluxes, reproductive failures, and depletion of genetic diversity (Joseph, 2009). For short, biodiversity loss is a menace to national development and environmental sustainability.

BIODIVERSITY AND SUSTAINABLE NATIONAL DEVELOPMENT

The variety and variability among living organisms and the ecological complexes in which they occur are veritable tools for environmental sustainability. The concept of sustainability has gained usage because of increasing concern over the exploitation of natural resources for economic development at the expense of environmental quality (Enger and Smith, 2013). All over the world, biological diversity is depreciating at an alarming rate. So many species have gone into extinction while others are either endangered or proned to vulnerability. This is a great threat to sustainable development.

The Earth summit held in Rio de Jenerio in 1992 increased environmental awareness as well as the concern for the environment. The major consideration of the Rio summit is the need to conserve and sustainably manage environmental resources. Consequently, the agenda 21 of Rio Conference defined sustainable development as “global partnership for economically viable, socially equitable, and ecologically sound development not only for today but also for the future”. Sustainable development involves meeting the needs and aspirations of the present without compromising the ability to meet those of the future. It is the process in which the exploitation of resources, the direction of investment, the orientation of technological planning, implementation and development, as well as institutional changes are all in harmony (Adejemilua, 2001).

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ISSN: 2186-8476, ISSN: 2186-8468 Print
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Sustainable development offers a vision of a future world, which meets the need of all without undermining the integrity of the environment (Sousan, 1992). For development to be sustainable, it should be socially acceptable, politically attainable, economically viable and technically appropriate. Sustainable development bears on the present generation the responsibility of ensuring not only their own survival and well-being, but also the survival and well-being of generations yet unborn; through processes of judicious and crisis-free anthropogenic activities, or physical forces (Ademiluyi and Solanke, 2004). Biodiversity resources are important for food, clothing, shelter and other necessities of life. These living natural resources are essential for the welfare of mankind (Amil and Arnab, 2014). In spite of this, environmental resources are degraded on daily basis without much consideration for the future generations.

Inter-specific competition and substitution, environmental failure, and natural extinction are major natural causes of the disappearance of biodiversity. Evidence suggest that humans have had a major impact on biodiversity for quite some time (Deaden and Mitchel, 2009). Human activities like agriculture, lumbering, grazing, bush burning, urbanization, industrialization, poaching, mining, and oil exploitation are responsible for the squandering of veritable natural resources. The home of almost half of the living species on this planet is being destroyed and almost one species of mamanal birds or plants is condemned to extinction per day (Asthana and Asthana, 2012). Given the high rate of biodiversity forfeiture globally, there is urgent need for conservation of the natural resources.

For the attainment of sustainable development through the conservation of biodiversity, Asthana and Asthana (2012) suggested reduction in waste generation, stabilization of chemical cycles, as well as moderation of the pace of global warming. The strategies for achieving these are adoption of more environment-friendly technology and switching over to renewable and least pollutive sources of energy, re-use and recycling of finite resources, conservation of fertile soils and wasteland reclamation, as well as freshwater conservation and water shed management. Other measures recommended by them are stabilization of world population, environmental education, as well as the conservation of wildlife, natural resources and the environment. Overall, the conservation of all the species of plants, animals, micro-organism, the ecosystem and the ecological processes of which they are part is a basic necessity for sustainable development.

CONCLUSION

Biodiversity loss is one of the biggest challenges facing mankind in this millennium. It is a great threat to sustainable development. It is caused by natural and anthropogenic factors. Natural causes of biodiversity loss include intra-specific competitions, inter-specific competitions, natural extinction, environmental failure, as well as natural hazards. Whereas, anthropogenic causes include rapid economic and population growth, poor technology and human activities. Biodiversity loss affect all sectors-economic, environment, agriculture, tourism, transport, health, aviation, forestry and fishing to mention a few. It has impact on the physical environment and resources. It can cause other environmental hazards like desertification, flooding and erosion.

Biodiversity loss affects human health, air and water quality, as well as the general quality of the environment. It is responsible for extreme events like diseases, drought, storm, flooding, climate change, and the consequent food insecurity. It is a cog in the wheel of sustainable national development. It prevents nations from meeting the present and future needs and

aspirations of their people. For the conservation of biodiversity and for the attainment of sustainable development, this study recommends legal, regional, ecological, environmental, institutional, educational, posterity and simultaneous development approaches.

RECOMMENDATIONS

Curtailing the crises which are threatening to overwhelm biodiversity and sustainable national development depend upon the roles of individuals, the private sector, government, non-governmental organizations, community based organizations, as well as international agencies. Individual, institutional, and societal appreciation of, and respect for, nature are essential foundation for truly sustainable future (IDRC, 1992). Saving biodiversity from more deterioration requires extensive environmental response in terms of environmental impact assessment, sustainable forest management, conservation, toxic substance control, pollution control, as well as promulgation and implementation of environmental policies.

The conservation of biological diversity include the ecological approach which takes into consideration the management of ecology, soil, vegetation, as well as other biotic and abiotic components of the environment. Another one is the environmental approach which considers the preservation of the habitat. Also, biodiversity conservation requires the sustainable management of cities. This method entails the strategies of landscaping, urban and peri-urban agriculture, as well as construction and maintenance of boulevards. Similarly, the regional approach to the conservation of biodiversity involves the management of soil and topography. Other moves towards the conservation of biodiversity are posterity procedure which encompasses the sustainable conservation of wildlife, as well as the institution technique which requires the involvement of establishments in the creation and spread of environmental awareness and education.

Kanagasabai (2010) expatiated on the need for protection of biodiversity. According to him, large scale destruction of biodiversity could lead to ecological imbalance. Consequently, he recommended in-situ conservation, protection of species, biosphere reserves, as well as ex-situ conservation measures for the protection of biodiversity. The preservation and conservation of biodiversity is, hence, extremely necessary and important, to keep this renewable resources alive and flourishing, for serving humanity for generations to come (Garg, 2010). Sustainable biodiversity conservation requires the control of illegal poaching. Hence, this nefarious act should be curtailed, and poachers without licence from the government authorities should be made to face serious punishment. To this end, Cunningham and Cunningham (2006) suggested the strict enforcement of hunting and fishing laws, endangered species acts, recovery plans, as well as habitat protection.

Reducing the effect of climate change is another sustainable way of conserving biodiversity. Hence, meeting future biodiversity needs require the establishment and maintenance of more weather observation stations and the sustainable use of meteorological predictions in order to mitigate the effects of climate change. Also, the use of climate models should be encouraged in the prediction of future climate changes as well as its mitigation. Other measures of diversity conservation include wildlife conservation, forest conservation, improvement in agriculture, as well as sustainable agroecology. The encouragement of agroecology will help in no small measure to replenish the soil fertility. Agroecology is based on traditional, small scale cultivation methods. By emphasizing the sustainable management of natural resources, it can have a positive impact on the environment and on the health of producers and consumers.

This study recommends multi-disciplinary approach for the conservation of biodiversity. These include environmental education on the use and abuse of biodiversity, water resources

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ISSN: 2186-8476, ISSN: 2186-8468 Print
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and other natural resources. It suggests respect for environmental policies like the 1992 convention on biodiversity, pollution control, hazardous waste treatment, as well as restriction in the use of pesticides and herbicides. Moreover, this study recommends that for the attainment of the most desired sustainable development, international organizations like United Nations Development Programmes (UNDP), United Nations Environmental Programmes (UNEP), Saving The Environment, Earth Charity, World Wildlife Fund (WNF), Natural Resources Defence Council (NRDC), Nature Conservancy, Wildlife Conservation Society should come to the aid of developing countries in the areas of funding, research and protection of biodiversity. Above all, the whole world should comply with the outcomes of international treaties like the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES), the U.N. Convention on Biological Diversity (CBD), and environmental legislations like the Wildlife Act, Forest Conservation Act, as well as Biodiversity Act.

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