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APPROACHES TO MINIMIZING AND OVERCOMING CURRENT BIODIVERSITY LOSS

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ABSTRACT: *Biodiversity is a measure of the degree of life forms on earth and the ecological complexes which they are part of. The maintenance of biological diversity provides enormous life support system to the biosphere. Though the earth recorded some past extinction events among organisms in the course of evolution as part of natural phenomena, the current rate of loss of biodiversity is far higher than past episodes of extinction and this is a worrisome concern because most of the contributing factors are man-made. Attempts have been made at the regional and global level to address these trends but seem to be sabotaged by lack of cooperation in developing nations. Tactical and integrated strategies therefore need to be adopted to ensure compliance with the laws guiding man's behavioral attitude to bio-resources. These integrated strategies may include policy making, legislation, attitudinal change, nature education, nature advocacy, socio-political measures, good governance, communal efforts, individual efforts, economic tools and all other combined strategies to overcome the current biodiversity loss so that the biosphere will remain sustainable and productive. This may also assist in ameliorating effects of climate change and in the long run halting it. Other related issues are discussed.*

KEYWORDS: Biodiversity Loss, Climate Change, Bio-resouces, Biosphere

INTRODUCTION

A paper by Bruce Wilcox commissioned by the International Union for the Conservation of Nature and Natural Resources (IUCN) for the 1982 world National Parks Conference defined Biodiversity as "the variety of life forms at all levels of biological systems (molecular, organismic, population, species and ecosystem)" The 1992 United Nations Earth Summit defined biological diversity as " the variability among living organisms from all sources, including 'inter alia', terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems" (CBD, 1992). We can infer from the above definitions that biodiversity is the degree of variation of life at all levels of biological organizations. Therefore, diversity can be grouped into genetic diversity, species diversity and ecosystem diversity (Magurram, 1988; Heywood, 1992). To the geneticists, biodiversity refers to the degree of variability in the genetic components of a species. The genotypic differences among organisms are responsible for the varying phenotypic variations either within a species (intraspecific variation) or between species (interspecific variation), although a level of interaction exists between the genes and the environment (Manoel, 2002; Oboh *et al*., 2008). Species diversity is a measure of species richness and their relative abundance interacting as a community of organisms in a particular ecosystem. Ecosystem diversity refers to the variations in the ecological processes among different ecosystems each containing a unique biotic community (Magurram, 1988; Heywood, 1992).

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As cited by the Ohio State University (2013) there are 8.7 million species on earth out of which 1.413 million have been discovered so far while 7.287 million are yet to be discovered. As analyzed by Asthana and Asthana (2012) the benefits of biodiversity are enormous and they include: utilitarian benefits to man, aesthetic benefits, cultural benefits, ecosystem stability, ecological benefits (photosynthesis, efficient pollination, soil maintenance, climate regulation and the provision of other ecosystem goods and services). Biodiversity is the result of 3.5 billion years of evolution (Ranganathan *et al*., 2008; Aguoru and Audu, 2012). Since life began on earth, five major mass extinctions and several minor events have led to large and sudden drops in biodiversity. Though extinction of species is a constant phenomenon because all species have a finite life span and this may occur over a wide time range. However, the current rate of extinction is not spontaneous rather it occurs at an alarming rate within short time interval and anthropogenic in nature, that is extinction of life and loss of biodiversity caused by the impacts of man on the ecosystem (Heywood, 1992; Asthana and Asthana, 2012).

According to Taylor *et al*. (2007), the last 540 million years marked a rapid growth in biodiversity through the Cambrian explosion. This was the period during which the majority of multicellular phyla first appeared. The next 400 million years included repeated, massive biodiversity losses classified as mass extinction events. This was the period of carboniferous loss when the rainforest collapsed which led to a great loss of plant, animal and microbial life. The Permian-Triassic extinction event also took place 251 million years ago with many vertebrates as victims. The cretaceous-Paleocene extinction event which occurred 65 million years ago attracted more attention than others because it resulted in the extinction of dinosaurs. Most biologists believe that the period of the emergence of Homo sapiens is part of a new mass extinction named the Holocene extinction event caused primarily by human impacts (Miller, 2001). Omofonmwan and Osa-Edoh, 2008; Asthana and Asthana, 2012). These include: Overpopulation; Habitat destruction; Habitat fragmentation; Co-extinction of species as a result of habitat destruction; Introduction of invasive species; Climate change and global warming through enhanced greenhouse effect caused by excessive release of greenhouse gases to the atmosphere; Ozone layer depletion and ozone thinning; Release of toxic air pollutants to the environment; Bush burning and wild fires; Acid rain as a consequence of air pollutant; Poisonous industrial and domestic discharges into water bodies; Over exploitation of natural resources (fish, games, forest; grasses); Nonspecific application of pesticide; Oil pollution and oil discharges into water bodies; Thermal pollution in water bodies; Global deforestation; Military activities and war; Urbanisation and industrialization; Fossil fuel combustion; Intensive crop cultivation and bad agricultural practices; Poaching and ivory sales; Developmental projects; Inequitable distribution of national wealth (poverty); Ignorance and Lack of political will (Omofonmwan and Osa-Edoh, 2008; Aguoru and Katsa, 2009; Agouru and Audu, 2012) . It has been argued that the present rate of extinctions is sufficient to eliminate most species from the planet Earth in the next 100 years (UNEP, 1995). In view of the above challenges, this paper presents integrated approach that critically evaluates the possible strategies to be adopted in overcoming the current biodiversity losses and to objectively proffer possible solutions to save the global biodiversity.

STRATEGIES IN COMBATING LOSS OF BIODIVERSITY

To overcome the challenges and difficulties currently facing global biodiversity, all the factors contributing to these challenges need to be withdrawn, reduced or totally eradicated if possible.

ISSN: ISSN 2055-0219(Print), ISSN: ISSN 2055-0227(online)

A combination of various strategies may be adopted to achieve better results than using a single approach. These holistic or integrated approaches include the following:

Controlling overpopulation

A great economist, Thomas Malthus in his theory of human population dynamics, once described the rate at which the human population grows in a geometric proportion at the expense of the resources. Today, this trend has become a danger to the earth biodiversity (Jimoh *et al.*, 2013). However, overpopulation can be mitigated through birth control, family planning, control of rural to urban migration, provision of basic infrastructures and facilities to the rural dwellers to prevent rural-urban drift and conducting population census to know the exact number of people in a particular location and the facilities therein to support them. Population control is not an easy task because of varying human beliefs, cultural background and differences. Lastly, a control should be put in place to checkmate illegal migration into a particular territory. Efforts to equate human population with the carrying capacity of the environment would help alleviate pressure on the earth's bioresources (Cincotta *et al*., 2000; Omofonmwan and Osa-Edoh, 2008).

Overcoming habitat destruction and fragmentation

Habitat destruction has played a key role in the loss of biodiversity and species extinctions as their habitats are constantly being destroyed by man (Adewuyi, 2012; Abere and Opara, 2012; Aguoru *et al*., 2014). All concerted efforts and control that can be made to checkmate overpopulation, deforestation and indiscriminate bush burning will help reduce habitat destruction (Suding *et al*., 2004; Asthana and Asthana, 2012). In the same manner, dam construction, road rail construction and various developmental works should be scrutinized and made to pass through environmental impacts assessment tests to evaluate the negative impacts of the projects on species biodiversity and the environment at large. Projects should be cited far away from specie-rich and specie-diverse habitats to prevent species loss. Multifaceted approaches need to be used in overcoming community caused habitat destruction in developing countries. These include efforts to alleviate poverty by the government and provide alternative sources for people to meet their needs including affordable housing schemes for settlements.

Habitat restoration and rejoining fragmented habitats

According to Suding *et al*. (2004) the act of restoring or reversing an initially destroyed habitat to its former state which supported species diversity is known as habitat restoration. When projects are constructed, habitats may become isolated or fragmented into patches and this may lead to species loss or migration. Barriers such as large water bodies, mountains, valleys and other prominent features of a landscape should be made to exist as they encourage diversity. Scientific research can inform the restoration of local habitats and help renaturalise entire ecosystems by uniting scattered fragments. In Costa Rica, scientists, businesspeople, politicians, and the local community helped regenerate 700 square kilometers of a tropical forest system, an area assaulted by ranching, hunting, logging, and fires for almost 400 years. They purchased large tracts of land, stopped the farming and fires, and let nature take back its original terrain (Janzen, 2000; Omofonmwan and Osa-Edoh, 2008).

Equitable distribution of wealth to reduce poverty

Food, clothing and shelter are the basic needs of man. The inability to possess these basic needs whenever desired is termed poverty. As cited by Brashares *et al*. (2004) developing and under

ISSN: ISSN 2055-0219(Print), ISSN: ISSN 2055-0227(online)

developed countries are considered to have high level of poverty because 75% of their population do not have access to these basic needs. This is because resources are inequitably distributed in these regions due to greed and selfishness. Incomes are low while good accommodation or housing schemes are meant for those in authority. The alternative option is to put pressure on the earth resources by exploring the forests for food, fuel wood to cook the food and timber wood to construct their abodes. Habitats are continuously being destroyed by the poor in search for survival and settlements which ought to be provided by good governance. In developed countries, these basic needs are not part of their challenges because government has already put in place various ways of getting access to these needs to a comfortable level. Therefore, they do not need to disturb the forest wealth. Good governance is thus a potent strategy to overcome the challenge of biodiversity (Ranganathan *et al*., 2008).

Controlling evasive species

There is an urgent need for the government to assess and identify invasive species and develop effective strategies for their control. This can be done by educating the public about the types of invasive species found in various regions and raise awareness of their relevance so that their control can start at the grass root. More research is required to understand vulnerability of different ecosystems to new invasions by the alien invasive species. We need to encourage the growth and diversity of wild species only to promote diversities rather than using domesticated and alien species (Asthana and Asthana, 2012).

Reducing Climate Change and global warming

The problem of climate change and its potential impacts on biodiversity should be addressed by the adoption of a variety of mitigation and adaptation measures. The measures include limiting or controlling anthropogenic activities such as deforestation, adoption of proper land management practices (including agroforestry), changing energy technologies (e.g. the use of efficient wood stoves and biogas), ensuring proper fire management as well as developing fire reduction strategies (Omofonmwan and Osa-Edoh, 2008; Abere and Opara, 2012). Afforestation is a potent remedy since trees are known to play key roles in carbon sequestration (Eneji *et al*.2014).Other strategies should involve adopting the integrated land and water management practices, and enhancing synergies between the conservation and sustainable use of biodiversity and climate change. In 1988 an Intergovernmental Panel on Climate Change (IPCC) was established to coordinate scientific information and research on the likely causes and consequences of increased levels of CO_2 and other greenhouse gases and to identify effective remedies. The Earth Summit in 1992 attempted to secure international agreements on targets for CO_2 emission for all countries (IAIA, 2005). To prevent climate change and global warming, efforts that will prevent excessive release of greenhouse gases (carbon (IV) oxide, carbon monoxide, methane and Chlorofluorocarbon) to the atmosphere should be put in place, most notably; the combustion of fossil fuel and fuel wood need to be discouraged. Advanced countries have already shifted their focus from fossil fuel to the production of biofuels and biogas as a source of cleaner renewable energy sources from wastes and from plant materials such as cassava and cane plants (Altmann *et al*., 2002; Taylor *et al*., 2007). Industries are now mandated to pay the compulsory emission tax fee and they are heavily charged if their emission goes beyond the standard threshold allotted. This helps checkmate their activities and make them more emission conscious. If these strategies are equally adopted in most developing nations, the biosphere will be a sustainable place to live and biodiversity will be maintained. To avoid the risk of dangerous anthropogenic interference with the climatic system, the

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European Union member states have agreed to limit the increase in global mean temperature to not more than 2^{o}C (NBSAP, 2001).

Controlling ozone layer depletion and ozone thinning

As analyzed by Asthana and Asthana (2012) the reduction in the ozone layer of the stratosphere caused by the action of nitrogen oxide molecules, chlorine atoms and hydroxyl ions released to the atmosphere by man is termed ozone layer depletion or ozone thinning. This impairs the function of this layer in preventing the ultraviolet radiation from the reaching the earth surface; with their damaging effects on life forms most especially genotoxic effects. The strategies that can be used to prevent ozone thinning caused by man include: Reduction fossil fuel combustion**;** Reduction in the use of nitrogenous fertilizers; Zero level of Chlorofluorocarbon used in industries**;** Zero level of ammonium perchlorate used by supersonic rockets and space shuttles.

Legislation and absolute enforcement on the release of toxic air pollutants to the environment

Most of the toxic air pollutants that threaten global biodiversity through global warming and acid rain are released from fossil from combustion (Altmann *et al.*, 2002). Currently, the global strategy is to adopt cleaner renewable energy sources for vehicles, domestics and industries. It should be incorporated into regional, national and global legislation to limit the use of petrol and diesels by using the instrument of taxation, dues, levies and other fiscal policy measures (NBSAP, 2001). Biocides that are not specific in actions should be banned while any erring manufacturing industry should be de-licensed by appropriate regulatory body. Ban should also be placed on the use of chlorofluorocarbons as industrial chemicals in refrigerators and foam making which disrupts our ozone layer. We therefore suggest that every country needs to have an effective law enforcement agency in environment that ensures strict compliance to the law guiding the release of toxic air pollutants and a special court of environments should be created regionally and globally. A comprehensive list of all banned toxic chemicals should also be available to the public through enlightenment.

Legislature on bush burning and wild fires

It has become habitual in most developing countries most especially in their rural settlements to set the environment on fire for frivolous reasons whenever they wish to, without any trial in court of law. This practice is a big threat to biodiversity (Siemmann *et al.*, 1997). Legislature should be put in place to checkmate this while erring persons should be charged to environmental courts for sanctions. With this strategy in place, habitat destruction will be reduced and biodiversity will rule (NBSAP, 2001).

Prevention of acid rain and ocean acidification

Another detrimental effect of fossil fuel combustion on biodiversity is through acid rain caused by acid gases (sulphurdioxide and oxides of nitrogen) emission to the atmosphere when fossil fuels are burnt (Aguoru and Katsa, 2009; Adeyemi and Ogundipe, 2012). A purer source of renewable energy such as biogas and ethanol will help militate against acid rain. The report of the Royal Society of London concludes that ocean acidification, a cause of aquatic species loss, is an inevitable consequence of continued emissions of CO_2 into the atmosphere and the magnitude of this acidification can be predicted with a high level of confidence (Fuller *et al.*, 2007). It is now obvious that as a matter of urgency shift away from fossil fuel combustion in

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vehicle, domestic and industrial petrol or diesel plants, indiscriminate bush burning and other sources that lead to excessive release of CO_2 to the atmosphere.

Legislation on poisonous industrial and domestic discharges into water bodies

The lethal aftermaths of industrial mercury discharge into Minamata bay in Japan is still fresh in mind which led to the death of aquatic species in that bay. According to Aguoru and Katsa (2009), strict laws should be enforced to ban the discharge of toxic materials, effluents and other wastes into water bodies across the globe in order to protect aquatic biodiversity of species (both invertebrates and vertebrates. The public should also be enlightened of the negative consequences of their actions and be made to know that the aquatic ecosystems are not repositories of waste disposal.

Sustainable fishing, hunting, grazing and use of forest products

Sustainability means taking care of the present generation in resource use without hampering the chances of the future generation to have access to that particular resource. Greed and poverty are major enemies to sustainable use of resources (Vitousek *et al*., 1998; Ceballos and Ehrlich, 2002; Pimm *et al*., 2006; Omofonmwan and Osa-Edoh, 2008). Enlightenment campaign should be made to sensitive the public on the concept of sustainable use of bioresources. Sustainable fishing, hunting, grazing and use of forest products should be preached so that biodiversity will be sustained and the biosphere will continue to exist. All means by the government to alleviate or eliminate poverty need to be used so that the public will have alternatives to choose from.

Manufacture of specific and more environmentally friendly biocides

Biocides are generally nonspecific and persistent in nature and these features have inimical effects on the biodiversity of the environment when they are applied (Taylor *et al*., 2007). In overcoming this challenge, biocides have to be specific from the point of production so that only the targeted pest or weed will be affected rather than killing a wide spectrum of plants, animals and microbes. Therefore, the manufacturers of pesticide, fungicide, bactericide, avaricide and herbicide should incorporate elements of specificity in their toxic formulae and they should be safe to the environment and its bioresources. Alternatively, the use of other pest or weed control measures should be sought. These include: biological control of pests, integrated control of pests and cultural control method (Aguoru *et al*., 2015a). The latter method involves the use of crop rotation, mixed cropping, planting diverse crops and other good agricultural practices (Manoel, 2002). Manufacturers of pesticide, fungicide, bactericide, avaricide and herbicide should incorporate elements of specificity in their formulae and they should be safe to the environment and its bioresources.

Control of oil pollution and the use of oil treatment technologies

Oil pollution is devastating to the aquatic species and the top carnivores feeding on them. Apart from the man-made causes of oil pollution, seepage of oil to water bodies is a natural phenomenon. Techniques for treating and preventing oil pollution have improved. They include: use of floating booms to prevent slicks from reaching sensitive shore lines**;** fast collection of oil and pumping back to special collection ships**;** application of oil digesting microbes such as *Pseudomonas* and plants such as *Dryopteris*; use of new specially designed oil spill cleaners that are less toxic and more biodegradable than those used previously; careful routing of oil tankers to avoid ecologically sensitive areas**;** introduction of double skinned

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tanker hulls such that if one hull is damaged, oil will not leak to the aquatic environment (Taylor *et al*., 2007).

Control of thermal pollution in water bodies and the environment

Some industries empty their heat energy wastes into water bodies without considering the negative consequences on aquatic vertebrates, sensitive invertebrates, aquatic plants and other microbes. Higher temperature above the optimal level disrupts cellular enzymatic functions and they may die off and become extinct. This is also a threat to biodiversity (Aguoru and Audu, 2012). To overcome this, industries should be made to know the potential consequences of this practice while the law guiding thermal pollution should be strictly adhered to. Industrialized nations are currently complying with this as indicated by Asthana and Asthana (2012).

Vigorous forest policy, forest productivity and reforestation

Forests are regions that heavily support biodiversity. The tropical forests are considered to be mega diverse regions of the world. This is natural design of stratification in forest canopies and each stratum supports diverse kinds of animals from the top canopies to the lowest canopies (Ahrends *et al*., 2010). Even the forest floor supports diverse kinds of detritivores and decomposers. Indirectly, afforestation also reduces global warming by helping in carbon sequestration and in preventing soil erosion (Fuller *et al*., 2007; Ahrends *et al*., 2010). Therefore the role of afforestation or reforestation in biodiversity cannot be over emphasized. Therefore, all nations should incorporate agroforestry programmes in their top agenda as a priority. Deforestation should be drastically reduced while vigorous forest policy should be enforced without nepotism or tribalism which is the order of the day in corrupt nations. Good governance also has a role to play by providing the masses with alternative sources of construction materials such as steel and shift attention away from reliance on timber production and excessive logging operations. Other energy sources should also be available to and affordable by the public so that fuel wood collection from forest regions will be reduced. Our forest regions should be reserved as protected areas and should be heavily guarded. The Brazilian Amazon massive deforestation between 1990 and 2009 is still fresh in mind. Therefore, the Brazilian government has set a target to reduce deforestation by 80% by the year 2020 (Klink and Machado, 2005).

Conflict resolution and controlling military activities

Given the negative impacts caused by a number of civil wars that lead to loss of rangelands, forest and marine biodiversity, it is imperative that superior strategies for the conflict prevention and peace building are developed and implemented. Both local and international communities, when necessary, should intervene to fight social vices that lead to civil wars, such as inequalities, corruption and nepotism. There is a need for the establishment of a global network on conflict prevention and peace education in collaboration with the respective ministry of education, civil societies and religious organization (Robinson and Sutherland, 2002).

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Shifting attention from dependence on fossil fuel combustion

It is crystal clear that fossil fuel combustion is a great enemy to the environment and biodiversity. Various toxic oxides of carbon, sulphur, nitrogen and heavy metals are released to threaten the earth life support system during fossil fuel combustion. The consequences of releasing these pollutants may include the elimination of life from the planet earth through global warming, climate change, ocean acidification, acid rain and ozone layer depletion (IUCN, 2010; Adeyemi and Ogundipe, 2012; (Batta *et al*., 2013). Nigeria is particularly more vulnerable as many households and industries now rely on alternative sources of power generation notably the use of petrol and diesel generator sets which release huge amount of carbon monoxide to the atmosphere on daily basis. (Batta *et al*., 2013). Our vehicles are manufactured to have petrol or diesel engines. The Nigeria government should therefore rise up to their responsibilities of providing stable power supply to the entire nation as this will reduce the emission of gases from generator sets. Attention should also be shifted towards the use biogas and ethanol for fuelling vehicles because they are environmentally friendly as currently being practiced in Brazil and China (Robinson and Sutherland, 2002). This will go a long way in overcoming the challenges of biodiversity.

Good agricultural practices geared towards biodiversity

While bad agricultural practices that discourage biodiversity should be abolished (land clearing, bush burning, mono cropping, habitat destruction, habitat fragmentation, continuous tillage, excessive use of fertilizers), good practices that encourage biodiversity need to be encouraged (Siemmann *et al.,* 1997; Adewuyi, 2012). These include: mixed cropping, crop rotation which incorporate the use leguminous crops to house nitrogen fixing bacteria, the use of organic manure which encourages microbial decomposition and tree plantation in farms which supports diverse animals, insects, pollinators, detritivores and decomposers.

Ban on poaching and ivory sales

CITES (Convention on International trade in Endangered Species) and various governmental polices have helped place a ban on poaching and the sales of parts of endangered species such as hides and ivory. This intervention is critical to save elephant (*Loxodonta africana*) from extinctions by man. Bans should also be placed on all other species considered to be endangered from being traded by man (CITES, 2008).

Environmental Impact Assessment

The Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS) recognize impact assessment as an important decision-support tool to help plan and implement developmental projects not at the expense of biodiversity. The Conventions require Signatories countries to apply EIA to proposals with potential negative impacts on biodiversity to help meet their objectives, so that development proposals respect mechanisms for the conservation of biodiversity, result in sustainable use of biodiversity resources, and ensure fair and equitable sharing of the benefits arising from use of biodiversity. Impact assessment provides opportunities to ensure that biodiversity values are recognized and taken into account in decision-making. Importantly, this involves a participatory approach with people who might be affected by a proposal (IAIA, 2005; Aguoru *et al*., 2015b).

ISSN: ISSN 2055-0219(Print), ISSN: ISSN 2055-0227(online)

Bioconservation and the use of protected areas

Bioconservation is all about maintaining the biosphere (Durugbo *et al*.,2012; Taylor *et al*., 2007; IAIA, 2005). It means taking action to avoid species decline and extinction and permanent detrimental change to the environment. To achieve this task, we need to understand how the biosphere functions or how organisms and environment interact. In order words, we must apply our knowledge of ecology and related environmental sciences. Successful conservation is not just a matter of science; it also requires public and governmental support. If we are to prevent the continued rapid extinction of species due to human activities, we need to identify the species at greatest risks, investigate why they have become vulnerable and make attempts to remedy the situation (Asthana and Asthana, 2012). Establishing sperm banks, field gene banks and seed stores to maintain the full range of genetic diversity of species. For instance, the International Cocoa Gene Bank in Trinidad which specializes in cocoa diversity grows 2500 trees from each of 16 different strains of *Theobroma cacao* types or strains. Cryopreservation and DNA preservation are new conservation technologies that give confidence to biodiversity in the future. Establishment of botanical gardens, zoological gardens, sanctuaries, parks and other protected areas have helped to conserve the earth's biodiversity when properly maintained. The maintenance of these areas require the use of trained personnel in relevant areas of specialization, adequate funding of breeding programmes and other efforts to maintain the species *ex-situ* and *in-situ.* (Taylor *et al*., 2007; IAIA, 2005).

Global adoption of Biotechnology in Agriculture

Introduction of land reforms and sustainable agriculture could go a long way to remove pressure of ever exploitation from forested wild land. If the people living in the locality are provided with viable alternatives for their needs, natural systems shall no longer be subjected to frequent encroachments. A high priority area for future research is the area of biotechnology for sustainable agriculture. In this area, large quantities and quality food can be produced within a small space of land through tissue culture techniques and genetic engineering. Crops can be made to flourish in acidic, saline, low water level, waterlogged and poor nutrient soils through crop improvement and plant breeding programmes (Taylor *et al*., 2007). With the use engineered plants, therefore there is no need for intensive fertilizer application to the soil since this has been implicated in causing loss of biodiversity through eutrophication and ozone thinning (Asthana and Asthana, 2012). Biotechnology also helps keep many green spaces as habitats for organisms and prevents habitat destruction through land clearance for agriculture. As a matter of facts, crops that resist insects and pests can be engineered thereby eliminating the use of herbicides and pesticides that are antagonistic to biodiversity.

Global Conventions and treaties strategy

At the 1992 United Nations Conference on Environment and Development called the Earth Summit held in Rio *de* Janeiro in Japan, the Convention on Biological Diversity (CBD) was born (IAIA, 2005).. In this convention, 192 countries were parties to the treaties where targets were set to combat loss of biodiversity. The Earth Summit of 1992 came out with a list of realistic objectives that should be met before year 2010. Unfortunately, these objectives have not been fully met at the global level but many regions across the world, most especially the developed nations were able to meet the set target by 60% especially in Japan, Germany and Sweden (Asthana and Asthana, 2012). In developing part of the world such as Nigeria, these targets were a mere mirage and dream probably due to; poverty, corruption, nepotism, tribalism, lack of regard for legislation and rule of law by the leaders, stronger commitment to

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politics than the environment and illiteracy among rural dwellers. These objectives include: Reduced climate impact**;** Zero tolerance to enhanced greenhouse gases**;** Natural acidification only**;** A toxic free environment**;** A protective ozone layer**;** A safe radiation environment**;** Zero eutrophication**;** Flourishing lakes and streams**;** A balanced marine environment and flourishing coastal areas**;** Sustainable forests**;** A varied agricultural landscape**;** Reduced habitat destruction (IAIA, 2005).. Apart from the Convention on Biodiversity of 1992, other conventions that had achieved results in reducing the challenges of biodiversity need to be mentioned. These include: Convention Relative to the Preservation of Fauna and Flora in their Natural State (CRPFFN) held in London 1993; Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere (CNPWPW) help in Washington 1940; International Plant Protection Convention (IPPC) held in Rome 1951; African Convention on the Conservation of Nature and Natural Resources (ACCNN) held in Algiers 1968; Convention on International Trade in Endangered Species (CITES) held in Washington 1973; Convention on the Conservation of European Wildlife and Natural Habitats (CCEWN) held in Berne 1979; Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Regions held in Nairobi 1985.

Role of Governmental and Non-governmental Organisations

Non-Governmental Organisations (NGOs) exist to promote education and awareness on biodiversity across the globe. Their activities have helped in reducing the challenges current facing regional and global biodiversity. Some help in managing small reserves that protect local wildlife while they also raise funds to support wildlife safety and management. In Britain, the National Trust (NT) owns 340 protected sites to maintain local wildlife. The Royal Society for the Protection of Birds (RSPB) popularly called the young ornithologists' club saddled with the protection of diverse species of birds. The Royal Society for Natural Conservation (RSCN) owns 126 reserves while others also maintain biodiversity in their regions. Others include: Wildfowl Trust (WT) which has reserves for protecting local ducks, geese and swan; The Rare Breed Trust (RBT); the Flora and Fauna Preservation Society (FFPS) and the Worldwide Fund for Nature (WWF). WWF has helped in saving many species from extinctions at the global level through habitat restoration and breeding programmes. For instance, the giant panda is their logo because the animal was saved from going to extinction by this organization. Many statutory associations are formed around a single taxon, such as the Polar Bears International (PBI); the Gopher Tortoise Council (GTC); or many taxa, such as the Xerces Society for Invertebrate Conservation (XSIC) and the Center for Plant Conservation (CPC). International organizations such as the IUCN and can help bridge the efforts of bioconservation between many national governments and promote bioconservation education to sensitize the public. Nature Conservancy, the National Parks Commission, Forest Commission, National Rivers Authority, Joint Nature Conservation Committee, the United Nations Environmental Protection (UNEP) and Intergovernmental Panel on Climate Change (IPCC) are few examples of statutory organizations saddled with the responsible of protecting nature and its biological resources. Many national governments across the globe need to intensify efforts in maintaining biological diversity and to wake up from slumber, because it is not enough for governments to form organizations rather such organizations should be effective in achieving their objectives.

Using legislation to combat all other man-made factors that threaten biodiversity

Present laws, commissions, and treaties, when fully enforced, may be best able to handle the direct exploitation of wildlife species (IAIA, 2005).. Treaties such as the Convention on International Trade in Endangered Species (CITES) and the International Whaling

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Commission's moratorium on commercial whaling have helped lower trade in rare and declining species. Domestic laws, such as the Endangered Species Act in the United States, are explicitly designed to stop anthropogenic extinctions. The act has been successful in reducing the extinction rate and recovering several high profile species, such as the alligator, bald eagle, and gray whale. Legislation and economic disincentives should be strengthened and enforced on local, national, and international levels, with the latter designed especially to exert pressure on noncompliant nations. Since 1986, after a moratorium on commercial whaling went into effect, whale numbers have increased. Elephant populations have expanded since the ivory ban was imposed in 1989. By contrast, despite regulations and treaties, many marine fish stocks have continued to decline. The push toward moderation has been depressingly slow and ineffective, but moderation is the only way to achieve a sustainable future for both the industry and the fish stocks that it has overexploited. Much the same can be said for many human interactions with nature. One possible way forward is a rights-based approach for biodiversity. Ecuador recently established constitutional rights for nature. Rather than simply regulating environmental destruction, the new law gives Ecuadorans the right, and obligation, to protect ecosystems, even if they are not directly injured themselves. This approach may offer a promising new path.

Ecological Economics and Ecotourism

Thomas Malthus worked within the tradition of the natural sciences. For these and other thinkers of the Enlightenment, human reason was understood as a derivative of natural instincts; nature was a benevolent force in creating wealth. The Ecotourism and Sustainable Tourism Conference (ESTC) is a unique annual conference providing practical solutions to advance sustainability goals for the tourism industry. In 2016, the ESTC will be held in Botswana and will bring together over 500 professionals from around the world (ESTC, 2015). Here the roles of ecotourism in sustaining global biodiversity shall be reviewed.

The relatively new field of ecological economics is a grand synthesis of human activity and the natural world. Within this sphere, there is plenty of room for discourse on individual human behavior, economic activity, ecology, and global change. For those working in this discipline, nature is seen as benevolent: the provider of goods and services, a protector against catastrophes such as hurricanes, droughts, and floods. Great strides have been made in valuing these services. Economists can estimate an ecosystem's value by the carbon it sequesters, the waste it absorbs, the water it provides, or the air it cleans. One species might provide pollination services and another might be valued for its appeal to tourists. These values can be calculated in various ways. Ecotourism has also helped to promote conservation efforts in many countries. Gorilla watching has become one of Rwanda's biggest economic engines (Brashares *et al.*, 2004). The high commercial value of wildlife is hardly confined to small and underdeveloped countries (NBSAP, 2001). As cited in the website of the American government, the United States, federal agencies interview hunters, fishers, and wildlife enthusiasts every five years to study the economic impact of wildlife recreation. Each year, 34 million hunters and fishers spend about 77 billion Dollars in the U.S. There are even more dedicated wildlife watchers. In 2006, 71 million Americans spent 46 billion Dollars observing and photographing wildlife (Taylor *et al.*, 2007). This passion for wildlife needs to be taken seriously in developing countries.

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Bioliteracy and Nature education

Since people only protect what they value, the most important and perhaps most difficult step in slowing biodiversity loss will be transforming human attitudes about nature. As a society, we need to establish an ecological identity that helps foster a love of nature. Biologists can convey the excitement of natural history and the joy of scientific inquiry to students and the general public. Social scientists can help make the connection between wildlife conservation and human well-being. Great places to start are in the home and in elementary school. Many authors have written convincingly on the need for environmental literacy and outdoor education, to take students directly into parks, farms, and shorelines. We need to integrate these moments into a broader societal dedication to conservation. There is considerable hope along these lines, indications that education programs on whale-watch tours and even on nature television influence people's behavior and increase their environmental consciousness. Bioliteracy can entail far more than an appreciation of wildlife and whatever large animals they might contain. It can help students explore the role of biodiversity in human well-being. Recent studies indicate that biodiversity loss, invasive species, and habitat destruction can be drivers in the ecology of diseases, by helping pathogens and vectors spread quickly around the world. A better understanding of the protective role of nature and biodiversity will ultimately benefit conservation efforts. Conservation education with urban and rural communities should be emphasized. Failure of implementation of conservation strategies has been partly because of the limited awareness of the people of the role of biodiversity in ecosystem and human health and limited financial resources (Aguoru and Audu, 2012). Conservation education may help re-align the people's minds toward protection of biodiversity and thus conservation would trickle down from people's own initiatives (Durugbo *et al*.,2012).Transforming communities into conservators requires clear understanding of the value that nature and the consequences of having non-functional ecosystems.

Endowment and Biodiversity Trusts

One innovative way to establish and maintain protected areas is by creating conservation trust funds. (NBSAP, 2001). There is an urgent need for such endowments, especially in the tropics, where human numbers and consumption are burgeoning and populations of many wildlife species are in decline. Permanent funds, ideally administered by a board of qualified trustees, will be critical in maintaining conservation areas in perpetuity. As of 2000, conservation trust funds had been established in 40 countries. This modest beginning is an important first step. According to Janzen (2000), Costa Rica is aiming to create a 500 million Dollars endowment fund to consolidate 25% of the country into eleven conservation areas. One hundred million dollars would be spent to consolidate the areas, and annual revenue from the remaining 400 million Dollars would be divided among the conservation areas to cover operating costs. We should think about how tourists and benefactors might contribute to national and global conservation trusts. Companies that are involved in bioprospecting in conserved areas should contribute to preserving the habitat from which they profit.

Attitudinal adjustments

In overcoming the challenges of biodiversity globally, man needs to change his attitude and belief towards nature and bioresources. There should be an inward passion to protect microbes, plants and animals of diverse group because they also determine our existence in the biosphere (Aguoru and Audu, 2012). The popular notion that man is a ruler over all living organisms should be discarded because all life forms are equally important for the functionality and

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productivity of the biosphere. It is when this is realized that biological diversity will be respected and cherished (IAIA, 2005).

SUMMARY AND CONCLUSION

In summary, biodiversity as a measure of variation and variability among living organisms needs to be sustained for the biosphere to remain functional and productive. This is because the strength of the various ecosystems is measured by their biodiversity. However, there are various anthropogenic factors threatening the global biodiversity and they constitute a huge threat to all life forms including man himself who is the originator of the problems. Concerted efforts are currently being made at the global level to overcome these enormous challenges and these may require integrated approaches, as no single strategy may effectively prevail over this difficulty.

A worrisome concern is the lack of good governance among developing nations most especially the hydra-headed problems of corruption, nepotism, tribalism, weak policies, lawlessness, recklessness and lack of regard to rule of law, all of which undermine the global strategies of saving biological diversity. While the efforts of most developed nations need to be commended, they are also advised not to relent "as the battle is not yet over, until it is over". Meanwhile, developing nations including Nigeria should swing into actions and enlist nature conservation in their topmost agenda rather than concentrating on political matters and revenue sharing formulae from crude oil sales. In conclusion, the solutions to overcome the difficulties and challenges facing biological diversity require individual, communal, national and global efforts. Good governance and commitments at all levels of governments are also required. The efforts of governmental and non-governmental organizations should be more intensified through conventions, treaties, advocacy, fund raising, and nature educations. When all integrated and concerted efforts are combined together with determination and will, the current difficulties facing biodiversity will surely be surmounted.

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