

Integrating Ecosystem Services Approach in Achieving Development Goals: The Role of the Geographer

Olalekan Adekola¹ Terdoo Fanen^{2*}

1.Department of Geography, Moddibo Adama University of Technology, Yola, P.M.B. 2027, Yola, Adamawa State, Nigeria

2.Department of Geography and Regional Planning, Federal University Dutsin-Ma, P.M.B. 5001, Dutsin-Ma, Katsina State, Nigeria

* E-mail of the corresponding author: fterdoo@fudutsinma.edu.ng

Abstract

The ecosystem services approach is increasingly suggested as a way to achieve the sustainable use of ecosystem products and services. This concept was put firmly on policy agenda by The Millennium Ecosystem Assessment report of 2003, even though its history dates back to the 1970s. This has drawn great attention to the study of ecosystem services. Studies in this field has been dominated by those interested in biophysical environment, exploring how natural sciences can protect and enhance goods and services necessary for human wellbeing. Others have focused on economics, measuring and communicating the value of ecosystem services and goods to spur government and other decision makers to take ecological gains and losses into account in decision making process. While this concept is widely adopted in countries such as United Kingdom, Netherlands and Australia, there is little or no attention to this concept and its integration into national and regional developmental objectives in Africa. In societies where the concept has been tested and adopted, geographers have been at the forefront of these developments. This begs the question what role does African geographer play in enhancing the ecosystem service approach in improving the lot of Africans. This paper explores the link between ecosystem services and Millennium Development Goals (MDGs), identify potential areas of contribution of African geographers in assessing the relevance and adoptability of the ecosystem service concept in Africa especially in areas such as in mapping, visualization, the manipulation of data via geospatial information systems, generating information for capturing and measuring goods provided by natural systems, enhancing economic decision-making through the widespread promotion of market based instruments for conservation such as markets for ecosystem services and so-called payments for ecosystem services schemes. It is suggested that to achieve efficient outcomes, MDGs and other development goals need to be framed in the context of an ecosystems approach.

Keywords: Africa, Geography, Ecosystem service approach, Millennium Development Goals (MDGs)

1. Introduction

Natural ecosystems such as wetlands, forests and coral reefs provide valuable resources for human populations and many other life forms. What is often less emphasised until recently is that natural ecosystems also perform fundamental life-support functions without which human civilizations would cease to thrive. For instance, wetlands have been described as “the kidney of the landscape” because of the functions they perform in hydrological and chemical cycles and as “biological supermarkets” because of the extensive food webs and rich biodiversity they support (Barbier et al., 1997). Through their ecological complexity structure (flora, fauna, soil) and process (photosynthesis, biogeochemical cycling, and ground water recharge) wetland areas perform many functions, which in turn provide the goods and services that are important for human well-being (De Groot et al., 2002). Collectively, these processes and the goods and services are the ecosystem services that benefit humans (Millennium Ecosystem Assessment, 2005). Historically, some of these functions which are essential part of the Earths life support systems have largely been ignored until their disruption or loss highlights their importance. This is because the final services are often dissociated from the functions and processes that generate them. The need to emphasise the inherent link between the processes, functioning, goods and services and the people benefiting from them and that an impact on one will affect the others is central to the ecosystem service approach.

This idea that natural ecosystems provide some services has been recognised by traditional conservation approaches for many years, however these approaches have been described as “focus on conservation without planning for the people” (Amend & Amend, 1995). This generally led to widespread establishment of national parks and protected areas (Dixon & Sherman 1991; Green 1990) with restrictions of access of local and indigenous people. The outcome of this traditional conservation approach resulted in conflicts which in itself is detrimental to conservation and achievement of a sustainable development (Lewis 1996). In the 1970s, and in a bid to correct this anomaly, researchers began to frame ecosystems in terms of a utilitarian, anthropocentric concept describing benefits human communities derive from ecosystems. This continued until the late 1990s Costanza et al., (1997) increased interest in the concept through their estimation of

the value of the world's ecosystem services. However, it was not until publication of the Millennium Ecosystem Assessment (MA, 2003) called for by the then United Nations Secretary-General Kofi Annan that the concept began to be firmly established on the policy agenda. The Millennium Ecosystem Assessment provided a comprehensive assessment of the state of the global environment and it classified ecosystem services into supporting, provisioning, regulating and cultural services (Table 1).

Table 1: Definition and typology of ecosystem services

Category	Definition
Cultural services	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values
Provisioning services	The products obtained from ecosystems, including food, fibre, fuel, genetic resources, bio-chemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water
Regulating services	The benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation
Supporting services	The services that are necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling

Since then the use of the concept in academic and policy literature has grown exponentially (Fisher et al., 2009). The concept of ecosystem services has been at the forefront of increased attention to communicate societal dependence on ecological life support systems (Daily, 1997; de Groot et al., 2002). At present ecosystem services are increasingly adopted in economic decision-making through the widespread promotion of Market Based Instruments for conservation and Payments for Ecosystem Services (Gómez-Baggethun et al., 2010).

In the last decade the use of the ecosystem services concept has transcended the academic arena to reach Governmental policy as well as the non profit, private and financial sectors (Bayon, 2004). For instance the concept was central to The UK National Ecosystem Assessment which provided the first analysis of the UK's natural environment in terms of the benefits it provides to society and the nations continuing economic prosperity (Watson et al., 2011). Similarly, the concept has dominated in Africa, especially in South Africa where scientific work on ecosystem services has grown and described as leading the way (Egoh et al., 2012). Although, most of the studies on the African continent have focused on South Africa, yet the origin/affiliation of experts are from outside Africa ((Egoh et al., 2012).

The situation is even less encouraging in sub Saharan Africa. Using Nigeria, the largest country on the continent as example, a cursory search on google scholar showed that there are very few studies in Nigeria using the concept of ecosystem services. Likewise, the concept is almost non-existent in national policy documents. This is unlike the wide uptake and application of the concept in the developed and many part of the developing world. The two major work on ecosystem services (Acharya & Barbier 2000; Eaton & Sarch 1997) are conducted by scholars with affiliation outside Nigeria. Definitely, if African countries like Nigeria are to benefit maximally from the use of this concept and its application in environmental management, there is need to develop local knowledge and expertise. This is even more important considering the fact that the ecosystem services approach has been identified as a key element of planning for sustainable development. By extension, this approach will be central to achieving the Millennium Development Goals (MDGs). A further analysis of global literature on ecosystem services also showed that majority of the literature have people who are Geographers or have affiliation with Geography departments as lead authors. This underscore the role geographers should play if this concept is to be widely adopted and begin to make impact in the policy arena across Africa.

2. Ecosystem service approach and the Millennium Development Goals

The Millennium Development Goals (MDGs) is a blueprint agreed to in 2000 by all the world's countries and leading development institutions to meet the needs of the worlds' poorest. There are eight Millennium Development Goals aimed to improve human well-being by reducing poverty, hunger, and child and maternal mortality; ensuring education for all; controlling and managing diseases; tackling gender disparity; ensuring sustainable development; and pursuing global partnerships. In Africa, some progress has been made toward achieving some goals; others however appear to remain stubbornly out of reach (Chibba, 2011; Trape et al., 2012). In part, this underachievement has occurred because much less attention has been directed at how such complex; interacting goals can be most effectively achieved. Emphasis has been on economic development to engineer provision of infrastructure etc. Little attention is paid to environmental factors despite increasing recognition that there is a strong link between environmental and human well-being (Millennium Ecosystem Assessment, 2005). Both the ecosystem service approach and the Millennium Development Goals (MDGs) not

only aims to improve the quality life of the people and environment (Hyvarinen & McNeill, 2003; IUCN, 2008), but also there are many linkages between ecosystem services and human well-being.

The complex links between environment and human well-being is now increasingly recognized. For instance it has been emphasized that the degradation of ecosystem services poses a significant barrier to the achievement of the Millennium Development Goals (Millennium Ecosystem Assessment, 2005). This underscores the role of ecosystems in achieving development agenda. In the last decade increasingly attention has been paid to how to understand and respond to these links and the implications this has for development priorities. It is possible that a key improvement for the current MDGs lies in acknowledging the multi-sectoral dynamics upon which the goals depends. This section draws on these precedents to highlight the importance and potential of pursuing “ecosystem service approach” as a means of achieving the MDGs in Africa.

Provisioning services are the most widely recognized because they provide tangible and direct benefits on which primary livelihood activity depends. Provisioning services include food provision through agriculture, provision of edible plants, art and craft materials such as reeds and sedge, grazing ground for livestock and water. These services provide sustenance base on which many people across Africa depend on for their livelihoods. For instance, Turpie et al. (1999) estimated that annual net financial income per household from livestock production ranges from US\$31 in the Lower Shire to US\$120 and US\$422 in the Barotse and Caprivi wetlands, respectively. In the same study, cropping yields net financial incomes per household between US\$89 in Barotse and US\$295 in the Lower Shire. In another study, Adekola et al. (2012) estimated the contribution of Ga-Mampa wetland to the livelihoods of the local community as \$228 per household, which was about 15% of the average household income. Therefore, provisioning service not only provide materials for subsistence but also serve as major source of household income generated to support other household needs, such as health care and education. This way provisioning service has proven central to directly eliminating poverty and hunger and promoting education and healthcare. Provisioning services also contribute to healthcare through the provision of materials for traditional medicine. It is widely agreed that throughout the developing world, traditional medicines are the primary source of health care for up to 80% of populations (WHO, 2002).

Reducing poverty is not only about increasing productivity and income. It is about enabling people to have a broad sense of well-being and opportunities to express and make choices about their lives. Other services aside provisioning services play a role in this. For example, cultural services provide physical setting where the cultural identity of local communities materializes, and provides the right place to generate economic opportunities relating to traditional and indigenous skills. Traditional medicines essential for health is reliant to a large extent on the integrity of ecosystems from both a provisioning and cultural perspective; this includes not only the species harvested for medicinal use, but also for the importance placed on landscapes and places of socio-cultural, religious and symbolic value (Cunningham et al., 2008). Access to primary health care remains a major challenge in developing countries, and particularly in Africa. Some of the cultural values of ecosystems are avenues for traditional medicines i.e. custodians are often traditional midwives.

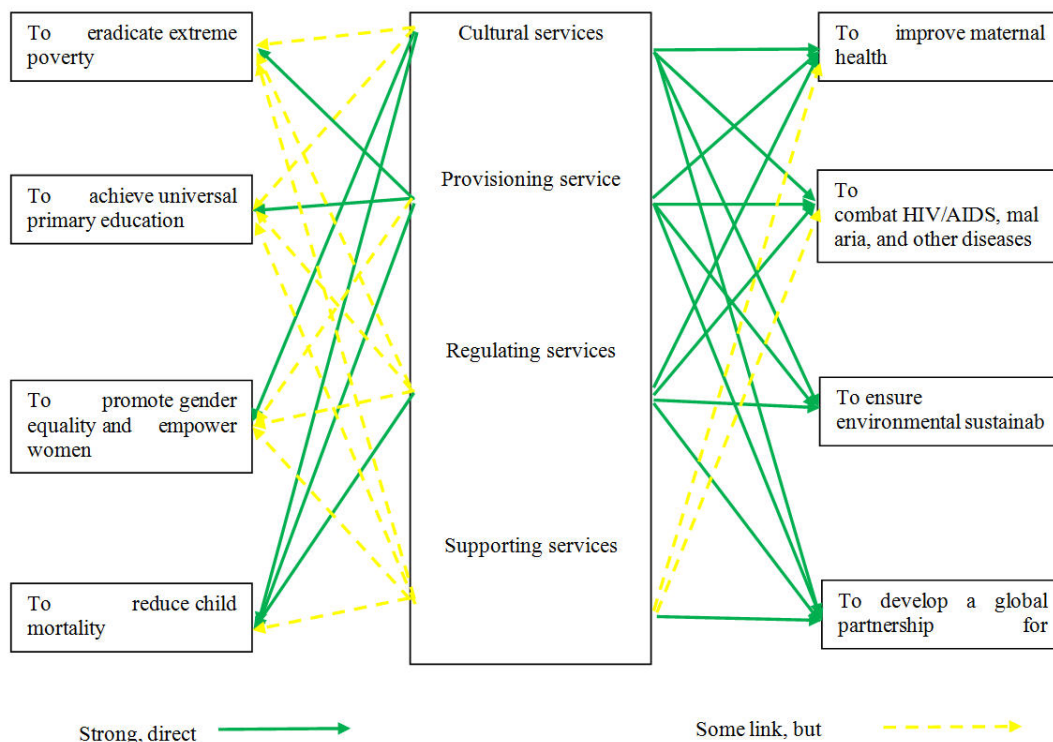


Figure 1: The link between ecosystem services and millennium development goals (MDGs)

Regulating ecosystem services such as soil protection, pollution control, photosynthesis, primary production, nutrient cycling and water purification have great economic value in terms of supporting ecosystems to provide food, health care, fibre, fuel, genetic resources, bio-chemicals and income generation opportunities (Hyvarinen & McNeill, 2003; MA, 2003). In addition, biodiversity also has an intrinsic value, especially as its roles in provision of social services are increasingly being recognized, and hence, viewed to be interwoven with cultural, spiritual and other human values (Hyvarinen & McNeill, 2003; MA, 2003). Other ecosystem services are necessary for the production of all other ecosystem services. Their impacts on people are indirect or occur over a long time frame.

The ecosystem approach offers better opportunity in enhancing the well-being of the people generally but particularly of those in the developing and indigent communities where the livelihoods of the people are tied to natural resources exploitation (IUCN, 2008; Hyvarinen & McNeill, 2003). There are strong potentials for ecosystems' approach to play important role in the achievement of specific targets of the Millennium Development Goals (Figure 1). This further justifies calls for the need for ecosystem-based approaches to ecosystem management, biodiversity conservation, and attainment of human well-being. Therefore policy agenda to achieve the millennium development goals cannot be achieved if ecosystem services continue to be degraded.

3. Importance of ecosystem service approach

Generally, the important aspect of the ecosystem services paradigm is that it enhanced conservation and environmental management. Specifically, ecosystem approach will prove to be quite important in two areas for African academics.

3.1 Understanding ecosystem production functions and benefits and the link between them

Traditional conservation treats ecosystems as independent entities, not as a system. This leads to poor understanding of the functioning of ecosystems. Besides, the link between state of one ecosystem and another and the link between one category of ecosystem service and another is mostly ignored. The ecosystem service approach to resource management attach ample focus to the complex interrelationships of an entire ecosystem in decision making rather than simply responding to specific issues and challenges. Therefore, the concept of ecosystems services has become an important model for linking the functioning of ecosystems to human welfare (Fisher & Kerry Turner 2008; Fisher et al. 2009; De Groot et al. 2002; De Groot 1994). This critical link is important in a wide range of decision-making contexts. Before now environmental practitioners will focus on protecting a forest, wetland or river without recourse to the link between all these systems.

The ecosystem service approach has now enhanced understanding of how activities within one of these systems are inextricably linked to the other (Table 2). As such, in order to protect a forest, it will be essential to fully understand the functioning of the surrounding wetlands and rivers. Likewise, the ecosystem service approach also ensures enhanced understanding of the functioning and benefits from an ecosystem. For example, an understanding of the link between pollination and water purification in a wetland. There is also an improvement of our understanding of spatial and temporal dimensions of ecosystem functioning. While traditional conservation approach might focus on upstream protection, ecosystem service approach has broadened our understanding that degradation of wetland hydrology upstream will affect fish catch downstream. This point underscore the reason why (De Groot, 1992) in assessing ecosystem services pointed to the importance of understanding the ecosystem as a system when he defined ecosystem functions as 'the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly'. This systematic approach to conservation has aided understanding of how activities in one ecosystem affect another, or changes in one ecosystem service affect another via the interlinking of ecosystem services (International Council for Science et al., 2008)).

Therefore, for Nigeria contribution in conducting ecosystem assessment to identify processes and functions performed by the numerous ecosystems in the country, there is an urgent need to adoption of ecosystem service approach. This is because, the approach provides a better understanding of ecosystem production functions and benefits and the link between them, hence making it possible for decision makers to focus comprehensively on the complex interrelationships of an entire ecosystem than simply responding to specific issues and challenges confronting the people as it always has been the case with conservation approach used in forestry and games reserves. This aspect of ecosystem services holds great promise in formulating policy to resolve most of the present environmental problem confronting Nigeria. Secondly, the approach enables valuation of nature, hence mainstreaming conservation. This is necessary in that the importance human beings attached to any ecosystem service is adjudged by the value it provides to its well-being. Therefore this approach to utilization of ecosystem services shall stimulate environmental management departments and ministries at national, states and local levels to solve the challenge of the lack of readily available data and information about the values of services supplied by nature due to non-valuation of their services being experience in the country today.

Table 2: Relationship between ecosystem services and millennium development goals (MDGs)

Millennium Development Goals	Cultural service	Provisioning service	Supporting service	Regulating service
To eradicate extreme poverty and hung hunger	Create place to generate economic opportunities relating to traditional and indigenous skills	Provision of food and materials for subsistence	Support activities (e.g. cultural farming and trading) that will increase income of indigent families in low income regions.	Regulate soil which play important role in land resources and provisioning services production of food.
To achieve universal primary education	Provide objects and environment for studies. Also access peaceable environment where children can enjoy a good quality of life and achieve their potential.	Provide household income that can be used for education	Support practical educational activities/projects (e.g. through the demonstration using natural processes such as soil formation, natural hazards and primary production) that will encourage enrolment of children in less developed areas.	Regulate climate, erosion, pest, pollination and natural hazards to improve agriculture (e.g. crop and animal yield) to provide family incomes that can be to support family education especially girl child education in less developed societies.
To promote gender equality and empower women	Encourage cultural activities of which most of the custodians are female e.g the goddess of Oguta lake, Olori of Oshun river	Provide food and natural resources (e.g ornamental resources, water, fibre, etc) as well as eliminate all barriers to accessing and utilization to improve the living condition of women.	Support photosynthesis in plants and primary production of raw materials (e.g. food crops and plants) to increase women access to wealth and decision making processes especially in the less develop societies.	Regulate climate, erosion, pest, and pollination to improve crop and animal yield to improve the wellbeing of rural household where majority being women.
To reduce child mortality			Supporting services such as photosynthesis and water cycling can support the production of medicines and clean and safe water to the diseases cause child mortality.	Regulate services such as water purification, disease and natural hazards are needful for reduce child mortality.
To improve maternal health			Ecosystem supporting services such as photosynthesis, water cycling and primary production of raw materials (e.g. medicinal plants, safe and clean water) that is necessary to improve maternal health.	Provision of safe and clean water, air quality and disease control have enormous capacity to improve maternal health.
To combat HIV/AIDS, malaria, and other diseases	Recreational, spiritual, religious and other non-material benefits	Provision of medicinal plants and animals used both in traditional and orthodox medicines.	Supporting services such as photosynthesis and primary production of raw materials (e.g. medicinal plants) used in combating diseases at all levels.	Provide safe, clean environment including reduce water borne diseases. human disease control (through the effect of ecosystems, air quality, water on human pathogens, such as disease vectors.
To ensure environmental sustainability	Encourage cultural agricultural practices (e.g. fishing festival, yam festivals) and cultural environmental management programmes and projects such as protection ritual sites, ancestral yards, etc.	Provision of plants (medicinal), biochemicals, ornamental and eco-tourism services that sustained the environment.	Supporting services such as soil formation, photosynthesis, nutrient and water cycling are key to supporting agro-forestry which in turn sequester carbon and ensure environmental sustainability.	Regulation of ecosystem processes especially climate to reduce irreversible changes that hamper environmental sustainability.
To develop a global partnership for development	Provide avenue for people of different culture to interact		Support primary production activities in agriculture to encourage global business especially to export and import raw-materials.	Regulate climate, disease and natural hazards to continuously pave way for global partnership and development especially in terms of conducting businesses.

3.2 Enables valuation of nature and mainstreaming conservation

Aside contribution in conducting ecosystem assessment to identify processes and functions performed by the numerous ecosystems in the country, Geographers can also contribute in valuation (economic, social, and

ecological) of ecosystems. This will go a long way in bridging the knowledge and information gap on the values and contribution of Nigerian ecosystems to local livelihoods. Such information generated will also serve to enhance our understanding of market based instruments such as payment for ecosystem services in the Nigerian context. With expertise in handling spatial and temporal data, Nigerian geographers can also contribute to the fledging arena of application of ecosystem services in mapping, visualization of ecosystem services through the manipulation of data via geospatial information systems. Nigerian Geographers can also champion replication of projects such as UK National Ecosystem Assessment in Nigeria. Such a project should provide an analysis of Nigeria's natural environment in terms of the benefits it provides to society and the Nations continuing economic prosperity. This is even important in the face of dwindling oil prices and diversification to the non-oil sector. Geographers should take a lead in this.

Valuation of nature provides a framework for assessing how a myriad of ecosystem services provided by nature contribute to human welfare. This process of valuing the economic (i.e. to human welfare), ecological and social contribution of ecosystem services is an important step towards sustainable utilization of nature (Turner et al., 2003; Adekola et al., 2015). The lack of readily available data and information about the values of services supplied by nature due to non-valuation of their services has not helped the full appreciation of their value and has been identified as a reason for continued environmental degradation (Balmford et al., 2002). When integrated into decision making, the valuation of ecosystem services enable decision makers use scientific assessment tools (such as multi criteria analysis, cost benefit analysis and other decision support systems) to understand people's dependence and impact on the services provided by ecosystems and by applying policy mechanisms that incorporate ecosystem service values into decision (Adekola et al., 2015). It has therefore been possible for decision makers to better evaluate alternative development options by quantifying the costs and benefits associated with each resource use options/scenario (sometimes conflicting). In this way, ecosystem service approach economic valuation provides a tool to inform policy decisions regarding conflicts among alternative resource use strategies.

By providing a categorisation of benefits derived from nature that ensure their valuation, the ecosystem service approach also made it possible for many governments to make assess the benefits that ecosystems provide to society at the national, regional and local scales and thereby make it possible to consider the value of nature making adjustments to national income accounts. This was not possible with the traditional conservation approach. This possibility of attaching value to ecosystem service is one of the major strengths of the ecosystem service approach. It has completely revolutionised the manner stakeholders view nature. For instance, wetlands that are hitherto considered wastelands (Mmopelwa, 2006) are now known to be important ecosystems through the valuation of their ecosystem services (Turpie et al. 1999; Emerton et al. 1999; Adekola et al. 2008). This realisation has further aided their wise use and incorporation in national planning.

Ecosystem service approach has helped solidify argument that nature in its own right provides economically valuable services that underpin business and as such nature should be viewed as an important factor of production that should be paid for. This realisation has prompted an increasing number of companies, including giants like Coca-Cola, to examine their ecological numbers just as closely as they would any other part of their balance sheets. Recently another giant in the chemical industry - Dow Chemical took the trend to a new level, announcing a five-year, \$10 million collaboration with Nature Conservancy (TNC), a Washington-based environmental group to eventually tally up the ecosystem costs and benefits of every business decision. The Michigan-headquartered company will look to make environmental factors part of its profit-and-loss statements — a move that was hitherto unheard of before the emergence of ecosystem service approach. These monies have served as important sources of long-term financing, supporting greater impact at a wider scale, and opening new avenues for advancing conservation with institutions that do not traditionally consider the environment in their decision-making (Fiallo & Jacobson 1995). Out of the concept of ecosystem service the concept of Payments for Ecosystem Services (PES) has also been widely developed. These are one type of economic incentive for those that manage ecosystems to improve the flow of environmental services that they provide. They have also opened up avenue to provide appropriate compensation when ecosystems are destroyed.

4. Other areas of application of ecosystem services by academic experts

The popularization of ecosystem service approach brought about by the MA, 2003 and 2005 has attracted a number of experts, who have used ecosystem services either in the bio-physical or socio-ecology context or in a coupled way. Table 3 below highlighted how experts in the environmental arena have used ecosystem services in improving the well-being of their societies.

Table 3: Application of ecosystem services by experts

Category of experts	Types of ecosystem services rendered
Conservationists, agriculturalist, environmentalist, and hydrologists	The services that are necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling
Environmental, Land use and Economic Planners	The products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water
Environmental managers such as foresters, climatologists, Water engineers and hydrologist, plants breeders,	The benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation
Tourism (heritage tourist and Ecotourism)	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values

5. The need for adoption of ecosystem service approach in Nigeria.

Nigeria's environment generally is endowed with abundant natural goods such as distinctive climate and vegetation zones and abundance natural resources in both the northern and southern parts. The climate of Nigerian for example, permits the occurrences of two seasons, namely the dry and wet seasons which contribute to rich, unique and distinct vegetation zones that support animal rearing and grain farming in the northern parts and plantation agriculture in the southern parts of the country respectively. The unique nature of the countries environment also support ecosystem services such as soil formation, photosynthesis, primary production, nutrient cycling and water cycling are very active (Table 2). This leads to the provision of ecosystem products such as food, fibre, fuel, genetic resources, biochemical, natural medicines, pharmaceuticals, ornamental resources and fresh water are obtained from ecosystems as a result of the interaction of the climatic variables with the five vegetation zones in these seasons. Other benefits obtained from the interaction of climate and vegetation in Nigeria include ecosystem processes such as air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination and natural hazard regulation (Adekola et al., 2015). These in turn, pave way for the people to obtain non-material ecosystem benefits such as spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values.

Apart from the climatic and vegetal endowments, Nigeria ecosystem is endowed with abundant mineral resources covering both the northern and the southern parts. Example includes: crude oil, natural gas, Uranium, limestone, Cassiterite, Columbite, Lead, Gold, Barite, Gypsum, Bitumen, Coal, etc. These mineral resources are transformed into ecosystem products that satisfy human needs and improve their well-being. Crude oil for example, is refined into fuel that is used to power automobile and is also sold to earn foreign income for the country.

Adoption of ecosystem service approach offers benefits to Nigeria's environment in three major areas. That is, in the ability of the approach to i) check unsustainable exploitation and utilization of ecosystem goods and services in Nigeria with its associated environmental challenges; ii) contribute to identify processes and functions performed by the numerous ecosystems in the in Nigeria; and iii) contribute in valuation (economic, social, and ecological) of ecosystems in Nigeria.

5.1 Check unsustainable exploitation and utilization of ecosystem goods and services in Nigeria with its associated environmental challenges

The unsustainable exploitation and utilization of ecosystem goods and services in Nigeria over the years have created a number of environmental challenges. For example, Nigeria is facing the challenge of climate change and desertification in the northern parts and deforestation and erosion in the southern parts, and degradation of the rich Niger Delta wetlands. However, in a bid to manage the above mentioned natural resources, Nigeria at both states and local level have used conservation approached which pays little or no attention on the well-being rural communities living around the resources in question reminiscent of the traditional conservationist approaches. Numerous National Parks and Reserves were created. However, instead of these bringing benefits to the local people, they rather made life more difficult for the host communities by increasing the cost of living in such communities and denying the local communities access to farm lands (Adekola, 2015). The problem has led to unprecedented forest wood harvesting and games hunting for both subsistence and commercial purposes in and around the forest reserves and parks. Sometimes it has even led to conflicts.

6. Opportunities and challenges to adaption of ecosystem service approach in Nigeria

There are a number of opportunities for adoption of ecosystem service approach. The number of Nigerian scholars adopting the concept is on the steady increase. Also, there are global funds available for encouraging adoption of this concept. Nigerian geographers can seize the opportunities and tap into some of the available funding opportunities world over supporting projects and programmes in the field of environmental management using ecosystem services approach. Adoption of ecosystem approach in Nigeria is not going to be without some challenges especially at the early stage. It is obvious, that the prominent challenge would likely be how to translate and integrate ecosystem service approach into existing environmental conservation and management policies, in order for the approach to be easily and rapidly adopted at the federal, states and the local government levels. Another eminent challenge is going to be how to build the capacity of experts especially geographers in a short possible time to effectively manage environmental development projects using the ecosystem service approach.

The Association of Nigerian Geographers (ANG) could stand up to these challenges. In the first place, as a body made up of prominent scholars in the field of environmental management, her call on government at all levels to translate and integrate the approach into environmental conservation and management policies will never be ignored completely, especially if the benefits for the national development outweigh the possible challenges. Also, the ANG can channel and re-direct the efforts of its few personnel and professionals in the field of environmental management to build capacity of geographers to effectively handle projects using ecosystem service approach. In doing this, the ANG may need to spear head a move for the restructuring and re-introduction of courses and modules with special focus on managing environment using the ecosystem system service approaches in the Nigerian Universities.

7. Conclusion

This paper shows that that human wellbeing and healthy environments are inextricably linked, thus justifying the need to framing the MDGs in the context of an ecosystems approach. There is need for government across Africa to recognize the intrinsic linkages between environment and the MDGs from the perspective of the vital services that ecosystems provide to human wellbeing, and put in place integrated policies that acknowledge and protect these services. The paper also called upon Geographers to be at the forefront in enhancing the adaption of ecosystem service approach in managing environments. Drawing from abundant natural goods and resource found in both the northern and southern parts of Nigeria, the paper points out some of the potential areas Nigerian geographers can contribute their quota in managing the environment. These include: assessing the relevance and adoptability of the ecosystem service concept in Nigeria especially in areas such as in mapping, visualization, the manipulation of data via geospatial information systems, generating information for capturing and measuring goods provided by natural systems, enhancing economic decision-making through the widespread promotion of market based instruments for conservation such as markets for ecosystem services and so-called payments for ecosystem services schemes. It is expected that, if Nigerian geographers and other stakeholders in the environmental sector of Nigeria adopt this approach in managing the Nigerian environments attaining sustainable environment development from no distant time.

References

- Acharya, G. & Barbier, E. B. (2000). Valuing groundwater recharge through agricultural production in the Hadejia-Nguru wetlands in northern Nigeria. *Agricultural Economics* 22 (3):247-259.
- Adekola O, Morardet S, De Groot, R.S. & Grelot, F. (2008). Economic value of provisioning services and livelihood dependence on the Ga-Mampa wetland, South Africa. In *13th IWRA World Water Congress*. Montpellier, France.
- Adekola, O., Mitchell, G., & Grainger, A.(2015). Inequality and ecosystem services: The value and social distribution of Niger Delta wetland services. *Ecosystem Services* 12, Elsevier, 42–54.
- Amend, S. & Amend, T. (1995). *National parks without people?: the South American experience*: IUCN-the World Conservation Union.
- Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R. E., Jenkins, M., Jefferiss, P., Jessamy, V., Madden, J., Munro, K., Myers, N., Naeem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K. & Turner, R. K. (2002). Economic Reasons for Conserving Wild Nature. *Science* 297 (5583):950-953.
- Barbier, E. B., M. Acreman & Knowler, D. (1997). *Economic Valuation of Wetlands: A Guide for Policy Makers and Planners*. Gland, Switzerland: Ramsar Convention Bureau.
- Chibba, M. (2011). The Millennium Development Goals: key current issues and challenges. *Development Policy Review*, 29(1), 75-90. De Groot, R. (1992). *Functions of Nature: Evaluation of Nature in Environmental Planning, Management and Decision Making*. Wolters-Noordhoff, Groningen.
- (1994). Environmental functions and the economic value of natural ecosystems. In *Investing in Natural*

- Capital: The Ecological Economics Approach to Sustainability*, edited by A. M. Jansson: Island Press; International Society for Ecological Economics, 151–168.
- De Groot, R. S., Wilson, M. A. & Boumans, R. M. J. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics* 41 (3):393-408.
- Dixon, J. A. & Sherman, P. B. (1991). Economics of Protected Areas. *Ambio* 20 (2):68-74.
- Eaton, D. & Sarch, M. T. (1997). The economic importance of wild resources in the Hadejia-Nguru Wetlands, Nigeria. In *Collaborative Research in the Economics of Environment and Development (CREED)*. London: International Institute for Environment and Development (IIED).
- Egoh, B. N., O'Farrell, P. J., Charef, A., Josephine, G. L., Koellner, T., Nibam, A. H., Egoh, M. & Willemen, L. (2012). An African account of ecosystem service provision: Use, threats and policy options for sustainable livelihoods. *Ecosystem Services* 2 (0):71-81.
- Emerton, L., L. Iyango, P. Luwun, & Malinga, A. (1999). The present economic value of Nakivubo urban wetland, Uganda. In *IUCN: Biodiversity Economics for Eastern Africa and National Wetlands: Conservation & Management Programme: IUCN*.
- Fiallo, E. A. & Jacobson, S. K. (1995). Local Communities and Protected Areas: Attitudes of Rural Residents Towards Conservation and Machalilla National Park, Ecuador. *Environmental Conservation* 22 (03):241-249.
- Fisher, B. & Turner, R. K. (2008). Ecosystem services: Classification for valuation. *Biological Conservation* 141 (5):1167-1169.
- Fisher, B., Turner, R. K. & Morling, P. (2009). Defining and classifying ecosystem services for decision making. *Ecological Economics* 68 (3):643-653.
- Gómez-Baggethun, E., R. de Groot, P. L. Lomas & Montes, C. (2010). The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes. *Ecological Economics* 69 (6):1209-1218.
- Green, M. J. B. (1990). Management of National Parks and Sanctuaries in India. A. Kothari, P. Pande, S. Singh and D. Variava Indian Institute of Public Administration, New Delhi, 1989, 289 pp., HB Rs 250/\$US 40, PB Rs 150/\$US 30. *Oryx* 24 (02):116-116.
- International Council for Science, United Nations Educational Scientific and Cultural Organisation, and United Nations University (2008). Ecosystem Change and Human Well being: Research and Monitoring Priorities Based on the Millenium Ecosystem Assesment: Paris International Council for Science.
- IUCN (International Union for Conservation of Nature) (2008). Position Paper: Application of the Ecosystem Approach (Agenda Item 3.6) Ninth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP9), Bonn, Germany: 1-2.
- Lewis, C. (1996). *Managing conflicts in protected areas*. Gland, Switzerland: IUCN.
- Hyvarinen, J. & McNeill, C. (2003). Biodiversity, Ecosystem Services and the UN Millennium Declaration. The Royal Society for the Protection of Birds (RSPB) and United Nations Development Programme (UNDP), 1-7
- Millennium Ecosystem Assessment (2005). *Ecosystem And Human Well-Being: Synthesis*. Washington DC: Island Press.
- Mmopelwa, G. (2006). Economic and financial analysis of harvesting and utilization of river reed in the Okavango Delta, Botswana. *Journal of Environmental Management* 79 (4):329-335.
- Trape, J. F., Sauvage, C., Ndiaye, O., Douillot, L., Marra, A., Diallo, A., ... & Muganwa, M. (2012). Assessing progress in Africa toward the Millennium Development Goals. MDG Report 2012. Emerging perspectives from Africa on the post-2015 development agenda. *Journal of Infectious Diseases*, 205(4), 672-9.
- Turner, R. K., J. Paavola, P. Cooper, S. Farber, V. Jessamy & Georgiou, S. (2003). Valuing nature: lessons learned and future research directions. *Ecological Economics* 46 (3):493-510.
- Turpie, J. K., B. Smith, L. Emerton, & Barnes, J. (1999). Economic Value of the Zambezi Basin Wetlands. Harare: IUCN Rosa.
- Uy, N. & Shaw, R. (2012). Ecosystem Services, Biodiversity, and the Millennium Development Goals, in Noralene Uy, Rajib Shaw (ed.) *Ecosystem-Based Adaptation (Community, Environment and Disaster Risk Management , Volume 12)*, Emerald Group Publishing Limited, pp.19-39
- Watson, R., S. Albon, R. Aspinall, M. Austen, B. Bardgett, I. Bateman, Berry, P., Bird, W., Bradbury, R. & Brown, C. (2011). UK National Ecosystem Assessment: understanding nature's value to society. Synthesis of key findings.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:

<http://www.iiste.org>

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

Academic conference: <http://www.iiste.org/conference/upcoming-conferences-call-for-paper/>

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

