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Review Article

Soil, Water, Air, Plant, Animals and Humans: What is the Environment?

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Abstract

The word environment has been an illusion within many people in societies from years to years, especially media and policy directions extending it wrong understanding all over, making it difficult for measures on environmental protection to hold effective and efficient grounds. For instance, efforts to fight against climate change, land degradation and desertification had not achieved effective outcomes. This paper drew some insights from the dictionary and Wikipedia as the basic point and uses many different research studies to argue that the environment is a "state" of the earth surface within ecosystems, which changes with time. It reviews my research studies from many landscape monitoring assessments of Ecosystem Services (ES) to justify that soil, water, air, plant, animals and humans are agents (multi-agents) of the earth surface within ecosystems that interact to determine the state known as the environment, which through this process transformations take place to form the different materials and substances that are found on the earth surface.

This means understanding really what the environment is will lead to the provision of measures that continuously support environmental balancing of the multi agents on the earth surface with ecosystems and promoting sustainable consumption. These will support that targets for environmental protection, the fight against climate change, land degradation and desertification are being achieved. But efforts to achieve sustainable consumption will also require a proper understanding of the natural environment and its functionalities base on the ES within ecosystems to design sustainability eco-patterns for transformation of the multi agents' interactions on the earth surface to meet human needs. This means, it is necessary to support research studies on bioprospecting requiring different cooperation. Bioprospecting will lead to the discovery of new organism, substances and materials to support human needs, thereby paving the way to more eco-production and cycle economies for sustainability. Therefore, to encourage environmental sustainability, the functional relationships of multi agents' interactions within ecosystems must be well known for effective and efficient protection measures requiring proper knowledge of the connections between the earth surface and the environment (state).

Keywords: Multi Agents; Interactions; Ecosystems; Ecosystem Services (Es); Bioprospecting

Introduction

What is really the environment? Cambridge University Press [1] presents it as "the conditions that you live or work in and the way they influence how you feel or how effectively you can work" or "air, water and land in or on which people, animals and plants live". While the Wikipedia's review presents it as "everything that is around us" [2]. It can be living or non-living things. It includes physical, chemical and other natural forces. Living things live in their environment. They constantly interact with it and adapt themselves to conditions in their environment. In the environment there are different interactions between animals, plants, soil, water, and other living and non-living things [2].However, when one asks people the simple question "what is the environment?", there are usually no clearly defined answers and many people are only playing with words (this can really be seen in media and daily interactions). For instance, the meaning of environmental process in agricultural productivity. But there are many scientific works on the relationship between the environment and ES for food and biomass production for example [3]. The problem is that many people do not understand that the environment is multi agents in a system that interacts (natural or artificial) to determine a "state" (environment) on the earth surface. That is, our environment is a "state" of the interaction and interdependences of everything that can be found around us on the earth surface [2], which soil, water, air, plants, animals and humans are agents of it (humans, animals

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and nature interact with the other agents on the earth surface within ecosystems to transform them to the different materials, organisms and substances).

Therefore, the environment is only a state of the totality of multi agents' interactions on the earth surface at a place (ecosystem) and time (few or many years based on observation of a transition) to determine the nature of a landscape or water body (earth surface). In other words, the inputs of multi agents on the earth surface within ecosystems that determine the outputs of a "state" is known as the environment. Since everything is part of the environment of something else, the word environment is used to talk about many things [2]. People in different fields of knowledge use the word environment differently. Electro-magnetic environment is radio waves and other electromagnetic radiation and magnetic fields [3], which it is simply referring to the state of something. Many efforts towards environmental protection, especially efforts to fight against climate change, land degradation and desertification are not achieving great results [4-11]. This is because many people do not actually understand that the environment is only a "state" of interaction within multi agents in a system (earth surface) as inputs to determine the outputs (state). Therefore, efforts for environmental protection need to focus on the multi agents on the earth surface as an integrated process and determine the root causes of environmental damages based on sinks in ES [12-15]. This is with respect to the totality of multi agents' interactions within ecosystems that can lead to control measures (input and output of processes) in order to balance them for environmental improvement performances.

ES are the benefits to mankind from the functionalities of the natural ecosystems that are distributed within the earth surface [4,10,16,17]. This means for measures on environmental protection to be effective, there is the need to balance the multi agents interacting on the earth surface within ecosystems by examining categories of output functions that humans directly benefit from them as ES [6,14,18]. They may be improving or antagonizing the environment (state). If, the categories of the output functions are in a sink, then there will be an environmental degradation, which could result to climate change or desertification and other catastrophes as in studies [8,16,19-22].Therefore, environmental impact assessment processes should examine the multi agents' interactions on the earth surface as an integrated process and determine the impact categories based on their interdependences. This requires indicator systems, which ES has been assessed and justified as an appropriate indicator for environmental impact assessment [13,14,19]. A review of results of monitoring observation studies of ecosystems carried out within research frameworks from protected and none protected areas, urban and none urban areas, and other areas explain the situation.

The aim of this work is to seek cooperation with different natural science researchers to open research development projects on bioprospecting on different ecosystems. This is based on the deep understanding of our environment that can be beneficiary to society in terms of supporting sustainable consumption, which will lead to policy frameworks for environmental protection. Bioprospecting is the search for new substances, organisms and resources [23,24], which can support eco-production leading to huge benefits for environmental protection.

Methodology

This paper employs a qualitative review methodological framework base information gathering and processes using a problem-objective orientation approach for strategies development and also integrates two evaluation techniques. The evaluation frameworks, on the one hand takes a sustainability impact assessment approach using an adaptive sustainability appraisal matrix. On the other hand, it takes an inter-generation learning approach using scenario thinking based on information gathering from differences data pools and discussion platforms as think tanks. That is information gathering from different ecosystems within different inter-generation groups in natural and traditional environments with respect to investigation researches carried out in protected areas and none protected areas. Information gathering and processes are used to describe systems, which is a management science approach of providing knowledge about things in the world and the way they are organized [25]. Therefore, information is needed to answer strategic questions. Information includes documentation, verbal communications, such as telephone call, computer database, and description of material objective [25]. While, process analyses information to allow objectives to be identified for development of strategies [26,27]. That is identifying problems that need appropriate clarification using different research studies to justify impact scenarios (positive and negative) and evaluate them for change systems in seeking appropriate solutions to support policy implications and strategies development.

Fongwa [9,13] has established and applied an adaptive sustainability appraisal matrix within different research frameworks based on different processes and assessment procedures to justify it as an appropriate tool for sustainability impact assessment at a strategic level. While, scenario thinking is a tool to provide motivation to organisations to think of doing better and be prepared of future challenges [28]. It allows one to rehearse the possibilities of tomorrow, and act today, which it is important to know, what if the future bring new and unpleasant opportunities or new challenges. If actors in the process will be ready to act or enter a risk-averse world of few gains, yet few losses [29]. Scenario thinking gives a deeper understanding of the world, how it operates and to use that understanding to develop strategies to improve the ability to make better decisions today for the future [30]. According to Diana [29], when scenario thinking is used in complex multi-stakeholder environments, it stimulates valuable conversation about future possibilities that can result in common ground for adversaries and push to challenge shared assumptions that are critical to achieving future targets. Nevertheless, scenario thinking is not the only tool for focusing on progress, but it can become an important tool when used in combination with other tools like a strategic evaluation. They can be responsible for long-term strategies, which can be well positioned and obligated to see the bigger picture of the future. In addition, they can help organizations

and countries suppress present and future challenges and take advantages of opportunities through sustainable strategies development.

Reviews of Outcomes from Ecosystem Monitoring Research Projects

The research works started with the examination of value creation [31] from the natural ecosystem for business development to protect the environment and climate change mitigation strategies based on the goods and services offer by the environment to mankind [14,19]. Analysis of business development opportunities for preserving ES were carried out with emission trading scheme, tradeable permits and certification as some of the markets considered to show that they are one option for balancing measures for achieving environmental protection and climate change mitigation targets [14,32]. Also, the analysis uses economic arguments to justify the need of inventory systems to estimate and balance ES, which payment schemes for them based on different economic and business models were considered for financing ecosystem developments [12,23,31,33]. This has led to further investigation of the relationships between ES and human activities on the landscape for appropriate payment schemes and management support systems. For instance, the impact of soil from waste to the landfill for degraded landscapes and contamination of the earth surfaces [34], shows how legal provisions and policies can be encouraging actions for soil, water, air and biodiversity protection based on proper understanding of the linkages within the different multi agents' interactions in ecosystems of consideration.

More so, changes of landscapes due to human activities were also examined. For instance, Figure 1 shows the sequence of land use changes leading to degradation and desertification in the Sahel region requiring appropriate measure and technological implication based on the understanding of the different multi agents' interactions on the ecosystems involved for balancing ES [7]. Many of these relationships were investigated and justified using different studies [2,6-8,10,31,35-37]. Furthermore, estimates from protected and none protected areas, urban and none urban areas, and other areas [6-10,13,21,23,36-38], show the need to describe the interaction within the multi agents on ecosystems for determining different scenarios of the environment. Therefore, to describe the relationships of multi agents' interactions within ecosystems, models were used that provided a more understanding [8,14,39,40]. For instance, description of the formation of algae growth in a natural ecosystem of the environment. Figure 2 below presents algae growth as a result of water temperature, nutrients, substrate and radiation in an interaction know as multi-resource kinetic modelled with Petri net [9,14]. However, modelling requires consideration of different background knowledges and data pools [14,29,41] that were integrated in the research to determine the quality of the modelling framework. In this regard, a sustainability assessment project was initiated with many invited scientists from around the world that participated in the discussion platforms (think tank) and contributed manuscripts that were published [41].

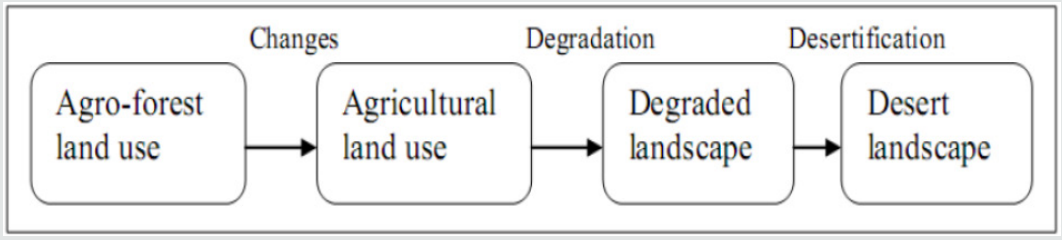

Figure 1: Sequence of land use changes and degradation in the Sahel region (Fongwa and Gnauck, 2010).

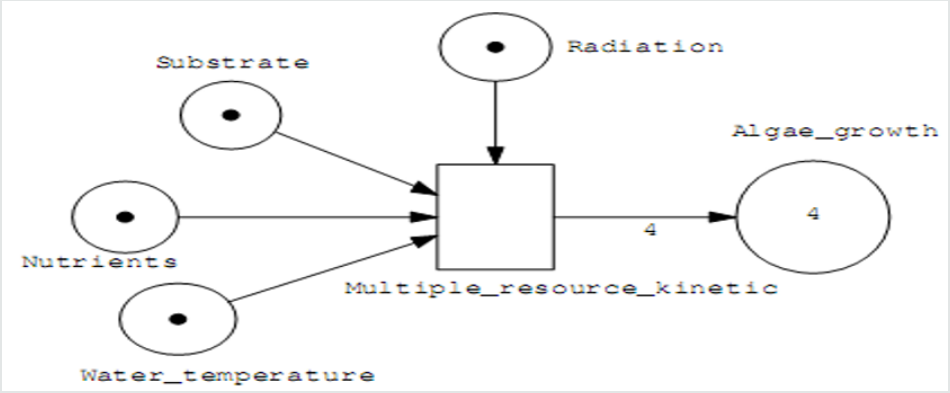

Figure 2: Petri Net of Multi-resource Kinetic for Algae Growth (Fongwa, 2012a; Fongwa, 2019).

The think tank project provided different scientific information and data pools for properly understanding and describing the systems in consideration. The different interdisciplinary results on ecosystems protection, targets for fighting climate change and sustainable development strategies as well as socio- economic and cultural implications from the discussions and some selected manuscripts that were published [41],also showed that there are continuous environmental challenges requiring more understanding of the multi agent interactions on the earth surface within ecosystems. These can be essential for policy support

measures on environmental protection, land degradation, climate change mitigation and desertification requiring policy measures in this direction. In addition, a review of future energy supply and target for climate change to justify that ES have the potential of regulating the environment through environmental balancing measures as an aggregate of interactions with multi agents to provide services [5,6,40]. That is their combinations will form a state, which it is the environment [40]. Therefore, ES was evaluated within the criteria for selecting tools for Strategic Environment Assessment (SEA) to justify that they are an appropriate indicator for weighting policy options on environmental protection, especially climate change mitigation policies [15,19]. This clearly showed the connection of ES and multi agents within ecosystems for understanding impact classes for their categories for different environmental Scenarios [2,4,5,13,]. All the approaches considered in the researches have shown that ES are essential indicators for assessment of multi agents on ecosystems for policy guides in the achievement of environment protection targets, which require further appropriate information and analytic models for knowledge development.

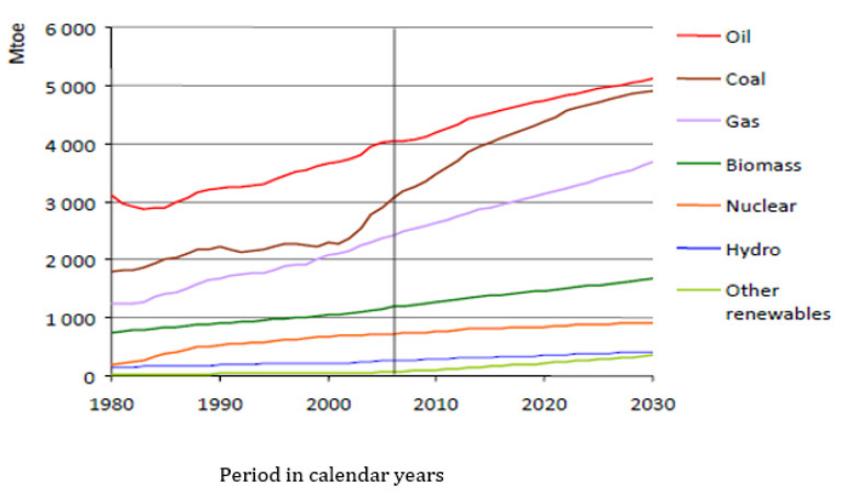

Figure 3: Trend of world energy supply in the energy industry (WEO, 2008).

Nevertheless, over the pass years, there have been driven innovations in technological and digitalization development to provide solution to environmental protection and climate change problems [10,11,42]. This is based on policy implications due to practical observations of negative impact scenarios [10]and efforts like the Paris Agreement on fighting Climate Change. But there is the continuous occurrence of serious climate change scenarios with increasing temperature observations, desertification and environmental degradations [7,9-11,42]. For instance, Figure 3 provides a projection of the world energy supply from 1980 to 2030 that envisaged the energy market domination with none renewable supply in different merit order of generation as could be seen on the curves (if everything remain constant from the projection period, which it is not possible). However, from the research observations, over time till now in 2019, there has been huge increase in the supply of energy generation influenced by drastic increase in population and changes of manual processes to electrical (automatization). This is according to the different information pools. But the merit order of sources of energy generation is almost the same as the 1980 projection (none renewable energy dominating) meaning that the level of environmental depletion has also hugely increased.

Also, many countries are trying to meet their huge energy demands by encouraging more dangerous sources of energy supplies from nuclear and atomic like UK [43] that could be very challenging for environmental sustainability. Even thought, the rate of energy generating from renewable energy has increased, but none renewable energy supply still dominates the market, which in real terms has led to the increase in negative environmental impacts. An adaptive sustainability appraisal matrix [9,15] is to evaluate technological and digitalization implications, and analyse trade-offs between climate change and sustainability for sustainable consumption scenarios. Two examples of energy-material flows-mobility-urbanization and food/fibers-industrial production-habitation-social economy scenarios are presented to give more explanations of the problems. The results show that the fundamentals and ethics of sustainability (invention to action) for environmental protection and climate change action scenarios are still not being understood to moderate the technological developments towards sustainability solutions requiring more scientific intervention on the politics of environmentally sustainable development.

For instance, making a more detail studies of the analysis, it was identified that there are many scenarios of technological changes like change to electrical cars without a complete life cycle assessment and analysis. Therefore, strategies and policies are being put in place to encourage electricity cars in urban areas, especially within Europe (observation region). While huge environmental damages are taking place in the rural areas for huge energy productions from none renewable and dangerous energy sources to meet up with the increases in electricity demand as a result of more utilisation of electric cars (change of process) in that region (the urban areas). That is creating scenarios for zero/reduced negative environmental impact (input and output balances) in urban areas and greater negative environmental

impacts in the rural areas, which must be seen as bad strategies for achieving environmental protection targets. Also, resources are being depleted and losses in the process of energy conversion to electricity as well as other social impacts of charging station and parking in the urban areas that may be a challenge for the efficiency and effectiveness as well. This will result to only none sustainable impact scenarios, which it is recently revealing itself through the constant variation in weather and climatic conditions.

Another scenario is food/fibres-industrial production-habitation-social economy were a lot of transforming is going on (especially in more resilience ecosystems found in rural areas) without appropriate measures on environmental balancing and sustainable consumption as well as healthy living measures [6,9,20,21,36,44]. This is influenced by lack of policy direction on appropriate environmental protection based on no appropriate understanding of the connection of deriving goods and services (ES) within the natural ecosystem of the environment [10,11,14]. Also, many communities are abandoning products that are natural [42] and consuming products with the same content of substances that had undergone a lot of chemical transformation influenced by globalisation and tourism on indigenous communities [27,44]. Cultural natural environments in indigenous communities are being destroyed by resources exploitation activities (mostly foreign countries) without providing balancing measures on those ecosystems leading to the damage of consumption patterns and the people forced to depend on none sustainable consumption patterns. Many indigenous people are raising voices every year at the UN Expert Mechanism on the Right of Indigenous People. In this respect one can use [45] and the cases that are being presenting in the book to argue that changing local consumption patterns are drives to underdevelopment imposed to the state of the mine influenced by globalisation and capitalism.

Daily and Ellison [23] argued on the need to make conservation profitable. While Wätzold [12] considered the organization of a public ecosystem service economy based on sustaining the goods and services of the biodiversity and Ranganathan and Irwin[5] examined it in term of action agenda for sustaining biodiversity. However, different research studies on different sites and literatures show that biodiversity has a good potential for business development and payments scheme to foster sustainability and environmental protection [6,9,12,14,18,21,23,46]. This requires a lot of studies on bioprospecting within the natural ecosystems based on the fact that "our environment is all the things around us" [3], which are transformed based on interactions [13].

Bioprospecting is the search for new organisms and substances for societal needs, which are available in our natural ecosystems as plants, animals and organisms known as provision ES [14,47,48]. They can be enhancing (service providing units) or deteriorating (service antagonizing units) the environment [14]. For instance, one of the functions of plants, animals and organisms in the ecosystems are providing substances and products as well as bacteria and pathogens [5,6,10], which can be interesting for agriculture, medicine, processing, manufacturing and tertiary industries such as foods, drinks, cosmetics, chemicals, pharmaceuticals, lubricants, remediations, public safety (medical) and sanitation, energy industrials and many more uses. Therefore, a proper understanding of societies of ES will foster more eco-production and design for the environment [2,4,13]. But there are scarcities of substances and resources for those production needs [4,46-48] requiring bioprospecting of ecosystems and sustainable consumption measures to support cycle economy conceptions based on an understanding of the natural environment and functions of ES.

Preliminary research studies on bioprospecting are been carried out on agricultural, agroforest and dryland ecosystems to understand the linkages between the use of different materials, organisms and substances from those natural environments by different intergeneration for sourcing bioprospecting scenarios. This can enable collaboration and cooperation for exploration researches on the substances from different ecosystems for different societal uses requiring the involvement of different natural science researchers. Also, it can open up different interest for investments on re-greening ecosystems as effort to support the fight against land degradation, climate change and desertification, thereby environmental protection.

Conclusion

This paper has provided the first work of presenting the environment as a "state" of the interactions between multi agents on the earth surface within ecosystems, which has been used to clarify the question on what is the environment. It has further explained that the different interactions of multi agents in ecosystems will lead to different functions that provide goods and services, which humans benefit from them known as ES. This was used to argue that land degradation, climate change and desertification are the results of nature, animal and human interactions with the other multi agents within ecosystems, which they are the outputs of a state (environment).

Therefore, it suggested that environmental impact assessment for measures on protections should focus on the multi agent interactions using ES as an indicator based on an understanding of the environment as a state and foster sustainable consumption patterns. To support the arguments, it provided reviews of studies carried on landscape monitoring assessments to justify that a proper understanding of the multi agent interaction within ecosystems on the earth surfaces and their transformation will determinate their "state" or "output" (environment). While ES is an appropriate indicator that can be used to foster sustainability consumption patterns. This was reviewed in studies with respect to the goods and services derived from natural ecosystems that human benefit from them and suggested that it requires bioprospecting to exploit the potential for sustainable consumption, which will protect the environment and the sustainability of the earth surface. This will be demanding further research work in this area using different interdisciplinary natural research scientists.

The conclusion is that bioprospecting has the great potential of contributing enormously to environmental protection, the fight against land degradation, climate change, desertification and the problem of resource scarcities due to its strength to drive

forward eco-patterns, discovery new natural products and cycle economies using ES as indicators. Also, this will foster sustainable consumption and healthy living patterns requiring proper and deep understanding of the different interactions within the multi agents on ecosystems (inputs) and their transformations that determine the state (outputs) of the earth surface (environment). This will be greatly beneficiary to societies requiring different supports.

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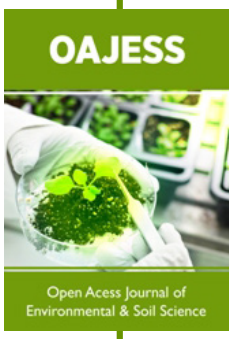

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