

# An Overview of the Concept and Practice of Environmental Management

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## Abstract

*This paper is a review study on the concept (idea) and practical application of environmental management in order to bring together the fragmented facts, ideas, principles, and general impression on the discipline as a field of study and a professional carrier. It is expected that this will go in portraying the spectral quantum of the discipline and its carrier output at a glance. The paper traces the evolution of environmental management, its unifying definition, ethical values, categorization, tools and techniques, entrepreneurship, and research. This paper compiled three (3) major evolutionary stages of environmental management; deduced that the discipline is multidisciplinary in nature, both science and technical, theory and practical, and it is a business of everybody but not owned by everybody except environmental managers. The review study highlights five key ethical issues of concerns in environmental management to include: consumption of natural resources, destruction of forest, environmental pollution, harm to animal, and inherent values to non-human entities. Also the discipline is categorized into three major areas – general, specialized, and others. While the accustom management tools and techniques, among others, include: Accounting, Auditing, Cleaner Production, Design for Environment, Environmental Performance Evaluation, Environmental Management System, Environmental Labeling, etc. The techniques are: Application of GIS, Mapping, Monitoring, Modeling, Sensitivity Analysis, etc. The centre-pit of environmental entrepreneurship lies on the discovery and sustainable exploitation of opportunities to create social change that positively transforms the environment. While the essential features of environmental management research are: revealing, impacting, and mitigating. The paper suggested that all aspiring environmental managers should be fully aware and knowledgeable on these basic environmental management concepts and practices.*

**Keywords:** Environmental; Management; Concepts; Practice

## INTRODUCTION

There is no doubt that environmental management occupies a high place in the service of humanity. As it could be argued that it is a single roadmap, with no alternative, for mans' successful stewardship of the planet earth (Weler, 2018). In the first instance, generally, it enables man to understand the structure and function of the earth system, as well as the ways in which humans relate to their environment (Laurila-Panta et al, 2015 and Barrow, 2005). It promotes safe keeping of soil, water, and air for humans and wildlife (Michael, 2014 & Mattheus, 2012). Also, it enables man to rationally adjust with nature - judiciously exploits and utilizes natural resources without disturbing the ecosystem balance and ecosystem equilibrium (Kumar, 2016). In the same vein, environmental management facilitates socioeconomic developments on one hand and maintenance of environmental quality on other hand (Kaushik & kaushik, 2010). While at a micro level or corporate entities,

environmental management promotes optimal allocation of scanty resources in the economy; ensures health and safety within workplace; serves as an index for pollution control in corporate bodies; helpful in discharging organizational accountability and increasing environmental transparency (Christiansen, 2004 and Beder, 2006). Others are: supports green reporting to combat effectively all negative public opinions in the global economy; improves performance through better management of environmental cost and thus, benefits the natural and human environments. In another direction, it forces corporate sectors to fulfill their commitments towards introduction and change, and thus appears to be responsive to new factors; and reflects unsound production and consumption patterns, misuse and scanty use of resources and assets, among others (Eresi, 1996; Jain, 2000; and Chong, 2008). Intellectually, political economists and environmentalists used it as an index in measuring a nation's economic development, social welfare, industrial development, pollution control and in fulfilling the needs of government (Chong, 2008).

Therefore, in an effort to maximize and utilize all these benefits, on the one hand, and term with the contemporary environmental challenges and problems, on the other, a great number of environmental scientists are enrolling into environmental management programme, take environmental management carriers, and even occupy top environmental management decision positions. The most disheartening, however, a great number of these categories of environmental scientists, especially in the developing nations, have either not being in the mainstream before, have little basic understanding of the concept and practice of environmental management, or just undergo short refresher or qualifying courses. In Nigeria, for example, about 65% of the senior labour force in Federal and States Ministries of environment and associated agencies are composed with scientists such as Geologists, Geographers, Biologists, Chemists, Engineers, Planners, and Surveyors among others, while less than 20% are mainstream Environmental Management Managers. A study by Ibrahim and Buba (2017) revealed that only 28% the senior staff directly and indirectly involved in environmental management practice/administration in the Department of Petroleum Resource (DPR) in the Northeast Zonal Offices have right environmental management training and skills. This according to the study (Ibrahim & Buba, 2017) has among others, been responsible for weak enforcement of environmental regulations by some government agencies in Nigeria as a whole. In view of this situation, therefore, the paper reviews vital idea and practice of environmental management, so as to serve as a guiding framework for the study and understanding of environmental management, emerging environmental managers or environmental scientists willing to convert to full pledge environmental managers.

### **Evolution of Environmental Management**

Quite contrary to the claims by nonprofessionals that environmental management is a recent discipline, a byproduct of the 1970s and 1980s earth summits (Colby, 1991), it is not an accidental career, profession or discipline but rather a strategy or technique that goes with time. Its philosophy dates back to the evolution of man on the planet earth. In real sense, however, the history of Environmental management is a very long one and can be divided into three major developmental periods; namely ancient, classical and modern history (Ereky, 1919; Hughes, 1975; Kolk & Mauser, 2001; and Weler, 2018). The ancient history dated hundreds of centuries ago suggesting that humans have used environmental management principles for development almost throughout human history. During that period, strategies and techniques that today formed the background of environmental management were developed, although the word environmental management was not used to describe any of the techniques (Dauvergne, 2009). Discovery of nature, protection and caring were the centre pits of ancient environmental management that later gave rise to the conglomerations concept of agriculture (Dauvergne, 2009).

The classical environmental management evolved from 1700 to almost the middle of the twentieth century. Thus environmental management in the classical phase centred on exploration of determinant factors and description of environmental features in relation to space, location and place. Further development of these, gave rise to the development of associated theories, concepts, and disciplines, such as Smith (1776) and Malthus (1798) theories on population-resources relationship, Ellsworth Huntington (1876 - 1947) concept of environmental determinism, classical geography (Charles & Withers, 2013), economics, environmental biotechnology, ecology, and environmental health and engineering, among others. It is on this background that most environmental, technical and social sciences cloned themselves with environmental management principles of nature and resource conservation.

Owing to the inability of most of the environmental sciences and techniques to completely handle the problems associated with industrial revolution, high population growth, modernization and globalization, the modern environmental management emerges in order to rescue the situation and promote safe living heaven and best keeping culture of the natural and built environment (Lois, 2016). Indeed, this development can be associated with the 1972 Stockholm Conference on the Human Environment, which was the landmark for the major changes in the way societies think about the management of the relationship between nature and human activity in the future (Kaushik & Kaushik, 2010). Since then, the nomenclature of modern environmental management began and the discipline develops and subsumes other applied and social sciences into one integrated discipline (Lochner, et al, 2004 and Michael, 2014). The modern environmental management, in addition to going in conformity with the ancient and classical principles, also avails itself with control of environmental quality and sustainable resource management (Raven, Berg, & Hassenzahl, 2010) through five basic operations. These are: Manipulation, Accounting, Monitoring, Auditing, and Legislation; which in acronyms is denoted as MAMAL.

### **Definition**

Irrespective of the controversy involved among scholars on a unifying definition of environmental management, here it can be defined, based on practical application, as the scientific study of the strategies and techniques of monitoring and manipulation of physical, chemical, and non-human biological system in order to preserve and maintain their natural qualities (after, Heer & Hagerty, 1977). Thus, from this brief definition, it can be deduced that environmental management is a broad field of study that includes the natural environment, built environment and the sets of relation between them (Ormazabal et al, 2014; Speight & Singh, 2014; and Theodore & Theodore, 2010). Therefore, in other words, Environmental management is concerned with the description and monitoring of environmental changes, with predicting future changes and with attempts to maximise human benefit and to minimise environmental degradation due to human activities (Colby, 1991). Barrow, (2005) added that 'Environmental management is the process we use to reduce risk and keep harmful substances away from humans or down to levels that will not cause harm... as risk is manage in the financial world through insurance, so also Environmental management too is a form of insurance'.

To sum up, NEC (2011) described Environmental management as a subject that combines science, policy, and socioeconomic applications. It primarily stresses on finding solution to practical problems that people face in cohabitation with nature, resource exploitation, and waste production. In a purely anthropocentric sense, environmental management is all about dealing with the fundamental issue of how to innovate technology to evolve continuously while limiting the degree to which this process alters natural environment. Thus,

Environmental management is closely linked with issues regarding sustainable economic growth, ensuring fair and equitable distribution of resources, and conserving natural resources for future generations (Paul et al, 2016).

Based on this practical multidimensional definition, the scope of environmental management has encompasses large number of areas and aspects, which can be summarized into five broad areas. These are: i. Natural resources, their conservation and management, ii. Ecology and biodiversity, iii. Environmental pollution and control, v. Social issues in relation to development and environment, and v. Human population, environment and climate change. Indeed, these are the basic aspects of environmental management studies which have a direct relevance to every section of the society (Barrow, 2005 and Kumar, 2016). It is in line with this broad scope that, Barrow (2005) identified the objectives of environmental management to include the following:

- i. Identify the environmental problem and find its solution;
- ii. Restrict and regulate the exploitation and utilization of natural resources;
- iii. Regenerate degraded environment and renew natural resources (renewable)
- iv. Control environmental pollution and degradation;
- v. Reduce the impacts of extreme events and natural disaster;
- vi. Make optimum utilization of natural resources;
- vii. Assess the impacts of proposed projects and activities on environment;
- viii. Review and revise the existing technologies and make them eco-friendly; and
- ix. Formulate laws for the implementation of environmental protection and conservation programmes.

As a field of study as well as a professional career, environmental management has basic distinctive features that differentiate it from other disciplines and related applied sciences. Some of these include the following:

- i. It is a strategy that centered on “sustainable development” (i.e. the ability of present generation to meet their need without compromising the ability of future generations to meet their own needs). It emphasizes utilitarianism (a belief in protecting resources for the “greatest good” for the greatest number and for the longest time) and disregards anthropocentrism (a belief in humans as master of the world with a unique set of right and values) (Mattheus, 2012).
- ii. It is multidisciplinary in nature, because it cut across many disciplines which include Agriculture, Architecture, Biology, Chemistry, Economics, Ecology, Engineering, Ergonomics, Estate management Geography, Geology, Physics, Psychology, etc: (Louis, 2016).
- iii. It is a vision of the nature, evolves on the basis of righteous practice and resolves the conflict between man and nature (Hussein, 2005).
- iv. It awakens man to be environmentally conscious and to be proactive than reactive to environmental problems. It has positioned man as a caretaker and steward of resources working together with the rest of nature to sustain life and make the world a better place.
- v. It rejects the views of the nihilist (the view that there is no reason to behave morally, only power, strength and sheer survival matter “might is right eat or be eaten”) instead, it accepts the views of biocentrism (the view that all living things are held to be worthy of respect).
- vi. It opposes environmental possibilism (a belief that humans can shape the environment), environmental racism (inequitable distribution of environmental hazard) and supports environmental determinism (the belief that the environment determines what man can do) and environmental justice (which combines civil right

with environmental protection to demand a safe, healthy and life giving environment for every one) (Guha, 2000).

### **Method**

The study was based on review of relevant literature on the subject matter. The central focus lies on the standard ideas or understanding and practice of environmental management as a field of study and a career opportunity. Environmental management concepts here refer to the standard idea or philosophy that defines the basic attributable context. Practice, on the other hand refers to the actual application or use of an environmental management idea, belief, or method. In other words, environmental management practice is the customary, habitual, or expected procedure or way of discharging environmental management principles. Environmental management is the process to improve the relationship between the human beings and environment which may be achieved through check on destructive activities of man, conservation, protection, regulation and regeneration of nature. The process, environmental management is related to the rational adjustment of man with nature involving judicious exploitation and utilization of natural resources without disturbing the ecosystem balance and ecosystem equilibrium

### **Environmental Ethics**

Ethics refer to the principles or standards of human conduct, sometimes called morals or norms of human conduct. It offers rules of conduct and ways of assigning value to, and assessing the “rightness” of actions and things. Environmental ethic therefore, refers to the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. Environmental ethics rest on the principle that, there is an ethical relationship between human beings and the natural environment (Tibor, & Feldman, 1996). Human beings are a part of the environment and so are the other living beings. Thus, the idea of environmental ethics brings out the fact that all the life forms on Earth have the right to live. Equally, it is unjust and unethical to destroy nature, as the right of other life forms is denied, since the food web clearly indicates that human beings, plants, animals, and other natural resources are closely linked with each other. Moreover, all life forms are creations of nature and depend on one another and the environment. In line with this doctrine, the primary duty of all environmental scientists, not only environmental managers alone, is respecting the existence of not just other humans, but also, the non-human entities, and recognizing their right to live.

Based on practical application, environmental ethic centred around five major aspects or issues. These are: Consumption of Natural Resources; Destruction of Forests; Environmental Pollution; Harm to Animals; and Inherent Value to Non-Human Entities. It is therefore, the duty and moral obligation for an environmental manager as well as environmental scientists to guard against destructive activities or practices, and promotes and sustains environmental quality. In addition to this, environmental managers should adhere to, and advocate for all international environmental principles and treaties. The following are international principles (after, NEC, 2011) in common usage to apply more directly to social issues.

- i. Precautionary Principle: In order to protect the environment, a concept which includes peoples’ ways of life and the integrity of their communities, the precautionary approach shall be applied. Where there are threats or potential threats of serious social impact, lack of full certainty about those threats should not be used as a reason for approving the planned intervention or not requiring the implementation of mitigation measures and stringent monitoring.

- ii. **Uncertainty Principle:** It must be recognized that our knowledge of the social world and of social processes is incomplete and that social knowledge can never be fully complete because the social environment and the processes affecting it are changing constantly, and vary from place to place and over time.
- iii. **Intra-Generational Equity:** The benefits from the range of planned interventions should address the needs of all, and the social impacts should not fall disproportionately on certain groups of the population, in particular children and women, the disabled and the socially excluded, certain generations or certain regions.
- iv. **Inter-Generational Equity:** Development activities or planned interventions should be managed so that the needs of the present generation are met without compromising the ability of future generations to meet their own needs.
- v. **Recognition and Preservation of Diversity:** Communities and societies are not homogenous. They are demographically structured (age and gender), and they comprise different groups with various value systems and different skills. Special attention is needed to appreciate the existence of the social diversity that exists within communities and to understand what the unique requirements of special groups may be. Care must be taken to ensure that planned interventions do not lead to a loss of social diversity in a community or a diminishing of social cohesion.
- vi. **Internalization of Costs:** The full social and ecological costs of a planned intervention should be internalized through the use of economic and other instruments, that is, these costs should be considered as part of the costs of the intervention, and no intervention should be approved or regarded as cost effective if it achieves this by the creation of hidden costs to current or future generations or the environment.
- vii. **The Polluter Pays Principle:** The full cost of avoiding or compensating for social impacts should be borne by the proponent of the planned intervention.
- viii. **The Prevention Principle:** It is generally preferable and cheaper in the long run to prevent negative social impacts and ecological damage from happening than having to restore or rectify damage after the event.
- ix. **The Protection and Promotion of Health and Safety:** Health and safety are paramount. All planned interventions should be assessed for their health impacts and their accident risks, especially in terms of assessing and managing the risks from hazardous substances, technologies or processes, so that their harmful effects are minimized, including not bringing them into use or phasing them out as soon as possible. Health impacts cover the physical, mental and social wellbeing and safety of all people, paying particular attention to those groups of the population who are more vulnerable and more likely to be harmed, such as the economically deprived, indigenous groups, children and women, the elderly, the disabled, as well as to the population most exposed to risks arising from the planned intervention.
- x. **The Principle of Multi-Sectoral Integration:** Social development requirements and the need to consider social issues should be properly integrated into all projects, policies, infrastructure programs and other planning activities.
- xi. **The Principle of Subsidiarity:** Decision making power should be decentralized, with accountable decisions being made as close to an individual citizen as possible. In the context of Social Impact Assessment (SIA), this means decisions about the approval of planned interventions, or conditions under which they might operate, should be taken as close to the affected people as possible, with local people having an input into the approval and management processes.
- xii. **Developing Guidelines:** Because guidelines are specific recommendations for action, they need to be developed in the context in which they are to be applied and they need to be addressed to a specific audience. Therefore, they need to be developed in

conjunction with the relevant parties. They need to become accepted as the guidelines of that group rather than being imposed.

### **Categorization**

Owing to its broad and multidisciplinary nature, environmental management is not standing as a single entity, but with subdivisions and branches. To this effect therefore, the discipline is classified into three major categories. These are general environmental management, specialized, and auxiliaries (others). General environmental management is a foundation to the study of environmental management. It revolves around basic understanding of natural and built environment, acquisition of skills and techniques in environmental manipulation, monitoring, assessment, auditing, mitigation, legislation, ethic and entrepreneurship. This is the base of undergraduate study and career in environmental management.

The specialized environmental management category is usually being studied or pursued at, or after postgraduate endeavors. Conservation option, Corporate Environmental management, Environmental policy and Governance, and Toxicology are the major specialized environmental management options; with each standing as a single entity or career (Theodore, & Theodore, 2010). The conservation option is concerned with the protection and conservation of nature as well as its resource base. It is either being studied alone as conservation management or in combination with other related field or aspects such as Natural Resource Management and Conservation (Peter et al, 2006). The corporate environmental management as the name implies is concern with environmental management aspects at corporate or business organization level. It is mainly concerned with how private sector firms address environmental and natural resource issues while promoting shareholder value and linking the firms' market objectives to the environment (Goldstein, 2002). Its focus is on three major different areas (IFAC, 1998). These are: i. Identification of environmental impacts in organizational operations; ii. Management of environmental impacts arising from the activities or operations of business organizations; and iii. Promotion of environmental sustainability in business and innovating new business solutions and sustainable business models.

Environmental policy and governance is concern with Legislative and administrative control of land, Air and water resources; Control of hazardous and toxic wastes; and International laws and Conventions on the Environment. It is also concerned with Practical tools and instrument for ensuring detailed compliance; and Measures of compliance, tools of monitoring and means of enforcement of environmental laws and regulations by regulatory authorities (Ormazabal et al, 2014). While Environmental toxicology is the study of how toxic chemicals affect organisms and the environment and mitigation or controlling measures. It is also concerned with techniques and or strategies of sample collection, testing of sample, determining the presence and amount of contaminants in a given area, risk assessment, and remediation measures (William 1996).

The Auxiliary categories, on the other hand, are environmental management affiliated specializations with roots or branches from other disciplines other than core environmental management discipline. Some of these include the follow:

- i. Environmental Biology: is a scientific study of the origins, function, relationships, interactions, and natural history of living populations, communities, species, and ecosystems in relation to dynamic environmental processes. Environmental biologists are mainly responsible for monitoring environmental conditions and conducting or

- partake in conducting environmental impact assessments for development project environmental monitoring, especially in maintaining environmental monitoring systems and collection of water and soil sample from the field.
- ii. Environmental Chemistry: is the study of chemical processes occurring in the environment which is impacted by human activities. Its focus is usually on the presence and impact of chemicals in soils, surface and ground water, and the effects of contaminants on ecosystems, animals, and human health.
  - iii. Environmental Economics: It is a sub-discipline of economics which is concerned with the evaluation and analysis of the impact of the economy on the environment, the significance of the environment to the economy and appropriate way of regulating economic activity so that balance is achieved among environmental, economic and other social objectives. The broad idea on Environmental Economics therefore centres on conservation, maintenance, appropriate use and re-use of natural resources in order to preserve the quality of life from excessive waste. The concept perceived the lack of adequate incentives in market systems to promote efficient use of resources as the major cause of environmental problem generated by them (Bhargava & Welford, 1998).
  - iv. Environmental Education: It is concerned with knowledge, emotions, feelings, attitudes, and values. It is an organized effort of teaching how natural environments function, and particular, how human beings can manage behavior and ecosystems to live sustainably. Its aim is to produce informed and responsible citizens capable of playing an active role in all matters concerned with the environment. It is studied in two major ways: as interdisciplinary and multidisciplinary but with common focus; a multitude of processes and activities by which an understanding of environment is developed and through which caring and committed responses are evolved (Geographical Association's Environmental Education Working Group, 1980).
  - v. Environmental Engineering: is the branch of engineering concerned with the application of scientific and engineering principles for protection of human populations from the effects of adverse environmental factors; protection of environment, both local and global, from potentially deleterious effects and improvement of environmental quality. It addresses energy preservation issues, protection of assets and control of waste from human and animal activities. It is also concerned with finding plausible solutions in the field of public health, such as waterborne diseases, implementing laws which promote adequate sanitation in urban, rural and recreational areas. Others are waste water management, air pollution control, recycling, waste disposal, radiation protection, industrial hygiene, animal agriculture, environmental sustainability, public health and environmental engineering law.
  - vi. Environmental Ergonomics: is a specialized field of study in architecture that is concerned with the evaluation and designing of workplace based on health and safety principles and environmental quality requirements. It also involves redesigning or modifying workplace to fit the workers in order to eliminate discomfort and risk of injury.
  - vii. Environmental Ethic: is a discipline in philosophy that studies the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. The definition of environmental ethics rests on the principle that there is an ethical relationship between human beings and the natural environment. A value system that judges human actions in terms of whether they harm, sustain, or improve environmental quality (Stanford Encyclopedia of Philosophy, 2015).
  - viii. Environmental Health: Is a health science discipline which is concerned with hygiene, sanitation and many other aspects of the environment such as global warming, climate

change, radiation, gene technology, flooding and natural disasters. It also involves studying the environmental factors that affect health. According the World Health Organization (1999), Environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors influencing behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health.

- ix. Environmental Law: is a field of study in law that involves a series of laws, policies and procedures enforced by various agencies with the goal of protecting the environment. It also focuses on existing legal regimes governing pollution, water law, endangered species, toxic substances, and environmental risk.

### **Tools and Techniques**

The broad and multidisciplinary nature of environmental management makes its management tools and techniques for performance improvement very diverse and dynamic. It is in line with this, that in the early 1990s International Organization for Standardization (ISO) recognized the need for standardization and in 1993 came up with a set of nine basic tools as follows:

- i. Environmental Management Systems (EMS)
- ii. Environmental Auditing (EA)
- iii. Environmental Labeling (EL)
- iv. Life Cycle Assessment (LCA)
- v. Environmental Indicators (EI)
- vi. Environmental Policies (EP)
- vii. Eco-Balances
- viii. Environmental Reporting (ER)
- ix. Environmental Charters (ECs)

The other best-known environmental management and environmental performance improvement tools are:

- i. Public Participation
- ii. Environmental Impact Assessment (EIA)
- iii. Strategic Environmental Assessment (SEA)
- iv. Social Impact Assessment (SIA)
- v. Biodiversity Impact Assessment (BIA)
- vi. Cleaner Production (CP)
- vii. Environmental Accounting (EAc)
- viii. Dose Response Analysis
- ix. Material, Energy and Toxic-analysis (MET)
- x. Material Input per Service Unit (MIPS)
- xi. Design for the Environment (DfE)
- xii. Environmental Performance Evaluation (EPE), UNDP - NEC (2011).

Fet (2000), classified four main levels in which these tools are used for improving environmental performance. These are: Society level (Macro); Industry and Company level (Meso); Product level (Micro/Meso); and Process level (Micro). At macro level, for example the appropriate tools and methods used for improving environmental performance are Montreal Protocol, Kyoto Agreement, Agenda 21, and policy frameworks; Meso level are: Cleaner Production policies, International protocols, Environmental Management System, Environmental Audit, and Environmental Performance Evaluation. While for Micro/meso level the appropriate tools are: Life Cycle Assessment, Life Cycle Screening, Material Energy and Toxic Analysis, Material Input per Service Unit, Life Cycle Costing, Design for Environment, and Cleaner Production related to products (industry level), Environmental

Management System, Environmental Audit, Environmental Performance Evaluation (company level); and Micro level are: Cleaner Production processes (in a narrow sense) and Environmental Accounting.

Another classification based on which these tools are used, categorizes them into three namely: Process oriented tools; Product oriented tools and Environmental Conscious Management tools (after Bras, 1996). Environmental Accounting (EAc) and Cleaner Production (CP) are process oriented tools frequently used in calculating and evaluating environmental impact caused by the production processes. The product oriented tools, frequently used, are Life Cycle Assessment, Life Cycle Costing, Life Cycle Screening, Material Energy and Toxic-analysis, Product Development and Design for Environment, and Eco Labeling. For environmental consciousness management, on the other, the most appropriate tools are: Cleaner Production, Life Cycle Assessment, Design for Environment, Environmental Management System, Environmental Auditing, and Environmental Performance Evaluation, among others.

In addition to these tools, environmental management is also known for efficient techniques used in handling or operating some or all the management tools. These are: Application of Geographical Information System (GIS), Environmental Monitoring, Environmental Modeling (forecasting and growth), Environmental Sensitivity Analysis, Laboratory Analysis, and Field Measurement and Survey. Environmental managers can choose from a huge range of tools to support research, administrative activities, enforcement of environmental standards, and communication with decision makers or the public (Barrow, 2005).

### **Environmental Entrepreneurship**

Environmental entrepreneurship is concerned with the discovery and sustainable exploitation of opportunities to create social change that positively transforms the environment. It is the process of establishing and promoting a for-profit or non-profit venture to address an environment issue such as green production, cleaner energy, and zero emission. Also it deals with an entrepreneurial mindset and hones the skills needed either to develop a new enterprise with potential for growth and funding or to identify and pursue opportunities for growth within an existing organization. Thus, the main goal of Environmental Entrepreneurship focuses on finding answers to three key questions (Lenox & York, 2011). These are: Under what conditions can entrepreneurship reduce environmental degradation? What are the motivations and processes involved in environmental entrepreneurship? To what extent do institutional conditions affect environmental entrepreneurship?

Basically, finding answers to these questions would generate wide variety of opportunities that an environmental entrepreneur or groups could pursue. Some of these are as follows:

- i. Bioremediation
  - ii. Climate Change Mitigation
  - iii. Consultancy Services
  - iv. Green Production
  - v. Horticulture
  - vi. Learning and Training Centres
  - vii. Organic Agriculture
  - viii. Renewable Energy
  - ix. Waste Management
- Zero emission, and so forth.

### **Research**

Environmental management is not only an environmental science discipline; it is also a strategy of solving environmental problems and improving its wellbeing (quality). Therefore, the mode of research in environmental management, to some extent, differs from that of other social and applied sciences; in that, it has three basic features that are not common to other environmental sciences. These are: it is multi-dimensional in approach; it centres on finding ways, mean, procedures or strategies of improving environmental quality, control, sound behavior, implementable policies, sustainability, efficient techniques, modeling, and good practices; and it is associated with new innovation, invention, and discoveries. To that effect, environmental management research has been reckoned with three specific attributes: it involves revealing new knowledge or ideas; it portrays impact in form of the implication of its findings on environment or other stakeholders; and it offers mitigating or remediation measures.

From the earlier huge range of tools and techniques discussed above, Environmental managers can choose to support basic or applied (evaluation, action, or assessment) research in environmental management. On the research design, however, there are several types of design, and choice will depend on the issue being researched. Commonly adopted designs are the experimental, cross sectional, longitudinal, case study, survey and correlation design. Generation of primary data (text and numerical) can be through survey, experiment, case study, programme evaluation, or ethnographic study. Text data generated from environmental management research is often being analyzed through discourse analysis, content analysis, and historical studies, while numerical data analysis can be through secondary data analysis and statistical modeling.

As noted by Neuman (2014), conducting research in environmental management, follows seven basic stapes. These are:

- i. Selection of a research topic: This may be a broad area of study. Examples, a researcher may decide to go for water quality study which is very broad, from there he may narrow down to a particular area.
- ii. Formulation of focus research question: Generally a topic is too broad to conduct a study, for this, researcher usually divides general problem into sub problems. Thus, the study is guided by specific research questions. It is highly desirable to review the literature and develop hypothesis that emanate from the theory.
- iii. Designing the study: Having formulated research questions, the next step is to provide plan for the study. The plan includes the data required, sampling strategy for data collection, number of the respondents and instrument to be used.
- iv. Collection of data: The next is to carefully record, verify, and code the data before taking it into computer system for proper keeping.
- v. Data analysis: It is required to subject the data to analysis, to give more meaning to the data. The output will be in form of charts, tables, graphs and maps, etc.
- vi. Interpretation of the data: After converting the data into charts, table and maps, there is need to further explain the analyzed data why it will be like that. Then compare the result to see whether it differs from other studies and why? Conclusion will be drawn from what was obtained.
- vii. Communication of Information to others: Finally, a report on the study should be produced and made available by publishing it in journal, presenting in conference or taking it to public library for other interested researchers to use.

## **Conclusion**

From the forgoing it is evidently clear that environmental management discipline and its career, as well, requires in-depth knowledge on wide varieties of areas, issues, techniques,

skills and strategies, among others. It is indeed, highly pertinent for an environmental management career seeker or manager to have full basic knowledge on at least all the idea and practices raised in this paper, if not on all environmental management curriculum. Having wide knowledge or training on a single aspect or attribute of environmental science cannot make the beholder an environmental manager, unless in addition, acquires the needed skills and training on what has been highlighted in this paper or the conventional framework. Therefore, it is recommended that all aspiring environmental managers should be fully aware and knowledgeable on these basic environmental management concepts and practices.

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