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Review Article

Role of Slt: Environmental Impact Assessments and Statements Concept

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Abstract: Within the special issues, the role of Science Laboratory Technology (SLT) in various fields of local, traditional, or modern and indigenous knowledge need to be elaborated. Review study was carried out on the role of SLT in environmental impact assessments and statements concept. SLT is a wide scope discipline, serving as a linkage between various fields, especially the ecosystem ecology and organisms interactions studies. SLT plays a greatest role in ecosystem research (biotic and abiotic pools and fluxes) analysis of relevant values, participates actively in Environmental Impact Assessment and Statement (EIA/S). It provides various laboratory techniques; analyses, samples collection on the targeted points or locations, parameters assess or state gives the baseline data to these samples points or locations. The samples conditions are not determined only, but would serve as reference baseline data in order to avoid unnecessary dispute or claim in the future of a project. Also provide services for EIA as a management tool designed to aid stakeholders, policy makers, managers and officials both at local, national and international observatory who mainly take decisions on major development projects in predicting the effects on the environmental consequences of such projects, before and after their implementation and planning measures, for avoiding or mitigating adverse laboratory techniques. The act of making natural laws adaptable to society understanding and eventual applications of these laws to solve man's day to day problems through skill knowledge of science, technology and engineering depended wholly on series of laboratory experiments, greatly improved many aspects of development in our societies, through the production and innovation of computers and internets, makes it to be virtual or stimulated and remote laboratories. Without the indispensable contributions of qualified and licensed professional in SLT, no producible, justifiable, valid and reliable findings can be ascertain on the EIA/S and data based study, including the description of baseline environmental condition of proposed project areas or points as multidisciplinary.

Keywords: Assessment, Statement, Environmental, Data Base, Laboratory Techniques, Management, Policy, SLT

1. Introduction

The SLT Science Laboratory Technology (SLT) is a very broad and lengthy bridge making profession serves as a linkage between the various field of sciences and technologies. Science in the broadest sense refers to as any systematic knowledge or practice or a system of acquiring knowledge based on the scientific method as well as to the organised body of knowledge gained through such research. Thus science is the acquisition of the knowledge of what to do or, and what the Scientists do, while technology is also a very broad concept that deals with a species' usage and knowledge of tools and crafts, and how it affects a species' ability to control and adapt to its environment.

According to Adewole, (2007) who stated that, in human society; technology is a consequence of science and engineering, although several technological advances predated the two concepts. Technology is a term with origins in the Greek 'techno logia'; 'techno' means 'craft' while 'logia' means 'saying'. Thus technology in Greek means craft-saying. However, a strict definition is elusive [4, 12]. Technology can refers to material objects of use to humanity, such as machines, hardware, or utensils, but can either be applied generally or to specific areas; examples includes, the construction technology, medical technology, environmental technology, metal technology, oceanic technology, etc, or state -of the – art technology [2, 11, 12].

According to Hornby (2001) in Oxford advance learner's dictionary define environment as the conditions that affect the behaviour and development of somebody or something; it's the physical conditions that somebody or something exist in. EIA is defining as the various aspects of the environmental effects, both adverse and beneficial of proposed development including the identification of measures for mitigating the adverse effects. Also Larry, W.C. (1977) and Munn, R.E. (1979), defined environmental impact assessment as an attempt to evaluate the consequences of a proposed or activity on the environment. It is a study designed to identify and predict the impact on the biophysical environment and on man's health and well-being. Heer, J.E. and Hagerty, D.J. (1977), see EIA as an assessment which consists in establishing quantitative values for selected parameters which indicate the quality of the environment before, during and after the project. The term is also used to include social, economic and cultural impact [20].

Recent years, changes in climatic have caused some impacts on human systems and natural, across water bodies, e.g. rivers, lakes, etc, causes some problems to agriculture and food security, especially in the fields of irrigation and fisheries sector. Climate change impacts such as unpredictable and changing seasonal weather variation, etc, is causing lower crops yields and fish production. Controlling this climate change is probably by introducing trees, herbs and shrubs along the water bodies' banks, creating more ponds, dams, or basins in order to collect and retain water, through agro – ecological techniques and data collection on environmental water bodies' parameters in order to ascertain, assess and address the environmental impacts [10, 21].

The ecosystem ecology is the interactions between organisms and or their environment as an integrated system. The ecosystem approach is fundamental to managing earths' resources, because it addresses the interaction that links biotic systems, of which people are integral part, with physical system on which they depend. Ecosystem analysis seeks to understand the factors that regulate the pools (quantities) and fluxes (flows) of materials and energy through ecological system. These materials are found in abiotic (non-biotic or non-biological) pools such as soils, rock, water and the atmosphere, and in biotic (biological) fluxes such as plants, animal and soil microorganism [8, 15].

Climate change is occurring as a result of warming of the earth's atmosphere due to human activity generating excess amounts of greenhouse gases. Because of its potential impact on the hydrologic cycle and severe weather events, climate change is expected to have an enormous effect on human health, including on the burden and distribution of many infectious diseases. The infectious diseases that will be most affected by climate change include those that are spread by insect vectors and by contaminated water. The burden of adverse health effects due to theses infectious diseases will fall primarily on developing countries, while it is the developed countries that are primarily responsible for climate change [19]. In general, climate change occurs as a result of imbalance between incoming and outgoing radiation in the earth's atmosphere [19, 17].

The global health impact of vector – borne diseases, particularly malaria (blood protozoan) and dengue fever (viral) is tremendous disease. Currently, 300 – 500 million people worldwide develop malaria annually, of which one million die [19, 24]. Ninety percent of the deaths occur in sub-Saharan Africa and malaria causes one out of every five childhood deaths in Africa. While malaria is an ancient human disease, dengue fever became widespread only in the middle of the last century [25]. Many infectious diseases are transmitted by ingestion (food), inhalation (polluted air), or contact with contaminated water. These infections can also lead to a wide range of clinical illness, e.g. diarrheal disease (due to bacterial or protozoan or both), which is the currently the second leading cause of death among children under the age of five worldwide [26]. Like vector-borne diseases, water-borne diseases are also strongly impacted by climate, particularly the effect of climate on the hydrologic cycle. During times of drought, water scarcity results in poor sanitation and exposure of much of the population to potentially contaminated water [19].

Protection of environment is the most vital issue today; explosive population growth, rapid progress in science and technology, massive industrial organization and use of various chemicals in agriculture and most important, human activities are the factors threatening the very quality of life [18, 22, 23].

Macro and micro element compounds found in plants such as vegetables and grains in small amounts, these compounds are not established nutrients, but significantly protect the development of lots of degenerative diseases [3, 5].

High levels in the body can be immediately poisonous, or can result in long-term health problems similar to those caused by pesticides and herbicides [1, 13]. Agriculture play role in an environmental impact, especially phosphate fertilizers applied at seedling have been shown to increase crop competiveness (and at the end left some residues) [7]. All plants require the same basic nutrients, but plants differ in the way they respond to nutrient availability. They differ in their ability to access nutrients because of differences in their root structures or mycorrhizal associations. They also can differ in their ability to tolerate nutrient imbalance, or in their efficiency at converting nutrient into growth, maintaining, or improving soil fertility is thus an element of weed management [7]. Thus, climate change may not always result in overall expansion of tropical infectious diseases, but rather may be followed by shifts in geographic ranges [14, 19].The objectives of this review study are to elaborate the role of Science Laboratory Technology (SLT) in various fields of disciplines, the role playing by qualified and licensed professional in SLT, in yielding producible, justifiable, valid and reliable data on particular projects and elaborate the contributions of data produced by SLT, there would be no findings (positive or negative) can be ascertain on the EIA/S and data based study.

2. Conceptual Frame Work

2.1. Biodiversity

An environment is the natural world in which people, animals and plants live, e.g. terrestrial, aquatic, arboreal, climate environment, e.t.c. The sum of all the different species of animal, plant, fungi, and microbial organisms living on Earth and the variety of habitats in which they live is called Biodiversity or Biological Diversity. Scientists estimate that upwards of 10 million or more than 100 million of different species inhabit the Earth. Each species is adapted to its unique niche in the environment, from the peaks of mountains to the depths of deep sea hydrothermal vents and from ice caps to tropical rain forest. It underlies everything from food production to medical research.

The array of living organisms found in a particular environment together with the physical and environmental factors that affect them is called Ecosystem or Ecological System. Healthy ecosystems are vital to life: They regulate many of chemical and climatic system that makes available clean air and water, with plentiful oxygen. Ecosystems, in turn, depend on the continued health and vitality of the individual organisms that compose them. Removing just one species from an ecosystem can prevent the ecosystem from operating optimally. Perhaps the greatest value of biodiversity is yet unknown. Scientists have discovered and named only 1.75 million species, out of which only less than 20% of those estimated to exist. Those identified, only a fraction have been examined for potential medicinal, agricultural, or industrial value. Much of the Earths biodiversity is rapidly disappearing, even before we know what is missing. Most Biologists agree that live on Earth is now faced with the most severe extinction episode since the event that drove the Dinosaurs to extinction 65 million years ago. Species of plants, animals, fungi, and microscopic organisms such as Bacteria are being lost at alarming rates - so many, in fact, that Biologists estimate that three (3) species go extinct every hour. Scientists around the world are cataloguing and studying global diversity in hopes that they might better understand it, or at least slow the rate of loss.

2.2. Human Activities and Development

This has to looked into with utmost care, No wonder therefore, effects have been geared up and garnered together to meet the challenges industrial development have so far made for the sustainable development of human race[19]. Industrial advancement and development programmes in nations of the world have given credence to making the environment to be less attractive through unquantifiable metric of tonnes of unwanted wastes that go into it on daily bases.

Federal and provincial government in some countries of the world, e.g. Canada, increasingly have adapted the concept of sustainable development as a standard. Sustainable development has been the defined by the World Commission on Resources and Development that meets the needs of the present without compromising future generations. The world Commission was created by the United Nations of which Nigeria is a member. In 1987, it produced an influential report, *our common future*, on environment and economic development. Among the report, are the roundtables policy groups of people with diverse background and increasing the amount of protected land[19].

2.3. Human Society, Knowledge of Tools and Craft Kills

The development of mankind, his activities on the Earth and the world in which he live, naturally or artificially, through the application of knowledge and craft skills has a better benefit and negative impact or effect on him and other species' environment. Thus, the concept of knowledge and craft skills is based on the study of concrete science and technology which lead to advance technology and Environmental Technology as a branch of this noble field of specialization. In this respect, Science Laboratory Technology (SLT) provide critical link in the knowledge of Environmental studies.

3. Concept of Science and Technology

3.1. Science

Science in the scope, broadest sense, refers to as any systematic knowledge or practice or a system of acquiring knowledge based on the scientific method as well as to

organised body of knowledge gained through such research[12]. Thus, science is the acquisition of the knowledge of what to do and, or what the Scientist do. That is Scientists decide what to do or create any the scientific idea and theory and this idea or theory been put in to series of experiments for a proof bases, i.e. to obtain results.

3.2. Technology

Technology is also a very broad concept that deals with a species' usage and knowledge of tools and crafts, and how it affects a species' ability to control and adapt to its environment. While technology was defined as, in human society, technology is a consequence of science and engineering, although several technological advances predated the two concepts. Technology is term with origins in the Greek "*technologia*"; "*techno*" means "craft" while "*logia*" means "saying". Thus, technology in Greek means craft-saying[2].

However, a strict definition is elusive. Technology can be refers as to material objects of use to humanity, such as machines, hardware, accessories, utensils, but can either be applied generally or to specific areas; e.g. include the construction technology, medical technology, Dental technology, environmental technology, etc, or state of the art technology.

4. Laboratory Concept

4.1. The Key Activities of SLT in EIA

The main accommodation and geneses of the profession SLT is the Laboratory, which remains the "engine" room of all scientific activities and discoveries, and without it no scientific adventure, study or research can be conducted successfully. It is often referred to as the "kitchen" of all scientific and technological development as there is no reliable, useable, and reproducible scientific data can be generated without Laboratory. The core of EIA studies is that of the key elements of processes in Science Laboratory Technology which comprises of hypothesis, experimentation, observation, data acquisition, analysis and reporting of new findings.

To that extent, without the indispensable contribution of the qualified and licensed to practice professionals of the SLT (Scientists and Technologists), no producible, justifiable, validable, and reliable can be ascertained on the EIA research as a multidisciplinary and data based study, which include the description of baseline environmental condition of proposed project areas, sites and or points.

4.2. The Laboratory and Its Field's Works in EIA

The role of the field's work in EIA study is the collection of samples on the Fields. The field work in Environmental Impact Assessments study would not be complete without the complementary effort and input of the various tests to be conducted on the field samples collection. From the fields, all the samples taken, from all the various environmental media would be conveying to the Laboratory for various analyses. This signifies the relevant role of Laboratory and its Fields work in EIA studies.

In industrial projects areas such as mining, cement, oil and gas, e.t.c. where high level particulates are emitted in to the environment, all the airborne metal particulates could be collected and determined by using sophisticated laboratory equipment. The air quality parameters, such as, the total suspended particulates (TSP) are quantitatively determined gravimetrically and broadly analyse in the laboratory.

The water samples both the surface and the underground are also subjected to physico - chemical laboratory analysis in order to ascertain the concentration level of pollution load in them or their quality before the commencement of the project.

The soil samples are also subjected to various physico - chemical laboratory analyses as to determine and quantify the various metallic ions, the pH and other related parameters. The geotechnical and engineering aspects of the various soil profiles are also to be determined. Thus the results obtained are also related to the purported project or projects.

Additionally, the read-out from the various portable monitors such as Nitrogen oxides, Hydrogen sulphides, Carbon mono oxide, Hydrocarbons, Hydrochlorides, Phosphates, e.t.c. are to be down loaded and the quantity so far read is related to the type of the project the EIA study is to cover. This parameters report the baseline data to these sampled points or locations, not characterising the samples conditions but serve as a baseline data in order to avoid unnecessary litigations in the near future of the project.

4.3. The Work of Laboratory in EIA

Among the works that are carry out in the Laboratory in EIA/S by the SLT professionals are the studies on the assessment of air quality such as the total suspended particulates (TSP) with the measurement of parameters such as Sulphates, Hydrocarbons, Carbon oxide, Nitrates, Oxidants, Particulates and Water quality include; physical and chemical quality, flow pattern, turbidity, dissolved Oxygen, Phosphates and other compounds or elements that may cause harmful effects on the biodiversity (environment and ecosystem). These particular studies become unattainable without the critical role of the Laboratory and the SLT professionals. The specialists in Science Laboratory Technology should therefore be actively involved in Environment Impact Assessments and Statements.

4.4. Modern Science Laboratory Technology

Research on environmental impact assessments and statements (EIA/S) wholly depended on series of laboratory experiments and fields work with relevance to samples collection which is the base rock of the project. However, modern laboratories have been developed, sometimes as a replacement for traditional laboratories which require the expertise of science laboratory technology, which involves the application of Nanoscience craft skills. Nevertheless, the recent discoveries cannot replace or be in position of the

traditional laboratories in which science laboratory technology (SLT) is a major key factor to be reckoned with, to stress that, the role of this age – long or olden profession will not be over emphasis. This is being coming more relevant than ever since it is the linkage between the founded scientific theories, hypothesis, invention, innovation and physical reality of all scientific and technological adventure.

The SLT professionals are the crucial engine power house of the science, technology and innovation. They provide midwife or husbandry in crucial areas such as environmental impact assessments and environmental impact statements, environmental engineering and technology, wildlife technology, biotechnology and water technology, to mention few. They also provide a critical link in the knowledge industry.

The SLT is a broad and lengthy bridge making profession serves as a linkage between the various field of sciences and technologies (Adewoye, 2007). This makes the discipline Participate actively in the EIA/S, with respects to its various areas of techniques of laboratory analysis, including the samples collection on the targeted points or areas. The parameters assess gives the baseline data to these samples points or location. This does not only characterising the samples conditions, but, would serve as a baseline data in order to avoid unnecessary litigation in the near future of the project.

5. Concept of Environmental Impacts

An environmental impact assessment and statement as a management tool is designed to aid stakeholders, policy makers, managers, and officials who mostly take decisions on or about major development projects in predicting the effects on the environmental consequences of such projects before and after their implementation and planning measures for avoiding or mitigating adverse environmental impacts.

5.1. Impact Effect

According to David W., (1999), who stated that in a world where a large proportion of native plants and animals are clinging to survival in increasingly isolated or degraded patches of habitat, invaders are often the final straw that, they dooms these native species to eventual extinct. That means that, non-native organism could transport to a native organism and cross – breed, transferring the gene into the native and cause or create damage or deformed to become extinct. For the instance, the bacteriophage – a virus cold fever.

5.2. Environmental Impact Assessment (EIA)

EIA is an attempt to evaluate the consequences of a proposed or activity on the environment. It is a study designed to identify and predict the impact on the biophysical environment and on man's health and well-being. According to Titi, (2007) who defined EIA, as the various aspects of environmental effects, both adverse and beneficial of proposed development including the identification of measures for mitigating the adverse effects. Also Larry, W.C, (1977) and Munn, R.E., (1979), who defined EIA as an attempt to evaluate the consequences of a proposed or activity on the environment. It is a study designed to identify and predict the impact on the biophysical environment and on man's health and well-being. Heer, J.E. and Hagerty, D.J, (1977) sees EIA as an assessment which consists in establishing quantitative values for selected parameters which indicate the quality of the environment before, during and after the project. These terms are also used to include social, economic and cultural impact and values.

5.3. The Objectives of EIA

The main objectives of EIA are to search and improve the suitability of projects within their Environment and ensure a more efficient use of resources and engender sustainable development. An Environmental Impact Assessment is expected to achieve specifically, the following:-

- To predict the nature and magnitude of impact from projects on the environment and ecosystem.
- To address and identify the physical, biological, socio-economic and cultural effects of developmental project in concern.
- To document the indicators to be used in assessing the impacts.
- To assist in the identification of possible alternative sites and or processes.
- To construct confidence in planning system by providing public participation and or consultation processes.

5.4. Environmental Impact Statement (EIS)

Environmental impact statement (EIS) is a written statement of the effect on the environment of an existing or proposed factory or development, or a scientific study undertaken in order to write such a statement.

The act of making natural laws adaptable to human understanding and eventual applications of these laws to solve man's day to day problems through the help of science and engineering depended wholly on series of laboratory experiment, in the medieval times. However, with the advent of Nanoscience and Nanotechnology, which have greatly impacted many aspects of our society recently, through the production and innovation of computers and internets which makes it to be virtual or stimulated and remote laboratories (Adewole, 2007; Titi, 2007).

The EIS, formal process used to predict how a developmental project or proposed legislation will affect such natural resource such as water, air, land and wildlife. Environmental Impact Statement was first introduced in 1969, in the United States of America as requirement of National Environmental Policy Act. Since then, an increasing number of countries have adapted the process, introducing legislation and establishing agencies with responsibility for its implementation. EIS have mostly been applied to individual projects and have led to various

offshoot techniques, such as health impact assessments, social impact assessments, cumulative effects assessments and strategic environmental assessments (environmental assessment of proposed policies, programmes plans). In some cases, social and economic impacts are assessed as part of the Environmental Impact Statements. In order cases, they are considered separately.

5.5. Steps of Environmental Impact Statement

An Environmental Impact Statement usually involves a sequence of steps, these are:-

- Screening to decide if a project requires assessment and to what level of detail.
- Preliminary assessment to identify key impacts, their magnitude, significance and importance.
- Scoping to ensure the EIS focuses on key issues and to determine where more detailed information is needed.
- Implementing the main EIS study, which involves detailed investigations to predict impacts, assess their consequences, or both.

5.6. Post- Audit of Environmental Impact Statements

After a project is completed a post-audit is sometimes done to determine how close the EIS's predictions were to the actual impacts. These days, a growing number of businesses commission independent audits that help set environmental performance targets, particularly regarding wastes disposal and energy use (bio - fuel, nuclear energy, solar energy, and e.t.c). The term Environmental Audit is applied to the voluntary regulation of organisations practices in relation to its environmental impact.

6. Conclusion

To conclude that, to reiterate the details roles that Science Laboratory Technology played in Environmental Impact Assessments and Statements cannot be over emphasis. Among others, environmental related studies have its other wings of success in the Laboratory, this shows that the relevance of Laboratory work in the successful implementation of conducting an Environmental Impact Assessment and Statement studies, since it is an integral part of it. The doors are open to and urge researchers in to Science Laboratory Technology and such allied subjects as may be relevant to the SLT and the EIA/S. There is the need to encourage young ones' study SLT as a course in order to have more qualified professionals in the field of SLT.

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