

**EFFECTS OF A COMMUNITY ENVIRONMENTAL MANAGEMENT
EDUCATION PROTOTYPE ON KNOWLEDGE AND ATTITUDE TO
SUSTAINABLE ENVIRONMENTAL MANAGEMENT OF RESIDENTS OF
AGO-ARE, OYO STATE.**

BY

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ABSTRACT

This study determined the effects of a self-designed community environmental management education prototype on the Ago-Are Community members' knowledge of sustainable environmental management. It also assessed the effects of the prototype on the community members' attitude to sustainable environmental management and examined the moderating effects of the residents' gender on knowledge and attitude to some aspects of sustainable environmental management. These were with a view to enhancing rural peoples' knowledge of sustainable environmental management and inculcating positive attitude towards the environment in them.

The study employed the pretest-posttest and control group quasi-experimental research designs. The study involved 400 residents (200 men and 200 women) selected through stratified randomization technique from 50 different societies from the Ago-Are Community. Out of the 400 participants, 200 people (100 men and 100 women i.e. 4 per society) were the participants in the experimental group (exposed to treatment – training on sustainable environmental management), while 200 (100 men and 100 women i.e. 4 per society) were in the control group (not exposed to treatment at all). The “Community Action Cycle for Community Mobilisation” in the Howard-Grabman and Snetro “Field Guide on How to Mobilize Communities for Health and Social Change” was adapted to develop a “Prototype of Community Environmental Management Education”. A Community Environmental Management Education Test of Knowledge and Community Environmental Management Education Attitude Measurement Scale, addressing five core areas of sustainable environmental management (biodiversity, pollution, conservation, environmental health and sustainable development) were used to determine the participants' knowledge of and attitude to sustainable environmental management. The data collected were analysed using descriptive and inferential statistics.

Results obtained showed that there was a significant effect [$F(2, 597) = 134.7; P < .05$] of the community environmental management education prototype on the Ago-Are Community members' knowledge of sustainable environmental management. There was also a significant effect [$F(2, 597) = 578.6; P < .05$] of the community environmental management education prototype on the Ago-Are Community members' attitude to sustainable environmental management. Result further showed that there was significant moderating effect of gender on the Ago-Are Community members' (i) knowledge of [$\chi^2(1, 207) = 2.4; P < .05$] and (ii) attitude to [$\chi^2(1, 324) = 2.4; P < .05$] the five aspects of sustainable environmental management; although, the female residents' overall average score was higher both in knowledge ($\bar{x}=86.1$) and attitude ($\bar{x}=93.6$) to sustainable environmental management than their male counterparts with overall average knowledge score of 86.75, and attitude score of 84.5.

The study concluded that grass root mobilization involving male and female community members could assist the people to acquire relevant knowledge and develop positive attitude towards sustainable environmental management.

Keywords : environmental management , prototype, sustainable environmental management.

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CHAPTER ONE INTRODUCTION

1.1. Background to the Study

Community-based natural resource management is now attracting widespread international attention. However, its practical implementation frequently falls short of expectations (Leach *et al.*, 1999); and the inability to reach and educate members of the community, especially people in the rural areas on the need to manage resources of the physical environment in a sustainable manner may be regarded as a major shortcoming on the part of the global community. The consequences of this are therefore dire: as residents of the rural communities are observed to be responsible for numerous environmental problems that are witnessed nowadays. Such problems include desertification, deforestation, loss of biodiversity, and pollution of various sorts (Ukpong *et al.*, 1995).

The rural communities may however not be blamed as much for negatively impacting on the environment. This could be because they are usually poor and very dependent on the environment for their daily living; and this may be expected of them as they are known to lack the skills and finesse of the outside world (Beer *et al.*, 2005). This may therefore explain why they “impact” on the physical environment to a large extent that damages are ignorantly made on it day by day. The ignorance could also explain why they do not rationally manage the land, water and the forest, thereby making them to contribute more to the overall problems of environmental degradation. The demonstration of the ignorance is thus so enormous that it does not take much effort to conclude that the rural populace needs community environmental management education - in order that the human environment might be sustained on a global scale.

Community Environmental Management (CEM) has been described by the United States of America’s Center for Community Environmental Management – CCEM (2004) as

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an attempt to shift the focus from “planning’s impact on the natural environment to the natural environment’s impact on planning”. According to CCEM, describing community environmental management this way is not a subtle or semantic change, but rather, a desire for fundamental change which affords the community people the opportunity to take decisive actions about the environment, so that in the future they could be proud of the good things they have accomplished in its respect. CCEM thus defines community environmental management as a non-regulatory initiative designed to help local communities to understand the impacts of their environmental decisions and coordinate their efforts in order to create desired environmental outcomes.

The CCEM’s definition seems to have an education undertone i.e. “understanding impacts” “and creating desired environmental outcomes”. So also is the opinion of the United States’ Environmental Protection Agency (USEPA) (2003), which regards Community-Based Environmental Protection Project (CBEP) as that which “emphasizes building capacity at the local level to achieve more integrated environmental protection and foster linkages between economic prosperity, and social and environmental well-being”. According to USEPA, CBEP is characterised by a focus on the geographic area; collaboration among a wide range of stakeholders; assessment that cuts across environmental media to support integrated decision making; integration of environmental, economic and social objectives; integration of regulatory and non regulatory tools and approaches; and integration of adaptive management approaches driven by ongoing monitoring information.

The USEPA (1994) also provides a guide for local decision makers in one of her projects titled “Environmental Planning for Small Communities”. The guide explains that Community Environmental Management Education (CEME) is a process for developing a community environmental plan. By implication, CEME assists the community to set priorities and decide how to make the best use of resources to protect people’s health and the

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environment. It is also to deal with issues before they become big problems; prevent pollution; provide a blueprint for compliance with the environmental regulations that affect the community; and build community awareness and support for actions to protect public health and the quality of the environment. CEME also helps to promote the economic health and well-being of the community by providing the environment with infrastructure, and quality of life that makes the community a good place to live and to do business.

All the descriptions of community environmental education above are suggesting that there is a need to educate the community members to acquire requisite knowledge which would in turn create a desirable environmental attitude in them.

1.1. Statement of the Problem

The USEPA (1999) explains that issues that involve the local people who have the local knowledge of resources that can be used to take care of the interest of the community and build socio-cultural cohesiveness, confidence and trust of the local people could not be addressed by one-sized command approach. The issues identified are those that cut across air, water, land, flora and fauna and which link economic, social and environmental impacts which are local and unique to a place. They are also those whose solutions require an emphasis on prevention, preservation and planning.

Given this perspective, residents of rural communities may be seen to have enormous environmental responsibilities that are associated with drinking water quality, management of wastewater, solid waste, household hazard and industrial wastes, emergency response to hazardous waste spills, ground water protection, wetland protection, air pollution among others (USEPA, 1994). It is therefore expected that the rural community members would acquire relevant knowledge of how to sustainably manage the environment and also develop

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desirable attitude in this regard, if they are provided with relevant environmental management education.

By and large, given the fact that rural communities contribute highly to the problems of desertification, deforestation, loss of biodiversity and pollution of various sorts, because they seem not to have the requisite knowledge and attitude towards sustainable environmental management, there is the challenge of “community environmental management education” for the residents of the rural areas. To embark on this among rural communities in Nigeria may however demand a blueprint or some technical guidance or a script (prototype) that may be followed in order to achieve maximum results. The learning content of such prototype should expose the rural dwellers to the fact that even though the planet earth is God-given, there are restrictions that must be adhered to if the needs of the present are to be met and means of survival are to be reserved for the incoming generations(sustainable development). There is also the need to alert the rural dwellers on the adverse effect of environmentally induced diseases and the need to prevent their occurrences. The need for conservation of natural resources especially along side occupational demands, and to encourage public participation in environmental protection are also supposed to be essential components of the community environmental management education (Ntia,1995), that would require a prototype

to be followed.

A prototype is by way of definition a “standard or typical example” (Bee Dictionary, 2010), an “original or model after which anything is copied”; “the pattern of anything to be engraved, or otherwise copied...”; “a primary form”; “exemplar”; “archetype”

(ThinkExist.Com,2010) or a “first form or design of something” (to be followed) (univSource.com,2009) - in this context, the one that could be useful for community environmental management education. However, a nationally approved prototype of community environmental management education is not evident in Nigeria. Raimi (1998),

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points out that Nigeria has realized as far back as 1980 that environmental hazards were looming and has been putting several measures in place; but there is yet a consensus of an approach that can be followed to embark on CEME especially among rural dwellers. There is thus a need to develop and experiment one. Rural dwellers are especially observed to lack access to the finesse of the outer world, because of lack of access to information as against their urban counterparts (Usang, 1995). The rural dwellers are therefore in dire need of education for the sustainable development. In Usang’s opinion on ‘the learning community in a living environment,’ ‘education for the community’ is an experiential learning, which is a programme that seeks to educate the community on their felt needs. According to Usang, community education “gives expression to the intrinsic desire of people to learn to change in a communitarian setting”. Usang however says this cannot be done without some expertise; and this has direct bearing with the foregoing discourse on providing a CEME prototype for Nigeria. A community of study is therefore required to experiment an initiative.

Consequently, the Ago-Are community is selected for such an approach. The community, from the experience of the researcher is a typical example of a community of an agrarian people that needs community environmental management education. What informs this idea is the observation of how the community members cultivate virgin land for propagation of yam and clear large expanse of land for mono-crop farming. The “work-men” (non-native labourers) also clear the river-banks for rice planting and fell trees for large scale charcoal making. In addition, the community is observed to have evolved from a hamlet to a town. As a hamlet there were no toilet facilities attached to buildings; hence people defecate on rock tops, nearby jungle, roadside, and water drains. Moreover, the community now appears to be urbanising; and being a nodal community, every surrounding settlements converge in Ago-Are daily for trade and commerce. Thus there is regular flow of traffic. The emergence of the commercial motorbike (popularly called ‘Okada’ or ‘Agbegade’ (Big man

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carrier) is hence noticeable in the community. Moreover, there are also complaints by members of the community that the rainfall pattern is not as it used to be, as late outset is now experienced. The late outset is also associated with whirlwind and storm, with its attendant house damage, flooding and erosion. The community is also known for game-related bush burning, which affects biodiversity of plants and animals. In other words, the community’s physical environment has highly degraded; and added to this are poor health and sanitation conditions which are as a result of land, water and air pollution.

Given the situational analysis of the community under study, it is therefore expedient to embark on community environmental management education – believing that it is the lack of community environmental management education that could be responsible for the people’s environmental scandals. The primary motive for this is however provoked by the impression created by Agrawal and Gibson (2008) who opine that it would be too simplistic

and idealised to assume that local people (like this community) would possess the knowledge about the environment in which they “live and have their beings” and hence be able to sustainably manage it without directly approaching them for community environmental management education.

Similarly, achieving sustainable environmental management in a community like Ago-Are may require the mainstreaming the issue of gender into the CEME that could be embarked upon in such a rural community. This is with the view to making every member of the community have equal access to knowledge related to sustainable environmental management and thereby developing desirable attitude towards it. ECOSOC (1997) cited in Graham (2001) describes gender mainstreaming as the ‘process of assessing the implications for women and men of any planned action...for making women’s as well as men’s concerns and experiences an integral dimension of the design and implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres so that

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women can benefit equally, and inequality is not perpetuated’. Thus bringing gender to bear in a CEME programme could reduce or eliminate gender inequality. This agrees with the opinion of Graham (ibid) which says that involving women’s active participation in a community programme makes it full and inclusive and hence improves the efficacy of prevention, relief, reconstruction and transformation efforts.

Gender mainstreaming in CEME may also be an approach to filling some research gaps on how men and women contribute to environmental degradation and how they are jointly and privately affected by environmental disasters. Fordham (2011) buttresses this by asserting that making a connection between environmental management and natural disaster mitigation from the gender perspective puts sustainable management and development in a clear view and thus requires urgent action. According Fordham, there is a lack of studies on the gender implications of CEME and thus mainstreaming gender into it points to a real research need. This is apparent because there is a lack of disaggregated statistics or general reporting by sex which is making secondary retrospective gender analyses vis-à-vis sustainable development very difficult to embark upon. The implication of this is also that it is difficult to empower women and enhance their capacity to play an active role in their communities, in policy-making and in achieving sustainable development, because there is no sufficient information about their current status in terms of knowledge and attitude to sustainable environment.

Thus, activities towards addressing the issue of CEME-induced knowledge acquisition and attitude development, and testing the moderating effect of gender on knowledge and attitude of people of the rural community has provoked the need for this study.

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1.2. Objectives of the Study

The specific objectives of the study are to

- a. determine the effects of community environmental management education on AgoAre residents’ knowledge of sustainable environmental management;
- b. assess the effects of community environmental management education on Ago-Are residents’ attitude to sustainable environmental management; and
- c. examine the moderating effects of gender on knowledge and attitudinal dispositions of Ago-Are residents in different areas of environmental management.

1.3. Research Questions

The following research questions are answered in the study:

1. Will there be significant main effect of community environmental management education on Ago-Are residents'
 - a. knowledge of sustainable environmental management; and
 - b. attitude to sustainable environmental management?
2. Will there be significant moderating effect of gender on Ago-Are residents'
 - a. knowledge of the different areas of sustainable environmental management; and
 - b. attitude to the different areas of sustainable environmental management?

1.4. Justification for the Study

The study is necessary not only because the residents of Ago-Are need environmental management education; but because there is the need to suggest useful approaches to educating the rural communities on how to sustainably manage their physical environment.

Such approaches are to bear in mind the subject-matter of community environmental management education and the approaches to disseminating its learning content. The suggestion of a prototype and the relevant learning content which prospective community environmental educators could need for their works is therefore necessary. The promotion of

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gender mainstreaming into issues associated with sustainable development also forms parts of the reason why this study is necessary.

1.5. Operational Definition of Terms

The following terms are operationally used in the study

Effects: The impact that education creates on its recipient.

Community: A social group (of people) occupying a defined geographical area.

Environmental: Anything that has to do, or has relationship with the environment.

Management: Sustainable utilization of resources.

Education: A process of imparting knowledge.

Community Environmental Management Education: Education provided to people living in a definite geographic environment on how to manage the environment in a sustainable manner.

Prototype: A guideline on how to embark on an activity or how to go about doing an event (environmental management education in this context).

Community Environmental Management Education Prototype: A guideline on how to embark on an environmental management education exercise.

Knowledge: The ability to remember previously learned materials (facts, laws, theories and principles). It does not demand any critical thinking from the learners.

Attitude: Learned emotionally-toned predispositions (favourable or unfavourable) (towards sustainable environmental management, in this context)

Sustainable Environmental Management: Effective utilization of resources that bears in mind what would be left for the future generation to survive.

Biodiversity: The degree of variation of life forms within a given ecosystem, biome, or an entire planet.

Deforestation: Removal of the vegetation that covers the soil.

Desertification: The breaking down of land by erosion as a consequence of overgrazing of livestock, overcultivating crops, deforestation, the increasing amount of fires per year, overusing groundwater, increasing amount of salt in the soil and climate change.

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Conservation: Preservation or restoration of life forms from loss, damage, or neglect (of forest and animal in this context).

Pollution: Any process or activity which leads to undesirable change in the physical, chemical, and biological characteristics of the air, water and land and that may or will harmfully affect human life or that of other species, industrial processes, living conditions and cultural assets.

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CHAPTER TWO REVIEW OF LITERATURE

2.1. Introduction

This study presupposes that rural communities contribute highly to the problems of desertification, deforestation, loss of biodiversity and pollution of various sorts, because they seem not to have the requisite knowledge and attitude towards sustainable environmental management. It thus calls for a “community environmental management education” believed to be useful in assisting the rural people to acquire the required knowledge and develop the right type of attitude towards sustainable environmental management. In order to support this believe, there is a need to review existing literature on issues associated with the theme of the study, with a view to justifying why environmental management education is necessary in the community of people. Specifically, issues on the following are reviewed in sequence:

- ☐ The community (meaning, types (rural and urban) and characteristics)
- ☐ Environmental problems that communities create that suggest the need for community sustainable environmental management education
 - ☐ Sustainable environmental management in the community
- ☐ Development-oriented activities that must bear on the capacity of the environment
- ☐ Approaches to sustainable management of the environment in the rural community
 - ☐ Community’s sustainable environmental management education
- ☐ Prototype for community environmental management education (CEME) among rural communities

2.2. The Community (meaning, types (rural and urban) and characteristics)

The word, “community” has many definitions and interpretations. But usually such definitions and interpretations centre on people, place and things. This idea agrees with the definitions of the Universal English Dictionary which describes the community as 'a society

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or body of persons living in the same place, having the same rights, privileges, and interests, and acknowledging the same laws.' The idea of “same rights, privileges, and interests, and acknowledging the same laws” also agrees with the Oxford English Dictionary (2012: online) which sees community as 'common character or commonness.'

The word “community”, is however reported to have come into an international usage in the early 20th century. Smith (2001) mentioned that “before 1910 there was little social science literature concerning 'community' and it was really only in 1915 that the first clear sociological definition emerged.” According to Smith, the process of delineating the rural area in terms of the trade and services, by Harper and Dunham (1959) provoked a number of competing definitions of community, some of which “focused on community as a geographical area; some on a group of people living in a particular place; and others which looked to community as an area of common life”. In the opinion of Moje (2000), overlap, convergence and conflict expose the complex nature of communities and that is why different

social groupings give it very different meanings such as , neighbourhood, culture etc. According to Moje, a community is expected to be stable, homogeneous, and contains relatively fixed groupings of people.

Connell (2003) also buttresses the above, by explaining that the community is a part of human nature that is deep longing and having the compelling urge for sociality, because it is the “most fundamental and far-reaching” social variable that provides the most direct and tangible experience of association. The idea of ‘association’ by Connell agrees with that of Bernard (1973) who regards the community as an arena where people live next door to others and eat, sleep, love, hate, avoid, or seek one another in a given locale. By the token they use a common grocery store or supermarket. They attend the same movie houses and patronise the same beauty parlours or barber shops. They also depend on the same services such as garbage collection, street cleaning, and police protection. The explanations of Bernard here agrees

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with that of Kendall (2010) which regards a community as a set of social relationships operating within the given spatial boundaries or locations that provides people with a sense of identity and a feeling of belongingness. Suffice to say (in the researcher’s opinion) that the community is made up of people operating in the context of associated web of interactions, which may be simple or complex, and upon which such community may be classified as rural or urban, depending on the parameters used. This impression about rural and urban communities (areas) thus calls for clarification – with a view to suggesting why they should be provided with community environmental management education.

However, as many definitions of rural area abound, there are no consensus as to which one should be adopted universally – because some people see it from a subjective state of mind and some others use objective quantitative measures (Reynnells, 2008). This (in researcher’s opinion) may explain why the opposite is always the case for the urban area when the rural is being described. The Danish Development Assistance – Danida (2008) seems to have a related opinion when it remarked that the criteria used in distinguishing between the rural and urban areas include population size and density, and availability of services such as secondary schools, hospitals and banks. Population thresholds are also used to differentiate between rural and urban communities. Okali *et al.* (2001) buttress this by explaining that a community within the threshold of 20,000 people could be regarded as an urban settlement – although there is no hard and fast rule about it. According to Okali and colleagues, this may be because each local government headquarter (created more often by political interest), regardless of population, automatically becomes an urban area by administrative fiat.

The Indian National Institute of Open Schooling (NIOS) (ND) however attempted a differentiation between the rural and urban society. It explained about eleven distinguishing characteristics of the rural society, mentioning well-demarcated geographic territory; living in

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forests and hilly areas; isolated or semi-isolated social grouping; economically subsistent; concerned about the needs of the day; managing own law and order through family and kinship ties; simplistic life styles; unique in religious belief and worship; and strong sense of belongingness as the sons/daughters of the soil (The idea of economic subsistence mentioned here may apply more to the community under study and set the baseline for understanding why residents’ actions and inactions are capable of impacting negatively on the environment). In a contrary view, the characteristics of urban society identified by NIOS are, high population density; heterogeneous culture; environment is man-made; non-agricultural

economy; class structure that allows for social mobility; formal social control; impersonal interactions; non-kinship relationships and formal interactions in recreation/leisure; market and monetary economy; availability of civic facilities; and anonymity of social life (All the attributes, whether analysed separately or put together, create significant impacts on the environment – although this study focuses more on the rural area).

By and large, while all the parameters of classification provided by NIOS above may seem applicable to all nations, the idea that no single classification can be used for all geographies is consistent and transparent enough to distinguish between the rural and urban areas (Pateman, 2011). Nonetheless, certain facts are evident. The facts are that there could be rural areas in the urban; all urban areas were once rural; and an urban area is an agglomeration of areas that were once rural (Hall *et al.*, 2006). There is also a mutual remittance between the rural and the urban communities. According to Okali *et al.* (ibid.), remittance is not always for personal reasons. It is “in kind”; an obligation; based on sense of responsibility; and a form of community investment. In that context, the rural community remits the required labour force (skilled or unskilled) to the urban areas through rural-urban migration, just as the urban remits gifts, money and even capital projects into the rural for community development.

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However, while the relationship between the rural and the urban communities is gregarious, they however create significant impacts on the physical environment – usually negative. Such impacts are thus posing challenges of community environmental management education.

2.3. Environmental Problems that Communities Create that Suggest the Need for Sustainable Environmental Management Education

The human community, whether rural or urban, depends on the natural environment for sustenance. They do this by encroaching on the natural environment, usually the forest and vegetation and the deposit of mineral resources. In the process, they clear the forest – cut grasses and fell trees, first for food production and to meeting other needs such as housing, furniture and the likes. They also do landscaping and excavate mineral resources that are converted to finished products, which in turn serve as materials for whatever development projects that are embarked upon. They have also burnt so much fuel that there is about 30% more carbon dioxide in the air today than there was about 150 years ago. To a greater extent there is now more carbon dioxide in the atmosphere than there has been in the last 420,000 years – hence the Earth is now becoming a warmer place (The USA National Center for Atmospheric Research, 2012). A brief look at environmental problems that the communities create may likely provide the justification for the need to provide community environmental management education for the residents of rural communities. The major environmental problems created by the communities are deforestation, loss of biodiversity and pollution.

Each of the trio is discussed in detail below.

2.3.1. Deforestation

Given the fact that the human community is alleged to be the brain behind all environmental problems, it may not be farfetched to deduce that communities which are now

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regarded as towns and cities were once hamlets and villages. For instance, Ibadan, created in 1829, which is now a megacity, was once a forest site with several ranges of hills, varying in elevation from 160 to 275 metres (Fourchard, 2012). Fourchard refers to the work of Areola(1994) and Onibokun(1995), and reports that Ibadan was estimated in 1952 to have a

total area of approximately 103.8 km² with only 36.2 km² built up areas; while the remaining 67 km² were devoted to non-urban uses, such as farmlands, river floodplains, forest reserves and water bodies. Fourchard reports further that it is rather unfortunate that these 'non-urban land uses' disappeared in the 1960 by giving way to urbanisation that has manifested in the appearance of physical infrastructures and other characteristics of a city. This was regarded as the resultant effects of the urban landscape spreads ((100 km² in 1960) (136 km² in 1981), (210-240 km² in 1988-89) and 400 km² in the year 2000). Perhaps it should be mentioned here that it is the same way that Ibadan as a city has evolved that some major towns and cities have developed – through encroachment on farmlands, river floodplains, forest reserves and water bodies, and their consequent disappearance.

The explanations provided above suggest that deforestation is a consequence of community (rural or urban) development; and scholars seem to agree on its assertion. For example, deforestation is defined as the temporary or permanent removal of large expanses of forest for agriculture or other uses (Miller and Spoolman, 2008). In the opinion of Abegunde *et al.* (2001), deforestation is the “process of clearing the forest for a variety of purposes, like lumbering, farming, mining, industrial, residential and grazing, without any immediate replanting of trees, shrubs and grasses”. In their own explanation, Areola *et al.* (2009) regard deforestation as the clearing of natural forests for lumbering or farming, without immediate replanting of new trees and thereby exposing the bare soil to rain and wind erosion. It is noteworthy here that all opinions about deforestation revolve around human activities, and their impacts. Such activities include agriculture, grazing, building of housing and residential

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estates, building of factories and industries, roads, and bridges, airport and railways, and domestic activities such as the felling of trees for fuel-wood, to mention but few.

The Encyclopedia Britannica (Student and Home Edition) - EBSHE (2010) presented same idea. It said that the human activities that contribute to tropical deforestation include commercial logging and land clearing for cattle ranches and plantations of rubber trees, oil palms, and other economically valuable trees. According to the Encyclopaedia, the practice of slash-and-burn agriculture, or swidden agriculture by small-scale farmers in the form of clearing the forests, burning them and then growing crops in the soils and fertilizing them with the ashes deforest an area – by declining soil fertility and increasing weeds, the consequence of which leaves the area fallow and thus turning the area to a secondary forest of bush.

Miller and Spoolman (2008) explained a similar view that the original forest cover of the earth has been reduced by about 46% since 1950 and the rate of deforestation which is now at an exponential rate could in the next two decades reduce the forest resources to less than 40%. This also suggests that by consequence the amount of carbon that would be released into the atmosphere would become unbearable and the forest would not be able to support the ever increasing human population. In other word, the carrying capacity of the earth to support human life would have disproportionately reduced. In addition, all other living and non-living organisms that depend on the forest for survival would have almost gone into extinction or absolutely threatened to the point of non-replenishment. Suffice to say that there would be a high loss of biodiversity.

In the same vein, desertification is an end consequence of deforestation. It is an impact of deforestation because it is a consequence of removal of plant covers, species diversity, and primary productivity of arid or semi-arid ecosystems and which are drastically reduced (Nigeria Environmental Study/Action Team – NEST, 1991). According to NEST, the

top soil base is exposed as a result of vegetation removal, subjecting it to wind and water erosion and leaving pebbles and stones which are not capable of sustaining plants lives behind. A further consequence is the blocking of soil surfaces due to large desert rain drop which scatters sand particles and hence reduces water percolation, which often ends up in producing gullies by water erosion (Ukpong, 1995).

Further, the United Nations' Convention defined desertification as a process of "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" (United Nations Department of Public Information, 1997). According to the convention, it involves the loss of biological or economic productivity and complexity in croplands, pastures, and woodlands which are consequences of climate variability and unsustainable human activities resulting from unsustainable land use such as overcultivation, overgrazing, deforestation, and poor irrigation practices. The Friends of the Earth international - FoEI (2012) also sees desertification as the degradation of productive drylands (rangeland or cropland) into less productive desert. The EBSHE (ibid) explained that desertification is a consequence of climate change and the influence of human activities. While the Climatic factors include periods of temporary but severe drought as well as long-term climatic changes toward aridity, human activities involve vegetation removal (which can lead to unnaturally high erosion), excessive cultivation, and the exhaustion of surface-water or groundwater supplies for irrigation, industry, or domestic use. The characteristics of deserted areas are that there is a "declining groundwater table, salinization of topsoil and water, diminution of surface water, increasing erosion, and the disappearance of native vegetation" (EBSHE, 2010).

The impact that desertification thus creates, according to the International fund for agricultural development - IFAD (2001) are enormous. According to IFAD, desertification threatens productive land, drinking water supply and livelihood. This is because about, 6

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million hectares of productive land are lost every year due to land degradation; about 12 million human death due to water shortages or drinking of contaminated water; and about 135 million people rendered homeless as a result of deforestation-induced flood; and on the whole it does not only generate income losses totalling almost USD 42 billion, but also responsible for rural poverty, thereby making for further desertification.

From the IFAD opinion here, it is very obvious that desertification is posing a very big challenge and it is inviting the attention of the whole world to the need to quickly address it; especially given the fact that it is also humanly-induced. There is therefore the need for community environmental management education to address those issues that could contribute to the overall problem of desertification especially from the community people – with a view to imparting knowledge and changing attitudes into environmentally sustainable one (Further details associated with deforestation are discussed under conservation as a component of community environmental management 2.5 below).

2.3.2. Loss of Biodiversity

Just as desertification is an end problem of deforestation, so also is loss of biodiversity. This in effect manifests in the combing of the forest and indeed, the vegetation cover of a place, usually to execute development projects. This thus suggests that loss of biodiversity is an end-consequence of the development process. This (researcher's) idea agrees with that of Okorududu-Fubara (1998) who explains that biodiversity resources are regarded as an economic asset, as they provide genetic materials for pharmaceutical

development, diseases or pest resistance crops, as well as other economic activities. Okorududu-Fubara thus explained that “biodiversity relates to the diversity of ecosystems, species, and genetic traits within species which exist in a particular area: wetland, rainforest, savannah, grassland, plant and animal diversity, and various primate sub-species, for

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example, all characterise biodiversity”. Abah (2011) also refers to the Nigerian Federal Environmental Protection Agency –FEPA (2003) which opines that living organisms vary from all sources - terrestrial, marine and other aquatic ecosystems; and their diversity vary in complexity, as they provide the building blocks for human existence and the human ability to adapt to environmental changes in the future. While Bamgboye and Salami (2011) accept that defining biodiversity may be difficult, they explained that biodiversity encapsulates the variety of life – different plants, animal and micro-organisms, their genes and the ecosystem of which they form a part.

Given the uniformity in the opinions provided above, it is evident that biodiversity does not only provide the human daily needs, but they are also life supporters for human beings and other living and non-living things. Miller and Spoolman (2008) lend a voice to this idea. According to them, biological diversity has two types of value – intrinsic value and instrumental value. By intrinsic value, they explain that the mere fact that the genes, species, and ecosystems exist regardless of their human use is highly appreciated. The instrumental value suggests that as human beings derive economic benefits in terms of availability for crop production, ranging, fishery, medicines, recreation and tourism they appreciate the economic and ecological services. There are also non-use values which Miller and Spoolman (ibid.) regard as ‘existence value’ (appreciating that a species exists), ‘aesthetic value’ (accepting the beauty of a species), and the bequest value, which is based on the willingness of some people to pay to protect some forms of natural capital for use by future generation.

Thus, as earlier said, efforts directed at physical and human developments are responsible for loss of biodiversity, as several development projects are executed.

Development projects, according to the Norwegian Refugee Council - NRC (ND), are projects that provide convenience for and meet the needs of the people. The NRC’s idea agrees with the opinions expressed by Couldrey and Morris (2002), which explain that

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development projects and policies can be justified on the basis of reducing poverty and inequality, and also promotes egalitarianism, especially because it primarily benefits the poor. Examples of such projects are water supply (construction of dams, reservoirs and irrigation); urban infrastructure; transportation (roads, highway and canals); energy supply (mining, power plants, oil exploration and extraction and pipelines); agriculture expansion; parks and forest reserves; and population redistribution schemes (Robinson, 2003). They are also reported to, in their usual characteristics involve alteration of the environment in terms of forests clearing, digging, excavation, blasting, dredging, drilling, haulage and incessant transportation (to mention but few) are responsible for loss of biodiversity, inclusive of human beings who are often displaced and also victims of environmental degradation. According to Robinson (ibid), development activities account for the displacement of well over thirty-five million people; and if this happens to human beings (in researcher’s opinion) the plants, animals, flora and fauna that cannot even help themselves would suffer more.

Moreover, while the physical environment may look glossy and beautiful, it should not be forgotten that the improved outlook of town and cities are to the detriment of the environment from which resources were sourced for the erection of structures that have been

put in place. It should also be noted that the location of such development projects was once a forest and a habitat of some living beings, birds, reptiles, rats and insects (to mention but few), which have either been killed or displaced. Suffice to say then that development projects have taken over the habitats of such living creatures; and the roles that each of them play in ecological balance thus disappear, rendering the environment an artificial one with its attendant environmental vices. The researcher's inference here agrees with that of Hattam (2009) which states that it is important to value biodiversity and natural resources and that refusal to do this may have high financial implications. Hattam thus remarks that

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development projects (giving example of a road project) may be expected to produce economic and social benefits, but may also damage local habitats and harm biodiversity.

The opinion of an organisation called the New Age Publishers (2012) may be useful in summarising about the major factors responsible for loss or reduction in biodiversity. The factors identified are:

- Overexploitation of natural resources and destruction of ecosystems for meeting the human requirements of food, shelter and comfort.
- Environmental pollutants like pesticides, heavy metals, chlorinated hydrocarbons, acid rain, global warming etc.
- Eutrophication leading to promotion of growth of some specific species suppressing others.
- Natural causes like earthquakes, floods, droughts, forest fires and epidemics.
- Excessive importance of specific species for cultivation (15 types of species provides 90% of the world's food supply).
- Hunting for pleasure and poaching for commercial purposes of certain animal species like elephants, rhinos, whales, crocodile, snakes etc.

In a nutshell, loss of biodiversity could therefore be regarded as an environmental problem emanating from human struggle for survival, which could be regarded as parasitic on other components of the physical environment (Further details associated with biodiversity are discussed as a component of community environmental management below); and as if getting means of survival is not enough, development activities end up polluting the environment. These are discussed below.

2.3.3 Pollution

Pollution is an environmental problem caused by human activities, and which also provokes the need for environmental management education in the human community. The Friends of Earth – FoE (2007) also adds to this discussion by describing pollution as a

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““noun” derived from the “verb”, “pollute”, meaning: to foul”. According to FoE, pollution is the release of harmful environmental contaminants into the environment; and that no matter how minute such release may be, it should be regarded as pollution as long as it precipitates negative effects afterwards. Okorududu-Fubara (1998) in reference to the Nigerian Federal Environmental Protection Agency (FEPA) Decree of 1988 reports that pollution is the “manmade or man-aided alteration of chemical, physical or biological quality of the environment

to the extent that is detrimental to that environment or beyond acceptable limits”; and also a “presence of matter or energy whose nature, location or quality produces undesirable effects”.

In a related perspective, Pollution is seen as “the addition of any substance or form of

energy (e.g., heat, sound, and radioactivity) to the environment at a rate faster than the environment can accommodate it by dispersion, breakdown, recycling, or storage in some harmless form” (Kemp, 1998). This agrees with the opinion of Gray (2011) that environmental pollution takes place when the environment cannot process and neutralize harmful by-products of human activities within a short time without any structural or functional damage to the environment. The Encyclopaedia Britannica (2011) however sees pollution as a special case of habitat destruction, which may not be limited to the more obvious physical destruction but could as well be a chemical destruction of habitats—land, sea, and fresh water—and in the atmosphere. The idea here agrees with the idea discussed earlier that loss of biodiversity and indeed loss of habitat could result from development-induced displacement, depending on the source of pollution. This idea thus suggests that pollution has sources.

Fears (2009) explained that “pollution occurs in many forms ranging from chemicals in the form of gases or liquids, noise, energy sources such as light or heat, or even solids such as the types of waste that end up in landfills”. According to Fears, when natural substances that can occur on their own are added to the environment in a quantity that makes them

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unsafe, they can create catastrophic effects on the environment and all forms of life including humans. Among such substances identified by Fears are carbon dioxide and mercury.

The opinion expressed by Fears above suggests that pollution has sources; and the Friends of Earth – FoE (2007) has provided a comprehensive list of such sources. According to the FoE, chemical plants, oil refineries, nuclear waste dumps, regular garbage dumps, incinerators, PVC factories, car factories, plastics factories, and corporate animal farms that create huge amounts of animal wastes and which produce serious contaminants such as chlorinated hydrocarbons (CFH), heavy metals like lead such as in lead paint and gasoline, cadmium (as in rechargeable batteries), chromium, zinc, arsenic and benzene, to mention but few, constitute sources of pollution.

Other authorities (Okorududu-Fubara, 1998; Pierce, Wiener and Vesilind, 1998; Miller and Spoolman, 2008) have a similar perspective of pollution and hence explained that pollution has sources which could be categorized into two i.e. “point source” and “non-point sources” – although this categorization is emphasized in water pollution than to other types of pollution. According to them, the point source of pollution are sources that generate pollutants which contaminate the environment directly from their identifiable origins; and their examples are smoke stack of a coal-burning power or industrial plants, the drain-pipe of a factory and the exhaust pipe of an automobile. The non-point sources however come from dispersed overland flow associated with rain events; and examples are run-offs chemicals and gases from streets, asbestos and waste liquid from construction sites, pesticides, herbicides and animal wastes from agricultural fields, oil spills, paints, and other wastes from mechanic villages and parking lots.

All these pollutants however have characteristics which emphasize that pollutants present serious long-term global problems that affect more or less every country and, therefore, can only be solved by a coordinated set of actions and unwavering commitment of

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nations to international environmental agreements and community environmental management education. According to Santos (2012) pollutants are trans-boundary (recognising no geographic boundary); and are observed to be staying longer in the ecosystem due to their non-biodegradable nature and the ability to destroy the biota and habitat. This

thus also buttresses the fact that pollution has detrimental effects on wildlife, human habitation, and the quality of life in the affected area (Mayntz, 2011).

Given the understanding of pollutants and their impacts on living and non-living things, the chief types of environmental pollution are air pollution, water pollution, soil pollution, pollution caused by solid waste and hazardous waste, and noise pollution (Chertow, 2005). Their enormous impacts are thus provoking the necessity of understanding some of them; and they could only be understood when there is a deliberate community's sustainable environmental management education.

2.4. Sustainable Environmental Management in the Community

The word “sustainable”, has been in existence for about three decades. It has its root as a prefix to the word “sustainable development” coined by the Brundtland Commission (Brundtland, 1987), which defines “Sustainable Development” as “development that meets the needs of the present, without compromising the ability of future generations to meet their own needs”. This idea is translated by the “Biothinking International” (reported in Chambers *et al.*, 2000.) as the six “Ss” of sustainability itemised as

- (S)caling the economy within the capacity of the biosphere
 - Using the (S)olar power to propel human processes
 - Re(S) cycling wastes and reducing pollution
 - (S)haring resources equitably – do not hoard
- Providing environment that is (S)afe for all living organisms
 - Having (safe) (S) ex (to keep living on).

If these six “Ss” are thus put in practice, achieving sustainable environmental management is near evident. This opinion seems to agree with what the Complete A-Z Geography Handbook 26

(online: no author is identified) explains about environmental management. According to the handbook, the objective of environmental management is improved human quality of life, which involves mobilization of resources and the administration of natural and economic goods and services. These are said to be based on the principles of ecology with the aid of system analysis and conflict resolution in the distribution of cost and benefits of development activities in such a way that such development efforts would not negatively affect the population by way of natural hazards.

The idea expressed here on the principles of ecology also agrees with that of UNEP(2011) which states that among several attributes, the ecosystems provide valuable adaptation mechanisms which manifest in the protection against flood risks; clean water and vegetation cover which enhances carbon sequestration; replenishment of soil nutrients in agricultural systems by deep-rooted, nitrogen-fixing plants; and grassland provision of forage for livestock and carbon sequestration in above-and-below ground biomass. Morelli (2011) provides a similar opinion that “the human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services” such as provisioning service, regulating service and supporting service. Provision services as explained by Morelli focus on the use of the products obtained from ecosystems to provide food, fiber, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources, fresh water, and all forms of energy resources. Regulating services are also explained to be focused on regulation of air quality, purification of water, treatment of wastes, pest regulation, disease regulation, climate regulation, water regulation, erosion regulation, pollination, and natural hazard regulation. The supporting services however focus

on formation of soil, photosynthesis, primary production, nutrient cycling and dispersal.

Hufschmidt *et al.* (1983) also provides an opinion which agrees with that of Morelli and UNEP's opinion on the services which ecosystem provides by regarding ambient

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environmental quality as referring to that which focuses on the state of air, water, land and human artifacts. According to Hufschmidt and colleagues ecosystem pays attention on relative capacity of an environment to satisfy the needs of an individual or society in terms of providing woody fiber for lumber, pulpwood or posts; plants for medicine and edible fruits and chemical substances; and other benefits such as flow of energy and materials, nutrient storage, distribution and cycling, provision of wildlife habitat, germplasm storage and evolution, biomass production; and flood control. Thus, without a gainsaying, if the ecosystem (environment) plays important roles discussed above, then there is the need to rationally manage it, if it has to meet the needs of the present generation and leave means of survival for the future generations.

The UNEP (2011) however describes an ecosystem management as “an integrated process to conserve and improve ecosystem health that sustains ecosystem services for human well-being”. According to UNEP, it is important for people to consider the long term benefits that could be derived from the ecosystem: because without full valuation of the benefits from ecosystems, their exploitation will remain unsustainable and degradation will remain inevitable and may lead to the collapse of important ecosystem function and services.

In the researcher's opinion, there is the need to sustainably manage the use of natural resources by way of thinking of what would be available for the future generation, each time resources for development purposes are harnessed; and that appears a summary of UNEP's opinion.

By and large, if the line of thinking on the benefits derivable from the components of the physical environment is followed, the challenges of effective management of water, land and air resources may be perceived as the subject of discourse on sustainable environmental management in the community of people. But Rogers *et al.* (2008) present a different perspective which may deserve to be examined if the understanding of environmental

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management is to be enhanced. According to Rogers and his colleagues, environmental management is not about management of the environment (i.e. its components). But it is about the management of developmental activities within the limits of the environment. Thus development according to the trio must be sustainable; and to so do, social and economic policies must go hand-in-hand with the policy on environment and institutional safeguards that focus on *water, energy* and *forestry*. Given this provocation, the question that comes to mind is what are developmental activities that must work within the limits of the environment? Put in another form, how must development activities bear on the capacity of the environment?

2.5. Development-oriented Activities that Must Bear on the Capacity of the Environment

“Development is a process of progressive and qualitative movement from inability to ability, (and) from incapacity to capacity” (Kauzya, 2012). This may explain why every nation strives for development. Unfortunately, most development efforts result into mass production of goods and services which ultimately infringe on the quality of the physical environment if development is determined by the Gross Domestic Product (GDP). GDP is the value of a country's overall output of goods and services (typically during one fiscal year) at

market prices, excluding net income from abroad (businessdictionary.com). Perhaps, this also justifies why premising development on GDP indicators is often criticized as not taking sufficient cognizance of well-being or quality of life factors of the citizens such as standard of living, life expectancy etc. The opinion of Mohammadi (2010) agrees with the foregoing assertions. According to him, development seeks first and foremost to tackle human destitution, poverty, and lack of basic welfare (food, shelter, basic primary health care, literacy and reproductive behaviour), and consequently raising living standards.

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However, using the GDP as a realistic guide to a nation's well-being has been greeted with criticisms. According to the Business Dictionary (Online), development guided by the GDP is preoccupied with indiscriminate production and consumption, and also includes the cost of damage caused by pollution as a positive factor in its calculations, while excluding the lost value of depleted natural resources and unpaid costs of environmental harm. The submission of this dictionary suggests that development-oriented activities infringe on the environment and hence approaches toward reducing environmental harms must be explored if development has to be sustainable.

Manahan (1994) provides a long list of categories of industries which the researcher wishes to regard as instruments or habitats of development-oriented activities and which are responsible for small and mass production of goods and services: the outputs of which are used as indexes of GDP and that of the Human Development Index (HDI). The researcher has culled out this list as a table with the view to raising some fundamental questions related to sustainable development activities; and taking a look at the activities listed in Table 2.1, a general question may be, "which of these industries does not use energy, water or resources from the forest?" It is apparent what the answer would be – none.

Thus, if the perspective of Rogers *et al.* (ibid) discussed above is anything to go by, each of the industries has a challenge of environmental management to address. The specific questions may however be, how much of energy, water or resources from the forest could each of these industries use? And would they not harm the environment in the process? What would they do to reduce the harm that they make on the environment? It is thus believed that when appropriate answers are provided to these questions, there could be clues on how to leave opportunities of survival for the in-coming generations in terms of efforts directed at developments (i.e. sustainable development). There is thus the need to take a look at some of

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these questions with the view to justifying the need for community environmental management education.

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Table 2. 1. Classification of Industries (Development-Oriented Activities)

Category	Activities
Food production	Agriculture and fishing.
Extractive mineral industries	Involvement with the mining of minerals, such as those used as sources of metals (energy sources are addressed in separate categories here).
Renewable resource industry	Forestry and production of non-food crops, such as cotton.
Renewable energy industry	A small but of necessity, growing industry dealing with the utilization of renewable energy resources,

	such as solar energy, wind power, and biomass energy.
Extractive energy industry	It consists of coal mining, uranium ore mining, petroleum, and natural gas.
Manufacturing	Conversion of raw materials or articles to higher value goods.
Construction	Building and erection of dwellings, buildings, railroads, highways, and other components of the societal infrastructure.
Utilities	Electricity distribution systems and natural gas
Communication	Telecommunications, media communications
Transportation	Rail, highway, air, barge, and ship.
Wholesale and retail trade	Provision of interface between the production of goods and their sale for consumption and use.
Finance	Banks and other entities that provide the financial resources and transactions required for industries and trade.
Services	Law, medicine, motels, recreation and many others.
Government	National, regional (state, provincial), city and local entities that provide needed services and regulation, such as environmental regulation.
Education	Schools from pre-school through graduate and professional schools providing the intellectual and human resources needed for a smooth running modern society.

Source: Manahan, S.E. (1994). Environmental Chemistry, USA: Lewis Publishers. P. 490.
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2.5.1. The Quantity of Energy, Water and Forest Resources that Development-oriented Industries Consume

Taking a critical look at the industries listed in Table 2.2 above, development-oriented activities may be regarded as those performed by four main industries. In other words, all the industries could be categorized primarily into four sectors, namely, “agriculture”, “trade and commerce”, “social services and manufacturing”. Thus, food production and renewable resources could fall within agriculture; services take hold of service-providing industries, government, education and transportation; manufacturing could take hold of, renewable energy, extractive and construction industries; while, trade and commercial industries take hold of utilities, communication, wholesale and retail and finance industries. Utilities, communication, transportation, and construction may however have some overlapping impacts across each of these four categories. Given these categorisation, the specific question that will require specific answers is how much of energy, water and forest resources could each of agricultural, service-oriented, manufacturing and trade and commercial industries consume in order to effectively be on course? And by way of response, holistic answers are to be provided to each of them. However, since the focus of this study is on a rural community which is primarily agrarian, only the agricultural industries are examined below.

2.5.2. The Agricultural Industries and Their Consumption of Energy, Water and

Forest

Resources

Agriculture is the cultivation of crops and or rearing of animals for consumption and for sale. It is the widespread and permanent form of human activity which is basic than any other industry. It provides means of livelihood for about three-quarters of the human race i.e. those practicing agriculture. Apart from provision of food for its practitioners, output surpluses are sold out as food (cereals and beverages etc) and as fibers for revenue purposes. A large scale farming otherwise called commercial farming or agribusiness also provides

opportunities for exportation (Areola *et al.*, 2009). In a joint perspective, the United Nations Environmental Programme – UNEP and Convention on Biological Diversity - CBD (2001), agriculture is a major provider of share of national income and export earnings in many developing countries because it ensures food security, income and employment to a large proportion of the population. The primary activities in the agricultural industries, whether planting and care for crops, harvesting and storage and raising and care of livestock could however not be successful in the absence of sufficient forest, water and energy resources.

2.5.3 (a). Forest Resources Consumed by Agriculture

A forest is best defined as an ecosystem or assemblage of ecosystems dominated by trees and other woody vegetation. Its living parts include trees, shrubs, vines, grasses and other herbaceous (non-woody) plants, mosses, algae, fungi, insects, mammals, birds, reptiles, amphibians, and microorganisms living on the plants and animals and in the soil. The parts are noted for their gregarious interactions. They are also noted for their interactions with other non-living part of the environment - including the soil, water, and minerals, to make up what is known as a forest (Illinois State Museum, 2000). By and large, agriculture is the highest beneficiary of the gregarious interactions of these biotic and a-biotic forest resources. This is because agriculture can only thrive when the biodiversity is intact or of highest degree. The Convention on Biological Diversity – CBD (2012) identifies the constituent of a functional agricultural biodiversity as “producers”, “support services” and “pest, pathogens and predators”. The CBD explains that producers are the domestic, cultivated, farmed and semi-wild species (mainly flowering plants, fishes, birds and mammals) whose production provides human food, together with the varieties and wild relatives that expand the genetic resource base for future breeding improvements. The support services are the wild and semimanaged species (mainly micro-organisms and invertebrates) that provide services

supporting agricultural production, notably the soil biota, pollinators and the predators that affect pest species. The pests, pathogens and predators are also the wild species (mainly micro-organisms and invertebrates) that decrease agricultural production by causing disease or damage to producers. However, the inevitable relationship that each of these constituents has with the soil as a component part of the forest, especially with good soil being the primary prerequisite to a successful agriculture would direct more attention on the soil as a “synonym” for “land” in the context of this study. This idea is informed by the fact that land is the habitat for the soil and the associated biological diversity; and that land use is more pronounced in agriculture than any other industry that focuses on development. The opinion of FAO (1997) and FAO/UNEP (1999) as reported in the Wikipedia Free Dictionary (2012) defines land use as the human use of land, which “involves the management and modification of natural environment or wilderness into built environment such as fields, pastures, and settlements”; and not only that, it is “the arrangements, activities

and inputs people undertake in a certain land cover type to produce, change or maintain it". In other words, agriculture depends on forested land than any other industry. The Encyclopedia Britannica (1970) (referred to by the Intergovernmental Panel on Climate Change- IPCC, 2011) describes a forested land as all lands whether exploited or not which bears the vegetative associations dominated by trees of any size and which is capable of producing wood or other forest products. According to the Encyclopedia, a forested land exerts an influence on climate or on water regime and provides shelter for livestock or wildlife. Lands which have been clear-cut or burnt but which will be reforested in the foreseeable future are reported to be included in this category – although they exclude orchards, shelter belts and groups of trees along roads or city parks.

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By and large the Convention on Biological Diversity – CBD (ibid) provides a clue on the proportion of agricultural land in relation to the total world land area. According to CBD, world land, excluding inland waters in 100% is 130.5 million km². Of this, agricultural land represents 49.4 km² (38%); from which each of arable land use (mainly annual crops) 13.8km² (11%), permanent crops (e.g. fruit and nut trees) 1.3km² (1%) and permanent pasture (inclusive of rangeland) 34.3km²(26%) are derived. In other words, about 50% of world's land area is used for agricultural purposes. Thus, if the initial line of thinking that agriculture can thrive on forested land is anything to go by, then 50% of world forest takes charge of agriculture, if CBD's idea is applied here. The FAO Land and Water Division (2010; reported in Wikipedia, 2012) provides varying information from this. It reports that "as of the early 1990s, about 13% of the Earth was considered arable land, with 26% in pasture, 32% forests and woodland, and 1.5% urban areas". This also suggests that agriculture took about 39% of the world land, leaving the remaining 32% for forests and woodland. Gibbs *et al.* (2010) report that the demand for agricultural products is increasing the pressure on land; and that across the tropics, more than 55% of new agricultural land came at the expense of intact forests, and another 28% came from disturbed forests between 1980 and 2000. Gibbs and colleagues concluded that there are serious consequences ahead if agricultural expansion does not go unabated; and given these facts, there is much to be dreaded about the impact that agriculture creates on the forest. A discussion of deforestation and the need for forest conservation would buttress this further (See 2.3 above).

2.5.2. (b). Water Resources Required for a Successful Agriculture
Food and agriculture are the largest consumers of water. This is because they require one hundred times more than the amount of water used for personal needs (Lenntech, 2011). Agriculture represents 70% of freshwater use worldwide (Pimentel *et al.*, 2004). The water

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needs of agriculture however vary. While that of subsistence farming may be minimal, agribusiness needs a very large volume of water which may range from rain water and the "supplementary water" needed for all-year round agriculture, which is derivable from underground sources and other water bodies such as rivers, dams, lakes and creeks and from boreholes. Such water is especially needed for irrigation where rainfall is inconsistent or low and in dry land farms. The researcher's opinion agrees with that of Lenntech (2011) which explains that 70 % of rivers' and groundwater go into irrigation, while the remaining 30% are shared in ratio ten and twenty percent between domestic applications and the industries respectively.

Lenntech (ibid) also provides three explanations on water consumption in food and agriculture. It gives the specific values for the water equivalent of a selection of food

products, the amount of water need of a few products per unit of consumption; and an overview of the amount of virtual water used in the different kinds of agricultural products. Examples of some of them are the dressing of a cattle-head which requires 4000m³ of water; a kilogramme of fresh beef which needs 15m³ for dressing and a kilogramme of fresh poultry which needs 6m³ of water. Other uses of water such as production of a glass of beer, a glass of milk and a glass of apple juice which require 7.5 litres, 200 litres and 190 litres of water respectively.

Thus, in order to meet the water needs in agricultural production, water must be available for agricultural use all year round. Indeed, industrial agriculture is incredibly water intensive, as water is used for crop irrigation (which accounts for 31 percent of all water withdrawals in the US (for example)), and for waste management (i.e., for flushing manure out of industrial livestock facilities) and as drinking water for animals (Network for New Energy Choices, 2012). These explanations therefore suggest that water resources must be sustainably managed – not necessarily for agribusiness to effectively be on course, but to be

able to provide the required food need of the people and other living things and to also supply the raw material needs of the industries. Perhaps, it should be mentioned that apart from the unsustainable use of water, agriculture also contributes immensely to the problem of water pollution (See 2.3. above).

2.5.2. (c) Energy Resources Consumed by Agriculture
Energy is the “capacity for vigorous activity or the available power” (www.definitions.net/energy). The Miriam Webster Dictionary (2012) defines energy as “a fundamental entity of nature that is transferred between parts of a system in the production of physical change within the system and usually regarded as the capacity for doing work.” Jones (2012) explains that “energy exists in several forms such as heat, kinetic or mechanical energy, light, potential energy, electrical, or other forms; and the SI unit of energy is the joule (J) or newton-meter (N * m)”. The joule is also the SI unit of work. Energy is also regarded as the provider of an essential ingredient for almost all human activities as evident in services such as cooking and space/water heating, lighting, health, food production and storage, education, mineral extraction, industrial production and transportation (Natural Resources Management and Environment Department - NRME, 2000). According to NRME, the dominant supplier of energy in the World today are the fossil fuels (coal, oil and natural gas), which account for 75% of total primary energy supply. The NERM explains further that other energy sources such as biomass⁴ (including fuel wood) and hydropower are representing less than 19% of world primary energy use; and the biomass thus contributes about 14%; while nuclear energy contributes around 6%. (This background information also applies to other development-oriented sectors).

Meanwhile, given the all important nature of agriculture, it would not be a gainsaying that agriculture is a great consumer of energy. The Network for New Energy Choices -

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NNEC (2012) explains that energy has always been essential for the production of food. According to NNEC, energy derived from fossil fuels is now the substitute for muscle power for agricultural purposes, as it is essential in every segments of the agricultural production system. The segments are fertilizer production (which requires the use of large volume of natural gas); water consumption (pumping, treating and moving of large volume of water for irrigation and other purposes); farm equipment powering (use of gasoline and diesel fuel for tractors and combines); and electricity (for lighting, pumping and fanning) and processing,

packaging and transportation (enormous energy footprints as a result of consolidated and centralized production, high quality processing, heavy packaging, and long distance haulage for distribution of finished goods). Moreover, there seems to be a consensus of opinion by NNEC (ibid) and The UK Congressional Research Service (CRS) to Congress on energy needs in agriculture. According to them they are direct and indirect needs. The direct energy needs include energy required for land preparation, cultivation, irrigation, harvesting, post-harvest processing, food production, storage and the transport of agricultural inputs and outputs. The indirect energy needs are also in the form of sequestered energy in fertilizers, herbicides, pesticides, and insecticides.

The UK Congressional Research Service (CRS) to Congress reports that, of energy used in agriculture in the USA in 2002, only 65% was consumed as direct energy; the remaining 35% was accounted for by indirect use via the manufacture of fertilisers (29%) and pesticides (6.3%). It also reported the estimates made by ADAS for Defra's Sustainable Farming and Food Strategy (SFFS) which suggest that indirect energy accounted for 60% of the total energy used in UK agriculture in 2004. This was said to have comprised 31% for fertiliser manufacture, 8% for pesticide production, 9% for tractor manufacture and 12% for animal feeds. The UK-based Warwick HRI (2007) also presents the statistical use of energy 39

in agriculture. According to Warwick HRI, the dairy section uses 15% of the total agricultural use of electricity in the UK. Other uses are by beef and sheep (6%), poultry (11%), other arable crops (6%), Potatoes (5%), cereals (25%), horticultural field crops (3%), and protected crops (26%). It also provides information on other direct energy use by agriculture with field operations representing 7,231 GWh (36%). Others are heating (6,598 GWh (32%)), motive power (834 GWh(4%)), refrigeration (1,148 GWh (6%)), ventilation (2,783 GWh (14%)), lighting (888 GWh (4%)), and Heating (899 GWh (4%)). To draw the curtain on energy use in the agriculture sector, it is important to stress that agriculture is a consumer of energy (deLucia, 2012); and hence efforts must be made to sustainably use energy in agriculture in such a way that it does not in the final analysis hamper ecological balance. In other words, it must be manageably used – because each act of energy use has significant implication for ecological balance. By and large, having taken a cursory look at the how the forest, water and energy are used in agriculture as a typical example of development-oriented activities, the next line of thought is, how could the three important resources be sustainably managed, especially among the rural populace, who are the focus of this study; or simply put, how should the environment be managed among by the rural community.

2.6. Approaches to Sustainable Management of the Environment in the Rural Community

Given the fact that the rural communities depend solely on their environment for means of livelihood, food, medicine, shelter and energy, they are duty bound to sustainably manage these resources of the forest, water and energy which are their sources. Looking at it holistically, the rural communities are expected to be mindful of the five aspects of sustainable environmental management. These are sustenance of biodiversity, discouragement of pollution, conservation, environmental health and sustainable 40

development. In subsection 2.3 above, the environmental problems that communities create that warrant the call for community sustainable environmental management education were

discussed. These are loss of biodiversity, pollution, deforestation; the same also applies to sustainable development in subsection 2.4. The other two that call for discussion before the discussion of environmental management education are “conservation” and “environmental health”. These are briefly discussed below, because they both cut across the other three spheres (loss of biodiversity, pollution and deforestation) that have been discussed above.

2.6.1.

Conservation

Conservation is one of the key concepts in sustainable development. It is a word that has acquired many connotations, as it may mean the protection of wild nature or sustained production of useful materials from the resources of the earth (Okorodudu-Fubara, 1998). In their own perspective, Enger and Smith (2002) define conservation as the best use of resources in the best way so that the long-term benefit is realised by the society at large. Akanbi (1998) also regards conservation as an example of a green environmental issue. According to him, conservation is the restoration of biological diversity of flora and fauna in the environment. The most widely accepted definition was presented in 1980 in the World Conservation Strategy by the International Union of Conservation of Nature and Natural Resources. According to that definition, conservation is “the management of human use of the biosphere so that it may yield the greatest sustainable benefit while maintaining its potential to meet the needs and aspirations of future generations”. The objectives of conservation are also listed as, conservation of living resources, such as maintenance of essential ecological processes and life supporting systems, preservation of genetic diversity, and guarantee of the sustainable use of species and ecosystems (Okorodudu-Fubara, *ibid*).
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Pepper (1996) also lends voice to this discourse. According to Pepper, conservation is a management strategy that calls for the management of what is left of forest and fen destruction in the interest of sustainable and rational exploitation of natural resources. Pepper goes further that there is the need to be aware of the ecological price of capitalism so as to bear in mind the limits of the natural resources of the earth and the need for conservation - because in practise, conservation involves the perpetuation of the resources of the earth on which human beings depend and the maintenance of the diversity of living organism that share the planet. The activities involved include protection and restoration of endangered species, careful use or recycling of scarce mineral resources, the rational use of energy resources, and the sustainable use of soils and living resources. From the submissions above, conservation is of a significant value in the sustenance of the physical environment and indeed, ecological balance. In addition to ecological balance, is the need to meet the multifaceted needs of humans, some of which are the essential ones - food, clothing, shelter and medicare. In addition to these are the economic value of the flora and fauna, especially the long term effect on the food chain. Okorodudu-Fubara (*ibid*) gave the example of marine fisheries that would be lost if efforts are not directed at conservation of floating plants of the ocean and the microscopic phytoplankton which are on their own of less economic values but are essential to the survival of these water-dwelling beings. The aesthetic and recreational and scientific values are also not left in this value-analysis of conservation. In this context (in researcher’s perspectives), aesthetics and recreational values point attention to places of tourist attraction, for picnicking, sunbathing, hiking, skiing, fishing, hunting, boating and swimming in the game parks and reserves e.g. Kanji Lake National Park, Yankari Game Reserve, Old-Oyo National Park (all in Nigeria) and the series of waterfalls, beaches and ranches too numerous to mention. The fields of medicine, archaeology, chemistry, botany, zoology would not devalue the benefits of a balanced

ecosystem. This may be because without the understanding of nature, experimenting with nature and exploration of nature, the world might just be static and undeveloped. Besides, if conservation efforts are not made, there would be little or no resources for professionals in these fields to practise with. From the foregoing, it suffices to state that the world might be worse off if there are no efforts to conserve the little resources left after a long period of biodiversity loss (see subsection 2.3 above on loss of biodiversity). In the opinion of Palumbi (2001) human impact and the demands on the biosphere have become very significant and that is why there is a great tension in the way the conservation of the environment is portrayed while thinking about sustainability. Cloke *et al.* (2009) explain that conservation is to be done in the name of biodiversity; and that biodiversity can be protected with the creation of national parks and other protected areas – although this is also criticized as a factor in the displacement of initial land occupants. In short, it creates loss of human habitat and the impoverishment of the local communities. An alternative approach to this is the ‘ecosystem services’ which stresses the use of biodiversity to generate economic benefits especially for the poor people who need safe and productive livelihood. This would also make the poor people to enjoy the benefits of clean air and water that flow from the ecosystem (Convention on Biodiversity – CBD, 2012). The opinion of other scholars (Aladejana, 1998; Idowu and Osuntogun, 1998; Akanbi, 1998; Odebiyi and Aina, 1998; Newage Publishers) are also congruous on discussion of conservation as an environmental management strategy. But the opinion of Newage Publishers summarises them all, and appears useful to wrap up the discussion. The organisation suggests eight measures and tags them as “remedial measures that will be useful for the repair and revamping of the biotic resources in the globe”. They are, assessment of the biodiversity inventory and preparation of detailed mapping; setting up of seed banks and gene banks; modification of agricultural practices encouraging mixed cropping and poly culture

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and thereby reducing excessive importance on specific species of plants; restoration of habitats and eco-systems which are important for biological communities; and reforestation, prevention of soil erosion, fencing, fertilization, and reintroduction of expired species. Others are population control and check on indiscriminate urbanisation; Ex-situ and In-situ conservation of wildlife (While ex-situ conservation is the act of keeping endangered plants and animals in captivity under human care, in places like zoos, sanctuaries and national parks: in order to assure supply of basic requirements like food, water, shelter and mates, to prevent the species from being poached and to promote genetic research, In-situ conservation is an approach whereby large areas of the earth surface are kept as reserve for wild life). Other two strategies identified are the introduction of stringent legislations and implementation of the same; and imparting Environmental Education and awareness and motivation of communities to conserve resources. All the remedial measures listed here may thus be regarded as strategies towards sustainable environmental management from the conservation perspectives. But, the idea on inculcation of environmental knowledge and creation of awareness and motivation of communities to conserve resources agrees to a greater extent with the focus of this study – non-formal education for knowledge of sustainable environmental management and development of desirable attitude to same. Let us take a look at environmental health as an integral programme in sustainable environmental management.

2.6.2. Environmental Health

Environmental health has been considered as an integral part of sustainable environmental management. This may be because the environment influences human health variously through exposures to physical, chemical and biological risk factors. This was the opinion of the Indian National Council on Educational Research and Training - NCERT 44

(2012). According to NCERT, it is quite appalling that, nearly more than 60,000 new chemicals, most of which are synthetically organic, non-degradable and non-safely disposable are being pumped annually into the environment; and hence they disturb the balance of nature and cause adverse impact on the health of living beings. This may explain why a deliberate attempt to promote good environmental health in the community of people should be considered as a sustainable environmental management strategy. By way of definition, Environmental Health (EH) according to an organisation called Solarpowernotes (2012) is the branch of environmental sciences that deals with the phenomena and study of various kinds of health care issues and the procedures for the recovery of damages caused by environmental pollution (The idea of pollution mentioned here agrees with the researcher's earlier opinion that all the five aspects of sustainable environmental management overlap and cannot be discussed without the other). This definition portrays the EH as a discipline or course of study. Meanwhile, the U.S. Department of Health and Human Services – USDHHS (1998) provides an ensemble of 28 definitions of environmental health. It remarks that “all definitions mention human health, public health, or humans, or similar words. In addition to mentioning of human health, some definitions mention ecologic health or ecological balances. Some of the definitions mention specific environmental stressors, such as physical, chemical, and biologic agents. Some of the definitions are quoted below with a mention of their sources. These are:

Environmental health focuses on the health interrelationships between people and their environment, promotes human health and well-being, and fosters a safe and healthful environment **(National Association of County and City Health Officials)**

Environmental health refers to freedom from illness or injury related to exposure to toxic agents and other environmental conditions that are potentially detrimental to human health **(Institute of Medicine).**

Environmental health is the professional practice of improving and preserving residential and industrial hygienic environments and housing for individuals and communities, and improving and preserving public health and allied matters including the control and management of the total environmental and ecological balance by educating processes and enforcement of statutory provisions by the application of preventive science and practice **(Institute of Environmental Health (Australia))**

Environmental health is to protect and enhance environmental quality for all people (of Hawaii), thus preserving (our) quality of life **(Hawaii Department of Health).**

Environmental health strives to link environmental quality of both the natural and built environments, with the level of public health and well being. Though lacking consensus in definition, environmental health addresses the interrelationship between human health and the environment.

It has been described as the "the art and science of protecting against environmental factors that may adversely affect human health and environmental quality. Such factors include, but are not limited to air, food, and water contaminants; radiation; toxic chemicals; wastes; disease vectors; safety hazards; and habitat alterations (**Gordon, Larry**).

Environmental health includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often, indirect) on health and well-being of the broad physical, psychological, social, and aesthetic environment, which includes housing, urban development, land use, and transport (**European Charter on Environment and Health**).

Given the long list of definitions, it is pertinent to note that EH concerns itself with the promotion of good health for all living things. In other words, it seeks a complete state of physical, mental, and social well-being, not just the absence of infirmity or disease for them, especially human beings. This agrees with the universally accepted definition of health as propounded by the World Health Organization. The Solarpowernotes (ibid) describes the importance of EH as a programme designed to deal directly with pollution and all the tricks to prevent the harmful effects of pollution caused by manufacturing and allied activities; and that it emphasizes human safety which

46 includes external and internal physical, mental and conscience of human beings. The major concerns of environmental health identified and their descriptions are paraphrased viz:

Air: the quality of indoor and outdoor air especially those caused by smoke and other contaminants. It also addresses treatments of infected air, precautions and safety measures.

Body art safety: the safety measures that should be taken while dealing with tattooing, body piercing and permanent cosmetics surgeries.

Climatic changes: addressing issues of climatic changes by learning how to live according to the changing environment; especially vis-a-vis air pressures, rainfalls, humidity and dry dust and seasonal viral diseases.

Disasters: preparing people to be mentally alert to deal with the natural disasters; how to respond to the immediate destructive situations, and what steps should be taken for the survival.

Food safety: addressing how to make food safe; and how agricultural practice must avoid toxics, because they affect the quality of foods, fungus protection and preservation, and transportation of food.

Water Protection: addressing the need for the provision of clean drinking water; and knowledge of how to determine water of good quality, and how to handle contaminated water.

Housing Standards: Knowledge of clean surroundings and appropriate standard of good housing and to avoid living in dirty apartments and surroundings.

Chemical, Medical and Liquid Wastes Management: addressing pollution emanating from the discharge of chemical, medical and liquid wastes from factories; especially as they pollute water and air. Their disposal techniques are also addressed.

Toxicity: Addressing how to effectively prevent and control the impact of toxic substances in material use, especially how they would not affect the air, water and soil.

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Roche *et al.* (2012) shed more light on how public health is a synonym for

environmental health; and that EH concerns itself with the prevention, diagnostic and control of diseases. According to them, “the increasing number of “zoonotic diseases” spilling over from a range of wild animal species represents a particular concern for public health, especially in light of the current dramatic trend of biodiversity loss (This also signals an overlap of the various aspects of sustainable environmental management – environmental health overlapping biodiversity here). This opinion of Roche et al (ibid) thus compliments the definition of community health provided by the Institute of Medicine and quoted by USDHHS (1998) above. It also builds on the long list of concerns of EH provided by Solarpowernotes (ibid), which this researcher feels has not included direct focus on the prevention, diagnostic and control of diseases. The idea of prevention, diagnostic and control of diseases vividly agrees with the opinions debated here; and the World Health Organization is also lending a voice. According to the WHO, environmental health is defined by “those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health”. It also includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and well being of the broad physical, psychological, social and cultural environment, which includes housing, urban development, land use and transport (Robert,1999). Looking critically at all the variables itemized in the WHO’ perspective would give a clear-cut direction on activities that could assure good environmental health; and some empirical works could buttress this. Thus, the idea of wastewater management discussed by Solarpowernotes agrees with that of Mo and Zhang (2012). According to Mo and Zhang, municipal wastewater treatment has emerged as one of the largest resource consumers and hence its systems must not be 48

limited to protecting receiving water and human health, but to also improve sustainability. Mo and Zhang used the embodied energy and the associated carbon footprint to measure the resource consumption and recovery in wastewater systems by investigating onsite energy generation through combined heat and power systems, nutrient recycling through bio-solids land application, and water reuse for residential irrigation. They found out that the integrated resource (energy, nutrient and water) recovery has the potential to offset direct operational energy but could not offset the total embodied energy of the treatment plant to achieve carbon neutrality. They concluded that water reuse has the highest potential of offsetting carbon footprint; while nutrient recycling has the lowest (This study has examined environmental health from the water quality and sustainability perspectives). Baig *et al.* (2012) present an empirical result of a study on risk of microbial water quality. They report the incidence of flash flooding in Pakistan which destroyed the basic water, environmental sanitation and livelihood infrastructures of 82 districts in mid-July 2010; and how several residents of Marghazar town became ill of *Escherichia coli*, *Shigella*, *Salmonella* and *Staphylococcus aureus* and were hospitalized. They also reported the intervention of Oxfam from Great Britain, which determined the causes of this incident by analyzing the community drinking water supply. The result of the investigation revealed that the people contracted the diseases after the ingestion of microbiologically unfit drinking water (full of pathogenic organisms and water quality risk factors due to the damaged water and environmental sanitation infrastructure). Baig *et al.* recommend that “continued water quality monitoring, the application of household based disinfectants, and healthy domestic hygiene practices are highly recommended in similar circumstances” (This empirical study

has examined environmental health from the perspective of disaster, hygiene and water quality).

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Riederer and Lu (2012) conducted a study titled “measured versus simulated dietary pesticide intakes in children”. They averred that children's dietary pesticide intakes can be measured directly through duplicate diet samples instead of the national residue data that is often used. They compared organ phosphorus and parathyroid pesticide intakes from conventional fruit, fruit juices and vegetables measured for two cohorts of children aged 3-11 years in the Children's Pesticide Exposure Study (CPES) with corresponding intakes simulated using CPES consumption and body weight data and residue data from the US Pesticide Data Program (PDP). They calculated daily measured pesticide intakes by multiplying grams eaten with measured concentrations and dividing by body weight. They concluded that “using PDP data could generate probabilistic estimates of dietary pesticide intakes that do not differ appreciably from measured intakes except in some cases”. (This kind of study has focused on environmental health from the food security perspective) Thus, looking critically at environmental health from the definitions to the empirical findings, it is worthwhile to state that environmental health is one of the indices of sustainable environmental management; and should be taken serious by members of the community of people.

From the foregoing, community environmental management could be seen to be revolving around the five core areas that are identified in this study. These are biodiversity, pollution, conservation, environmental health, and sustainable development; and having this understanding, the question that may be raised in the context of this study is how the community of people (especially the rural ones) could be adequately informed to sustainably manage the environment. The answer that this study has to offer is that the community of people must be reached, mobilized and educated. These are with the view to making them to have the requisite knowledge about the environment and develop the right type of attitude towards sustainable management of the resources of the physical environment which have

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been wrongly construed to be infinite, whereas they are getting decimated day by day. This will therefore lead to the discussion of community's sustainable environmental management education.

2.7. Sustainable Environmental Management Education in the Community

The preceding paragraph emphasizes the need to reach the community, to mobilize and educate them about sustainable management of the natural environment. This draws attention to the opinion of Lucas (1991: mentioned in Sterling (2008) on three approaches towards using education to make people to change their attitude towards the environment and to effectively manage it. These are “education in sustainability”, “education about sustainability”, and “education for sustainability”. While education in sustainability is said to be creating an awareness (about the environment), education about sustainability encourages environmental management and control (of natural resources). But they are regarded by Sterling (ibid) as weak approaches to making people to acquire knowledge (about the environment and develop the right attitude towards the environment), because they do not promote critical reflection and are considered too technocratic, placing emphasis on nature alone. But to educate “for” sustainability, is regarded as the strongest approach to integrate issues pertaining to the environment with those associated with democracy, social justice, equity, structural change, and reclamation of social bonds cum propagation of green

economy. These are with the mind to promoting reciprocative approaches to thinking about and solving local and global problems, environmental ones inclusive (Ojedokun, 2012). In the researchers opinion, to educate in and educate about sustainability are prerequisites to educating for sustainability. This is because, the objective of any education in relation to the environment would always start with awareness creation, with ability to control and manage

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resources of the environment sustainably as the ultimate goal. Such education is also expected to make people to acquire knowledge and change attitude towards the environment. Kansal *et al.* (2001) seem to agree with this assertion. According to them, environmental education awareness levels are limited at community level, and these are exacerbated by low literacy levels and the limitations to environmental management information delivery systems. Kansal *et al* go further that “the main causes of environmental degradation and resource depletion are believed to be (1) emphasis on rural production enhancement by farmers, (2) high rate of poverty (3) low literacy rate, and (4) lack of information and awareness on environmental issues”. The ideas on the need for information and awareness will not make the opinion of Sterling (*ibid*) on weak sustainability approaches to hold the grip here. Perhaps it should be mentioned here that the issues of gender mainstreaming is a major factor that must be considered if a strong sustainability is to be assured in the community of people, especially the spirit of sustainable management of natural resources which community environmental management education wishes to inculcate. Graham (2001) supports this assertion by explaining that “interventions and life saving strategies are made more efficient and timely when gender differences and inter-dependencies have been properly understood and addressed”. According to Graham, channeling resources to those most in need, and mobilization of the capacities of a significant proportion of the population that is often under-estimated could be successful when a gender approach is employed to understand and profile the groups that are very vulnerable. In other words, a successful CEME takes cognizance of the specific roles and responsibilities of men and women, their main constraints and needs, and their ability to carry out activities under emergency situations and early rehabilitation.

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Moreover, the involvement of men and women in a CEME programme could make it a balanced programme – since it is not only men that contribute to environmental degradation and neither are they the only ones that will suffer the impact of environmental disasters. In fact, women are more vulnerable. Therefore approaches which attempt to re-insert women into development processes as ‘agents’ of transformative change, rather than as ‘beneficiaries’ of it (Connell, 1999) must be employed when embarking on a CEME. Issues that thus support interventions and life saving strategies (as put by Graham above), may therefore revolve around the five core aspects of sustainable development that this study seeks to determine how gender could determine the extent to which knowledge about them could be acquired and influence the attitude that people have towards them. These are conservation, protection of biodiversity, discouragement of pollution, environmental health and sustainable development. Thus, in the researcher’s opinion, community’s sustainable environmental management education is an approach towards strong sustainability and hence must be encouraged among the community of people especially in the rural areas. Therefore, given this mindset, then there is the need to examine what environmental management education

may mean, and to also explore how to embark on it in the community of people.

2.7.1. What is Environmental Management?

A critical examination of all that have been said about the five aspects of sustainable environmental management (pollution, biodiversity, environmental health, sustainable development and conservation) could drop clues as to what environmental management may mean. Rogers (2012) quotes the opinion of the renowned conservationist, Aldo Leopold, who said that “conservation is a state of harmony between men and land” and that environmental management, which is the practice of creating this harmony involves the management of both

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the living and non-living components of the nature. Environmental management is also considered as the process by which environmental health is regulated; (and) it does not involve managing the environment itself, but it is the process of taking steps and behaviours to have a positive effect on the environment” (WiseGeek, 2012: online). According to WiseGeek, environmental management involves the wise use of activity and resources to have an impact on the world. Similarly, environmental management means the managing of the environment in ways that help the environment; and example of such ‘wise use’ of environmental resources are recycling, and using recycled materials (Answers Corporation, 2012).

Moreover, Rogers *et al.* (2008) who earlier gave direction to the discussion of development oriented activities that impact on the environment express that “ environmental management is seen as not about management of the environment; but about the management of development activities within the limits of the assimilative capacity of the environment”. Their stand on answering questions on how to address activities affecting water, energy and forest are also pointing attention to the fact that environmental management is about prevention of activities that will affect the quality of water, energy and forest. Or put in another sense, ensuring that right activities that will restore the environment to its nearoriginal state; reduce or halt the degradation of the environment may be regarded as an environmental management approach. The researcher’s opinion is premised on all that have been afore-said on the need to, restore biodiversity; prevent and reduce pollution of water; air and land, and to promote clean and hygienically healthy environment for people to live in. It could also include embarking on development activities that give consideration to the environment and in the event of the need to tap the resources of the environment, make deliberate efforts to replace the resources with a new one or propagate others that will serve as alternative to the one lost as a result the development activities.

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All the opinions (of the researcher) presented above agree with the opinion of Rogers *et al.* (ibid) on environmental management. According to Rogers *et al.*, there are pressures on natural resources, as land is mismanaged; wetlands that provide clean water and flood protection are lost; wildlife has suffered as animals and plants species are lost each day due to deforestation; and there is the need to take cognizance of the fact that national economy, food production, health and recreation all depend upon proper management of natural resources. Examples of management practices provided suggest prairie restoration through prescribed burning, invasive species management through pesticide application or removal, and wildlife management through hunting or other population-reduction methods. These ideas could also be buttressed with the opinions of Bamgbose (2012), who regards land pollution control as an environmental management strategy; and that “recycling”, “recovery” and “reuse” are approaches to pollution control. His opinion is thus that glass, paper, junked automobiles and

tyres can be recycled: thereby buttressing the fact that recycling supports environmental management. In a nutshell, environmental management is primarily concerned with environmental protection measures and impact mitigation of activities surrounding the five divisions of environmental management i.e. biodiversity, pollution, conservation, environmental health and sustainable development. By large, having reviewed what environmental management may mean, the next issue that may be addressed is on how to go about educating about and for sustainability in the community of people, especially the rural areas. This thus leads to the discussion of environmental management education.

2.7.2. What is Environmental Management Education?

The challenges that humanity faces and may continue to face in the face of unbridled environmental degradation is drawing attention of the whole world to the need to sustainably
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manage environmental resources. This proceeding has reviewed such critical issues with the view to suggesting that environmental management education could be an excellent tool towards changing peoples' attitude - by providing them with knowledge about and for sustainable environmental management. A cursory look at what education in this context may mean could give a clue on what actually has provoked this initiative. In 2004, "James Rhem and Associates" published a list of quotations on teaching, learning and education. It quoted Arendt, who states that "education is the point at which we decide whether we love the world enough to assume responsibility for it and by the same token to save it from that ruin, which, except for renewal, except for the coming of the new and the young, would be inevitable". The remaining part of the quotation explains the need to love younger and incoming generations by not leaving them to their own devices and to provide them a future that will make them to have a choice of what is good for them and hence promoting a renewal of the world for their sustainable existence. A critical look at this quotation suggests that education is a tool to inculcation for sustainability (environmental management) values; and this idea is in consonance with the Brundtland definition of sustainable development which is about meeting the needs of the present generation without compromising the ability of the future generation to meet their own needs. In fact, a keyword in this definition(renewal) is in total agreement with the idea of environmental management and its associated issues such as reduce, reuse and recycle (of wastes); use of renewable resources and clean energy, conservation and biodiversity preservation and mitigations of polluted sites.

The Cambridge International Examinations - CIE (2012) provides a relevant clue to what the goal and objectives of environmental management education could be; and also provides the curriculum content for her examinations. These are having a congruous bearing
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with this discussion. According CIE the aims of environmental management education are eleven. These are to enable learners to acquire:

Knowledge of the functioning of the natural system which makes life possible on Earth;

An understanding that humankind is part of this system and depends on it;

An appreciation of the diverse influences of human activity on the natural system;

An awareness of the need for management and human responsibility to keep the system in a healthy condition if life as we know it is to continue;

An understanding of sustainable development and management to meet the needs of

the present without compromising the ability of future generations to meet their own needs;

- An understanding of how local environments contribute to the global environment;
- A sensitivity to, and a sense of responsibility, and concern for, the welfare of the environment and all other life forms which share this planet;
- An awareness of values concerning environmental issues;
- An awareness of the values of others;
- A willingness to review own attitudes in the light of new knowledge and experiences;
- A sound basis for participation in local and global environmental concerns.

In addition to the wide goals, candidates are expected to demonstrate knowledge and understanding of, the wide range of processes contributing to (a) the functioning of the Earth's natural, geophysical and ecological systems; and (b) human development within the natural system and the impact of human activity on the total environment; the concept of environmental interdependence, and placing local environmental questions in an international or global setting; the implications of the unequal distribution of resources and of the unequal patterns of human development; the concept and practice of sustainable development and the ways of reducing and repairing environmental damage. The ICE thus presents an environmental education syllabus as shown in Table 2.2 below; and from the goals, objectives and learning content of environmental management as provided by ICE in the

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table, it is pertinent to state that the whole programme of environmental management education revolves around inculcation of knowledge and attitude in the learners. Such learners which could be under the formal and the informal/non-formal settings are thus expected to bear in mind how the local environments contribute to the global environment with the view to putting environment into considerations when investing in development activities, whether agriculture, industry or services.

Table 2.2. An Environmental Education Syllabus Matrix used by the International Cambridge Examinations.

Resources	Development	Impact	Management	
Lithosphere	The lithosphere: structure and processes	Human activity and the lithosphere	Lithosphere in crisis	Action on the lithosphere
Hydrosphere	The water cycle The oceans	Human intervention in the water cycle Exploitation of the Oceans	Water hazards The oceans at risk	Clean, safe, water Strategies
Atmosphere	The atmospheric system	Human activity and the atmosphere	Atmosphere in crisis Agriculture development consequences	Action on the Atmosphere Managing agriculture
Biosphere	The ecosystem	The changing	Ecosystems at	Conservation of the

	Elements of Vegetation Elements of soil	of role of people in the environment Population growth Modification of vegetation and soils	risk People in crisis Land at risk Agriculture: development consequences	Ecosystem Population Management Managing the land Managing agriculture
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Managing

the

oceans

Source: Cambridge International Examinations 2012.

http://www.cie.org.uk/qualifications/academic/middlesec/igcse/subject?assdef_id=855

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By and large, given the task of environmental management education, an issue of concern is how its prospective educator could embark on its project among the prospective learners – be it in formal or the informal/non-formal settings. However, since the focus of this study is on the non-formal setting, it is pertinent to explore how to go ahead to teach for values (knowledge and attitude) among the adult members of the community who appear to be contributing more to environmental degradation in the process of contributing to economic and development activities. This task may however not be easy as a formal classroom lesson plan, except there is a guideline or prototype to doing so. It is therefore necessary to suggest a prototype for community environmental management education (CEME) (by way of designing and validation of one); believing that same could be useful to facilitate a nonformal CEME among the rural communities of Nigeria.

2.8. The Need for a Prototype of Community Environmental Management Education among Rural Communities in Nigeria

In chapter one, the definition of a prototype was given as a “standard or typical example” (Bee Dictionary, 2010), an “original or model after which anything is copied”; “the pattern of anything to be engraved, or otherwise copied...”; “a primary form”; “exemplar”; “archetype” (ThinkExist.Com,2010) or a “first form or design of something” (to be followed) (univSource.com,2009). Without much ado, a CEME prototype could incorporate the learning content suggested by the International Cambridge Examinations, as contained in the syllabus matrix and provide a guideline of how to mobilize the participants of the intended learning. The researcher’s opinion is motivated by the United States’ Environmental Protection Agency (USEPA) (2003) that emphasizes the need for environmental management plan. The USEPA’s recommends among other strategies that CEME should plan and implement a public education and outreach programme that will enhance the public understanding of the impacts of an environmental problem, its possible sources and what

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needs to done to reduce its impact or deter its reoccurrence. It also suggests that local officials should be trained on such noticeable problem(s) with the view to making the local officers to develop sense of stewardship that will make them to compliment other state-wide initiatives and to support decision making on drinking water quality, waste management, leakages, household hazards emergency responses, ground water-protection, wetland protection, air pollution, industrial waste management, non-point source pollution and the need for conservation, mitigation and remediation.

Lisa Howard-Grabman and Gail Snetro (ND) however wrote a field-guide which was published by the Health Communication Partnership of the US-based John Hopkins University. The field-guide is titled “How to mobilise communities for health and social change”. The layout and content of the guide portray it as adaptable for the design of a prototype of community’s sustainable environmental management education (CEME). This opinion is informed by the fact that CEME itself is an approach to social change. The document is organised around nine phases of the community action cycle (i) prepare to mobilise (2) organise community for action (iii) explore the (environmental) issue and set priorities (4) plan together (5) act together (6) evaluate together, and (7) prepare to scale up. Each of these nine phases has its detailed content and the detail sheet is attached as Appendix I. The applicability of the field-guide is showcased in 3.3 below. By and large, as it appears that a prototype of community environmental management education may be required by people who may be interested in embarking on community environmental management education, especially in Nigeria, there is a need to explore the development and validation of a local approach/guideline (prototype) for it. Adapting the content of the nine phases that guide the instrumentation of this study in terms of how members of the community are mobilised for community environmental management

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education, what the learning content should be and how the success of the learning is determined are required; and that is what this study is set out to do.

Chapter

Summary

In this chapter, deliberate attempts have been to provide explanations of the word, community, bearing its meaning and types (rural and urban). Its characteristics are also explained. The review has also touched on environmental problems that communities create that warrant the call for community sustainable environmental management education and examines development-oriented activities that bear on the capacity of the environment. The review dovetails to approaches to sustainable management of the environment in the rural community. It bears in mind that community sustainable environmental management education could only be effectively done when a given prototype is employed; and by so doing, making people to acquire knowledge and develop the right type of attitude towards sustainable environmental management in the community of rural communities in Nigeria.

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CHAPTER RESEARCH

THREE METHODOLOGY

This chapter presents the research design, population, sample and sampling procedures, instrumentation, and procedures for data collection and analysis.

3.1. The Research Design

The study employs the descriptive survey and quasi-experimental research designs. It is descriptive because it relies on large scale data on environmental issues with a view to making appropriate comparison between groups. It is also quasi-experimental because it is a study conducted outside the laboratory. However, there is an experimental, as well as a control group. In this context, community members exposed to treatment (environmental management education) are in the experimental group; while the control group members are those not exposed to treatment, but subjected to test of knowledge and attitude as well. The independent variable is the community environmental management education (aided with a self-designed prototype) to which the community members are exposed; while the dependent variables are the understanding (knowledge) of sustainable environmental

management (of Conservation, Protection of Biodiversity, Discouragement of Pollution, Environmental Health and Sustainable Development) that participants demonstrated and the attitude that participants of the study elicited after the treatment.

3.2. Population, Sample and Sampling Procedure

All residents of Ago-Are, an agrarian rural community in the Oke-Ogun area of Oyo State, Nigeria, constituted the population for the study. The study involved 400 residents (200 men and 200 women) selected through stratified random sampling technique from 50 different societies through which the Ago-Are community is locally administered – a society

63 being a stratum. Out of the 400 participants, 200 people (100 men and 100 women i.e. 4 per society) were the participants in the experimental group (exposed to treatment – training on sustainable environmental management), while 200 (100 men and 100 women i.e. 4 per society) are in the control group (not exposed to treatment at all). The participants were selected with the assistance of the leaders of the Ifelodun Egbe Omo Ago-Are (Agglomeration of Ago-Are Indigenes' Associations), who formally invited them (with letter) in the name of the community.

3.3. Instrumentation

3.3.1. The Prototype and the Experiment

The “Community Action Cycle for Community Mobilisation” in the Howard Grabman and Snetro “Field Guide on How to Mobilize Communities for Health and Social Change” was adapted to develop a “Prototype of Community Environmental Management Education”. Given the prototype, community environmental management educators are expected to follow a definite guideline. The original guideline is marked as Appendix I; while the emerging adapted action plan (prototype) is marked as Appendix II. The action plan also contained the learning content that highlighted the following:

i.	What makes a good environment?
ii.	At what time does environment get bad?
iii.	What are activities that make environment bad?
.	and
iv.	What can be done to make environment good?

The experiment (Community education on sustainable environmental management) took five days to complete. It was conducted in the annual community meeting usually held for a week in the first week of August. One hour each was spent each day after the community meeting to discuss each of the issues itemized above. The fifth day which was a Friday when community meeting was not held was used as the grand-finale of the experiment. This took

64 about three hours. In this, comprehensive clarifications of issues surrounding the five core aspects of environmental management were made. The experiment was followed with posttest of knowledge of, and attitude to sustainable environmental management among the experimental group.

3.3.2. The Test of Knowledge

A self designed Community Environmental Management Education Test of Knowledge (CEMETK) was used for the study. It was a 25-item dichotomous answer (Yes or No) type. The areas covered in the test included biodiversity protection (items 1,2,3,4,5,6,7,8,14,15,17,22 and 24); discouragement of pollution (items 10, 11,12,13,18 and 25); encouragement of conservation (items 8, 16, 22, and 24); promotion of environmental

health (items 19, 20 and 23); and promotion of sustainable development (items 1-20). Some of the items also overlapped into more than one area of environmental management. A 'Yes' response attracted a mark of 1. A 'No' response attracted a mark of 0. Only items 14 and 21 were negatively worded – their scoring were inversely graded i.e. No response attracted a mark of 1, while a Yes response attracted a mark of 0. The test was written in Yoruba language, to provide equal level of understanding of all the participants, especially the illiterates and others with low level of literacy. The test of knowledge was used as the pretest and posttest measure of knowledge on the participants in the experimental group and on those in the control group. The validation test was administered in Ofiki, a neighbouring town with similar characteristics as the research community. Its cronbach alpha was 0.75.

3.3.3. The Test of Attitude

The Community Environmental Management Education Attitude Measurement Scale (CEMEAMS), addressing the five core areas of sustainable environmental Management (Conservation- items 3,5,14, 19 and 20); Protection of Biodiversity(3,4,5,6,13,18 and 21);

Discouragement of Pollution(1,2,5,8,9,10,11,12,15,16,17, and 19); Environmental Health (11,15,16,17, and 18); and Sustainable Development (item 1-21) was also developed and used as the pretest and posttest measure of attitude of the participants in the experimental group and on those in the control group to sustainable environmental management. The instrument was a 21-item 4-point scale of strongly agree (4marks), Agree (3marks), disagree (2marks) and strongly disagree (1mark).The items were also written in Yoruba language. The validation test was administered in Ofiki, a neighbouring town with similar characteristics as the research community. Its cronbach alpha was 0.72.

3.4. Data Collection and Analysis.

3.4.1. Procedures for Data Collection

A total of 200 participants (4 from each society) who were not in the experimental group were served the tests of knowledge and attitude to sustainable environmental management in a community meeting through their society leaders. The tests were also returned to the researcher through them. They were not exposed to the experiment. The 200 others who were in the experimental groups (4 from each of the fifty societies) were given the two tests on the first day of the experiment to serve as pretest measures. They were also post-tested immediately after the experiment with the same instruments.

3.4.2. Procedures for Data Analysis

The tests were scored and subjected to SPSS data analysis procedures. Thus research questions 1(a) and (b) were answered using the One-way ANOVA statistics in order to determine whether there were differences in the mean value of three arrays of scores indicating the level of knowledge of, and attitude to sustainable environmental management of the participants i.e. experimental group's pretest and posttest scores and control group's scores. **The Fisher's LSD (Least Significant Different) comparison test** was also used to determine the sources of significance of the effect of CEME on knowledge and attitude to

sustainable environmental management. Research questions 2(a) and (b) were answered using the chi-square statistics, in order to determine the moderating effects of gender on participants' knowledge and attitude to the five core areas of environmental management i.e. biodiversity, discouragement of pollution, conservation, environmental health and sustainable development. All resulted were tested at 0.05 level of significance.

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CHAPTER FOUR RESULTS AND DISCUSSION OF FINDINGS

This chapter presents results of analysed data and the discussion of findings.

4.1.

Research

Question

Results

1(a)

Will there be significant main effect of community environmental management education on Ago-Are residents' knowledge of sustainable environmental management? Table 4.1 presents the descriptive results showing the differences in the mean and standard deviation of the Ago-Are community members' score as indicators of knowledge of sustainable environmental management.

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Table 4 .1. The mean and standard deviation scores of the Ago-Are community members indicating their level of knowledge of sustainable environmental management.

Treatment Categories	N	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean	Minimum	Maximum
Lower Bound	Upper Bound						
Control	200	67.4200	8.57738	.60651	66.2240	68.6160	50.00
Pretest Experimental	200	76.1650	13.53008	.95672	74.2784	78.0516	44.00
Posttest Experimental	200	86.5050	12.24786	.86605	84.7972	88.2128	36.00
Total	600	76.6967	14.00160	.57161	75.5741	77.8193	36.00

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Table 4.1 indicates that the participants have varying knowledge of sustainable environmental management with the control group having an overall mean score of 67.42 and standard deviation of 8.57. The pre-test mean and standard deviation scores of the experimental group ($\bar{x}$ = 76.16; SD = 13.53) are equally less than their post-test mean scores and standard deviation of ($\bar{x}$ = 86.5; SD = 12.24) respectively. But this may not suggest that there is a significant statistical difference when all the three results are compared; hence the need for an analysis of the variances of the scores. This is contained in Table 4.2 below.

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Table 4.2: Summary of ANOVA of the Ago-Are Community Member's Knowledge of Sustainable Environmental Management by Treatment Groups

Sum of Squares	df	Mean Square	F	Sig.
Between Groups	36508.523	2	18254.262	134.670
Within Groups	80922.270	597	135.548	
Total	117430.793	599		

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Table 4.2 shows that there is a significant statistical difference ($F(2,597) = 134.67$;

$P < .05$) in the Ago-Are community member's knowledge of sustainable environmental management by treatment groups; hence, the answer to the research question is thus, yes, there is a significant main effect of treatment (Community Environment Management Education) on the participant's knowledge of sustainable environmental management. However, there is the need to trace the sources of the significant effect of the treatment, using the Fisher's LSD (Least Significant Different) comparison test. Results obtained are shown in Table 4.3 below.

Table 4.3: Multiple Comparisons Test of Significant of Effect of Gender on Ago-Are Residents' Knowledge of Sustainable Environmental Management.

Dependent Variable: Knowledge Score

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	(I) group	(J) group
LSD	Control	pretest experimental	8.74500*	1.16425	.000	11.0315	6.4585
posttest experimental	-	19.08500*	1.16425	.000	-21.3715	-16.7985	
Pretest Experimental	control	8.74500*	1.16425	.000	6.4585	11.0315	
posttest experimental	-	10.34000*	1.16425	.000	-12.6265	-8.0535	
Posttest Experimental	control	19.08500*	1.16425	.000	16.7985	21.3715	
pretest experimental	10.34000*	1.16425	.000	8.0535	12.6265		
*. The mean difference is significant at the 0.05 level.							

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Table 4.3 indicates that participants in the experimental group differ significantly in their pretest and post-test knowledge of sustainable environmental management than the control group. The control group also portrays itself as significantly different from experimental group. This is also graphically explained in Figure 1 below.

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Figure 1: Graph Showing the Differences in the Mean Score on Knowledge of Sustainable Environmental Management Obtained by Ago-Are Residents (in the Control and the Pretest and Posttest of the Experimental Groups)

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The graph above buttresses the above findings that there is a large variation gap in the pretest and posttest marks obtained by the experimental group as against the control in knowledge of sustainable environmental management.

Research
Question
1(b)

Will there be significant main effect of community environmental management education on Ago-Are residents' attitude to sustainable environmental management? Table 4.4 presents the descriptive results showing the differences in the mean and standard deviation scores of the Ago-Are community members as indicators of attitude to sustainable environmental management.

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Table 4.4: The Mean and Standard Deviation Scores of the Ago-Are Community Members Indicating their Attitude to Sustainable Environmental Management

Treatment Categories	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	Minimum	Maximum
Lower Bound	Upper Bound						
Control	200	66.1200	9.16162	.64782	64.8425	67.3975	54.00
Pretest experimental	200	89.5500	8.25276	.58356	88.3992	90.7008	63.00
Posttest Experimental	200	91.9100	7.71293	.54539	90.8345	92.9855	62.00
Total	600	82.5267	14.35337	.58597	81.3759	83.6775	54.00

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Table 4.4 indicates that the participants have varying attitude to sustainable environmental management with the control group having an overall mean score of 66.12 and standard deviation of 9.16. The pre-test mean and standard deviation scores of the experimental group ($\bar{x}$ =89.55; SD=8.25) appear not to have a similar outlook with post test scores in knowledge. While their post-test mean score ($\bar{x}$ =91.91), is greater than their pre-test mean score ($\bar{x}$ =89.55), their posttest standard deviation score (SD=7.7) is less than their pre-test standard deviation score (8.25). But this may not suggest that there is a significant statistical difference when all the three results are compared; hence the need for an analysis of the variances of the scores. This is presented in Table 4.5 below.

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Table 4.5: Summary of ANOVA of the Ago-Are Community Member's Attitude to Sustainable Environmental Management by Treatment Groups

Sum of Squares	df	Mean Square	F	Sig.
Between Groups	81310.573	2	40655.287	576.582
Within Groups	42095.000	597	70.511	

Total	123405.573	599			
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Table 4.5 shows that there is a significant statistical difference ($F(2,597) = 578.582$; $P < .05$) in the Ago-Are community member's attitude to sustainable environmental management by treatment groups; hence, the null hypothesis is hereby rejected. Thus, there is a significant main effect of treatment on the Ago-Are community member's attitude to sustainable environmental management.

However, there is the need to trace the sources of the significant effect of the treatment using the Fisher's LSD (Least Significant Different) comparison test. Results obtained are shown in Table 4.6 below.

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Table 4 .6: Multiple Comparisons Test of Significant Effect of Gender on Ago-Are Residents' Attitude to Sustainable Environmental Management.

Attitude LSD	score				
(I) group (J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
control pretest					
experimental posttest	-23.49472*	.83980	.000	-25.1440	-21.8454
experimental pretest	-25.85472*	.83980	.000	-27.5040	-24.2054
control posttest					
experimental pretest	23.49472*	.83980	.000	21.8454	25.1440
control pretest					
experimental posttest	-2.36000*	.83875	.005	-4.0073	-.7127
experimental pretest					
control posttest	25.85472*	.83980	.000	24.2054	27.5040
experimental posttest	2.36000*	.83875	.005	.7127	4.0073

*, The mean difference is significant at the 0.05 level.

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Table 4.6 indicates that participants in the experimental group differ significantly in their pretest and post-test knowledge of sustainable environmental management than the control group. The control group also portrays itself as significantly different from experimental group. This finding is also buttressed graphically in Figure 2 below.

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Figure 2: Graph showing the differences in the mean score on attitude to sustainable environmental management obtained by Ago-Are residents (in the control and the pretest and posttest of the experimental groups)

83

Research

Question

2(a)

Will there be significant moderating effect of gender on Ago-Are residents' knowledge of the different areas of sustainable environmental management

Table 4.7 presents the descriptive results showing the post-test percent-correct scores of male and female members of the Ago-Are community members' knowledge of the different areas of sustainable environmental management.

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Table 4.7: Descriptive Results Showing the Post-test Mean Score of Male and Female Members of the Ago-Are Community's Knowledge of Sustainable Environmental Management.

Gender knowledge of Sustainable Environmental Management	Mean of Percent Correct Score	N	Std. Deviation	Overall Average (%)
Male's knowledge of biodiversity	81.7000	100	10.81665	84.5
Male's knowledge of pollution	87.6000	100	17.87273	
Male's knowledge of conservation	85.5700	100	17.09111	
Male's knowledge of environmental health	80.9000	100	30.97229	
Male's knowledge of sustainable development	86.8000	100	11.79625	
Female's knowledge of biodiversity	84.6500	100	10.62908	86.1
Female's knowledge of pollution	95.2200	100	8.24447	
Female's knowledge of conservation	83.2500	100	16.68749	
Female's knowledge of environmental health	79.2500	100	15.09858	
Female's knowledge of sustainable development	88.1200	100	8.26735	
Total	85.3060	1000	16.57453	

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Table 4.7 indicates that male have less ($\bar{x}$ =81.7) post-test knowledge of biodiversity than their female community members who have a mean score of 84.65. They (male) also score behind the female in knowledge of pollution ($\bar{x}$ =87.6 against 95.22). This is also in knowledge of sustainable development ($\bar{x}$ =86.88 against 88). The male however take the lead in knowledge of conservation ($\bar{x}$ =85.57 against 83.25); and in knowledge of environmental health ($\bar{x}$ =80.9 against 79.25). Overall the female's average score ($\bar{x}$ =86.1) is higher than the male ($\bar{x}$ =84.5) in attitude to sustainable environmental management. The results presented here are also expressed graphically in figure 4.1 below.

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Figure. 4.1: Chart Showing the Ago-Are Community Members' Knowledge of

Sustainable Environmental Management (with gender as moderator)

From figure 4.1 above, it appears there is some element of variation in the knowledge that male and female members of the Ago-Are community have of the five aspects of environmental management. But there is the need to determine how significant this is. A result of statistical test of this varying degree of knowledge is desirable. Table 4.8 presents the result of chi-square test of the significance of these variations.

Table 4.8: Chi-square Test of the Significance of Variation in the Degree of Knowledge of Sustainable Environmental Management by Male and Female Members of the Ago-Are Community

Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	2.398E3 ^a	207	.000
Likelihood Ratio	1.921E3	207	.000
Linear-by-Linear Association	.898	1	.343
N of Valid Cases	1000		

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From Table 4.8 above, the chi-square value ($\chi^2(1, 207) = 2.398$; $P < .05$) indicates that there is a significant moderating effect of gender on the Ago-Are community members' knowledge of the five aspects of sustainable environmental management. This suggests that being a male or female and its associated roles, may not be a determinant of the degree of knowledge that one acquires or possesses in respect of the environment.

Research

Question

2(b)

Will there be significant moderating effect of gender on Ago-Are residents' attitude to the different areas of sustainable environmental management? Table 4.9 presents the descriptive results showing the post-test scores of male and female members of the Ago-Are community's attitude to sustainable environmental management.

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Table 4.9: The Descriptive Results Showing the Post-test Scores of Male and Female Members of the Ago-Are Community's Attitude to Sustainable Environmental Management.

Gender Attitude to Sustainable Environmental Management	Mean of Percent Correct Score	N	Std. Deviation	Overall Average (%)
Male's attitude to biodiversity	86.3100	100	16.91255	86.75
Male's attitude to pollution	90.2900	100	11.86396	
Male's attitude to conservation	91.1000	100	17.35925	
Male's attitude to environmental health	85.5500	100	12.14173	

Male's attitude to sustainable development	80.4800	100	11.57276	
Female's attitude to biodiversity	92.0200	100	9.70367	93.6
Female's attitude to pollution	94.5400	100	5.49089	
Female's attitude to conservation	96.2200	100	6.46292	
Female's attitude to environmental health	93.1000	100	8.15816	
Female's attitude to sustainable development	92.1600	100	4.79208	
Total	90.1770	1000	12.06886	

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Table 4.9 indicates that male have less ($\bar{x}$ =86.31) post-test attitude to biodiversity than their female community members who had a mean score of 92.05. They (male) also scored behind the female in attitude to pollution ($\bar{x}$ =90.29 against 94.54). This is also in attitude to sustainable development ($\bar{x}$ =86.88 against 88); and ditto for attitude to conservation ($\bar{x}$ =91.1 against 96.22); and in attitude to environmental health ($\bar{x}$ =85.55 against 93.1). Overall the female's average score ($\bar{x}$ =93.6) is higher than the male ($\bar{x}$ =86.75) in attitude to sustainable environmental management.

The results presented here are also expressed graphically in figure 4.2 below.

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Figure. 4.2: Chart Showing the Attitude of the Ago-Are Community Members' Attitude to Sustainable Environmental Knowledge (with gender as moderator)

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From figure 4.2 above, it appears that Ago-Are women have taken the lead in terms of attitude towards the five aspects of environmental management. But there is the need to determine how significant this is. A result of how statistically significant this is desirable. Table 4.11 presents the result of chi-square test of the significance of these variations.

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Table 4.10: Chi-square Test of the Significance of Variation in the Degree of Attitude to Sustainable Environmental Management by Male and Female Members of the Ago-Are Community.

Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	2.319E3 ^a	324	.000
Likelihood Ratio	1.763E3	324	.000
Linear-by-Linear Association	38.723	1	.000
N of Valid Cases	1000		

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From Table 4.10 above, the chi-square value (χ^2 (1, 324) = 2.398; $P < .05$) indicates that there is a significant moderating effect of gender on the Ago-Are community members' attitude to the five aspects of sustainable environmental management. This suggests that being a male or female and its associated roles may influence the degree of attitude that one has towards the environment.

4.2.

Discussion

This study has in the first instance found out that there is a significant effect of community environmental management education (F (2,597) = 134.67; $P < .05$) on Ago-Are residents' knowledge of sustainable environmental management. This suggests that all other things being equal, community members would respond positively by showing improved understanding of sustainable environmental management concepts if they are directly visited and properly taught by competent hands (people who understand the problems of the community and have the knowledge and skills to teach them). This finding agrees with the opinions of Usang (1995), Ukpong et al (1995) and Beer et al (2005) which all indicate that rural people's impacts on the environment are a product of their level of understanding or the lack of information required to act appropriately on the environment, especially in the their day to day occupational activities or in search of means of survival. The finding could thus be addressing the shortcomings which revolve around poor implementation of community-based natural resource management which even though is now attracting widespread international attention, falls short of practical implementation (Leach *et al.*, 1999). This is also suggesting that reaching the people in their immediate community (especially the rural areas) is a good avenue to improve their knowledge of sustainable environmental management and perhaps could be by far better than using the public media (Radio, Television, Newspaper and others)

which are rather only accessible to the urban residents who may not eventually have time to pay attention to such pieces of information - given the demands of their white collar jobs, busy schedules and other infrastructural inadequacies (such as power outage) which are characteristic of urban centres in Nigeria. Second, the study has found that there is a significant main effect of community environmental management education ($F(2,597) = 578.582; P < .05$) on Ago-Are residents' attitude to sustainable environmental management. This also suggests that all things being equal, community members would respond positively by showing improved attitude to sustainable environmental management if they are directly visited and properly taught by competent hands. This finding agrees with the opinions of Harris and Blackwell (1995) which indicate that environmental education, be it formal or non-formal is a tool to achieving sustainable development. According to Harris and Blackwell, environmental education (CEME in this context) does not seek to create awareness and inculcate knowledge only, it also seeks to instill attitude, impart skills and provoke the desire for participation in sustainable environmental management. The finding also buttresses the opinion of USEPA (1994) that community environmental management education assists the community to set priorities and decide how to make the best use of resources to protect people's health and the environment. Such decisions are thus reflections of attitudinal development, which are cardinal objectives of CEME. Results also showed that the participants in the experimental group differ significantly from the control in both attitude and knowledge of sustainable environmental management. This thus confirms that the objective of the International Cambridge Examinations (2012) which indicates that people may have the willingness to review their own attitudes in the light of new knowledge and experiences following an exposure to

environmental management education. This also agrees with the opinions of Arcury (2008)

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and Dechano (2006) that there is a positive correlation between knowledge of environmental problems issues and their attitude towards them. Paul et al (1999) however presents a near disagreement with the direct teaching approach that was done (CEME) here (even though they agree that significant relationship exist between knowing something and developing attitude towards it). They opine that “ecologicistic and moralistic attitudes toward the environment correlated with talking about the environment at home, watching nature alms, and reading about the environment”. But their opinion falls in line with getting information through the media which was earlier said to be problematic and characteristic of the urban centres. However, the ideas of Barr (2007) that the predictors of reduction, reuse, and recycling behavior differed significantly, with reduction and reuse being predicted by underlying environmental values, knowledge, and concern-based variables are supporting the fact that attitude is a determinant of behaviour. Nonetheless, a little exception to this can also be found in the opinion of Arcury (2008) which says that “environmental knowledge is found to be consistently and positively related to environmental attitudes, *although the relationship is not especially strong*”. But whatever this may be, the fact still remains (in the opinion of the researcher) that knowledge and attitude to environmental management correlate positively. This thus suggests that no matter how little the attitudinal change may be, environmental management education is better done than not. Moreover, the study has found out that there is a significant moderating effect (χ^2 (1, 207) =2.398; $P<.05$) of gender on Ago-Are community residents’ knowledge of the five aspects of sustainable environmental management. The initial mindset was that all things being equal, men and women would understand environmental problems alike, and hence

their responses would be similar, if given equal opportunities to learn similar things and air their views on sustainable environmental management. But the reverse is the case. This thus suggests that being a male or female and its associated roles may influence the degree of

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knowledge that one acquires or possesses in respect of the environment or environmental management.

That the female scored higher than the male in their learning outcome in knowledge of biodiversity, pollution and sustainable development presents a scenario that departs from conventional expectations that males may be very much more knowledgeable in these three areas than the females. The assumption is premised on the believe that men appear to be more occupationally involved in environmental impact activities than the women, especially in farming. In deed in Ago-Are (the community being studied), men who are civil servants are also big time farmers, who are expected to have adequate knowledge of plant and animals better than the women. But this study has found that the reverse is the case. The only area where they have demonstrated better knowledge of environmental knowledge is in conservation which is highly expected of them given the characteristics mentioned above. It is also an oxymoron to learn than the male took the lead in the knowledge of environmental health which the women are also supposed to be more knowledgeable of; after all they are saddled with the cleanliness and sanitation of the home and the communities, if gender role is anything to go by. This opinion agrees with the opinion of Ariyabandu (2001) which explains that the gender division of labour leads to major differences between men and women in preparation, responding, and recovering from disasters in the day-to-day life. According to Ariyabandu, gender division of labour prepares women to secure water requirements of the household, preserve food items and seed material for continuity of

livelihoods (especially in the rural areas). The question that may thus be raised here is, are gender roles shifting? The answer to the question especially in relation to the components of sustainable environmental management activities may require a further study. But this researcher may be tempted to state that in the rural areas, there is an overlap in the functions

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and roles that women perform especially as it affects environmental management – just as their various knowledge of the environment management overlap. Similarly, the study has found that there is a significant moderating effect (χ^2 (1, 324) = 2.398; $P < .05$) of gender on the Ago-Are community members' attitude to the five aspects of sustainable environmental management. This suggests that being a male or female and its associated roles may be a good determinant of the degree of attitude that one has towards the environment. In deed the posttest measure of attitude paints a scenario which is a complete departure from that of the knowledge of sustainable environmental management. This is because the female scored higher than the male in all the five aspects of environmental management in attitude to biodiversity, pollution, sustainable development, conservation, and environmental health. This may however not be very amusing as that of knowledge, in that the men in the rural areas are predominant farmers who do not care whose bush is gored when it comes to getting the right type of arable land for their subsistence agriculture. They are noticed as cultivators of virgin land which they believe could bring huge yield in yam production especially. The learned ones amidst them are also noticed to be applying their knowledge of agriculture to want to cultivate large hectares of land for mono-cropping of maize, cowpea, soya beans and the likes. However, the phenomena reported here are in contrast to the findings of Arcury (2008). According to Arcury, environmental knowledge is found to be consistently and

positively related to environmental attitudes. But good enough, he said ‘not to a very strong extent’. The alarming thing however is the concluding part of Arcury’s report which states that “the low level of environmental knowledge has disturbing implications for environmental policy” – perhaps because the person who has low level of knowledge may not be very supportive of what is not known (environmental management in this context). Shrode and Morris (2008) present a research report which has a similar outlook with the outcome of

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this study in terms of attitude of men and women to environmental issues. The study submits that gender, party identification, education, race, and income have an influence on an individual’s concern about global warming. But this current researcher’s keen study of the result (of Shrode’s and Morris’ study) has driven the notion that the influence might not be very significant; and that agrees with the outcome of this study that even though there is a significant moderating effect of gender on male and female’s attitude to sustainable environmental management, the result tilts more positively to the side of the women than the men. Why this is so may also be provoking further study.

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CHAPTER

FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of the study, the emerging conclusion and recommendations.

5.1.

Summary

This study has explored how to mobilize communities of people for environmental management education with the view to determining whether participants would have posttest knowledge that would be significantly better than those who have not been exposed

to such treatment. The study specifically

a. determined the effects of a self-designed community environmental management education prototype on study's participants' knowledge of sustainable environmental management;

b. assessed the effects of a self-designed community environmental management education prototype on study's participants' attitude to sustainable environmental management; and

c. examined the moderating effects of gender on knowledge and attitudinal dispositions of the participants of the study in different areas of environmental management

The specific findings of the study are that all things being equal,

□ rural community members would respond positively by showing improved understanding of sustainable environmental management concepts if they are directly visited and properly taught by competent hands (people who understand the problems of the community and have the knowledge and skills to teach them)

□ knowledge and attitude to environmental management correlate positively as it thus suggests that no matter how little the attitudinal change may be, environmental management education is better done than not.

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□ there is an overlap in the functions and roles that women perform especially as it affects environmental management in the rural areas – just as their various knowledge of the environment management overlap.

□ Even though there is a significant moderating effect of gender on male and female's attitude to sustainable environmental management, the result tilts more positively to

the side of the women than the men.

5.2. Conclusion

Premised on the above findings, it could be concluded that that if proper channels are taken to mobilize people for change, using a good channel, especially when environmental problems that must be addressed are glaring, people will acquire relevant knowledge; but it is not very certain that people would absolutely understand all the issues that are to be addressed at an equal rate. They will also develop good attitude; but male and female participants may also as well not develop equal attitude to environmental concerns. By and large, it is better done than not.

5.3. Recommendations

Given the findings of this study, the researcher wishes to recommend that community environmental management education of this type should be viewed as a pragmatic educational response to the problems and concerns of environmental management; hence efforts must be made to properly organize and implement it, especially among the rural communities whose life depend absolutely on the environment for survival. The study also wishes to recommend that environmental management experts and educators should explore how to replicate this type of study in the urban setting, given the fact that they have the population that may contribute more to environmental degradation than their rural counterparts.

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APPENDIX

II

ADAPTED PROTOTYPE OF COMMUNITY ENVIRONMENTAL MANAGEMENT EDUCATION

1. **Prepare to mobilize the community for action, by**

(a) **The issue** – Community Education for Sustainable Environmental Management

The community – The Ago-Are Community (as described in 3.2. above)

(b) **The community mobilization team** – The Executive Committee of the Ifelodun Ago-Are Community

(c) **Information about environmental issues in the community** - The physical environment of the town has vastly diminished – there is a high loss of biodiversity (of plants and animals); the rainfall pattern is irregular; deforestation is annual and high; desertification is imminent; the health and sanitation conditions are poor; and land, water and air pollution are not seen as wrong or dangerous activities.

Resources – The community has vast land mass that can be used for series of activities, most especially farming which is the predominant occupation of the people. The community is strategically nodal, and makes it essentially receptive to the influx of traders and other business people from Saki, Tede, Ofiki, Irawo, Owo, Sabe, Agunrege, Baasi and the surrounding farm settlements. There is a big World Bank Project Dam that could be explored for irrigation in the dry season and supply of fish protein in commercial quantity. There is a large farmers' cooperative market that belongs to 14 towns and their adjoining villages.

Constraints – The business of the people is constrained to farming, especially cultivation of yam and other arable crops in commercial quantity; but the naturally fertile (virgin) land useful for that purpose is several kilometer away from town as the nearby farmlands have been overused and currently resistant to inorganic fertilizer. There is low level of literacy among the people, especially the women. Their ability to follow any training conducted in English is highly limited.

(d) **The community mobilization plan** – Interact with the leaders of the Ifelodun Ago-Are Parapo. Brief them on the objective of the training and get their support to have access to the leaders of the 50 societies that the community is divided into for ease of administration.

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2. Organise the community for action, by

(a) **Building community relationships, trust, credibility and sense of ownership** - Narrate the essence of training and the advantages derivable there-from.

(b) **Invitation of community participation:** Visit the leaders of the 50 societies that the community is divided into for ease of administration. Secure a nomination of the number of participants needed for the training. Specify the number of men and women required for the training (Use a written letter of invitation).

(c) **The Community Environmental Management ‘Core Group’** - Seek the assistance of knowledgeable members of the community, especially teachers with bias for Geography, Biology, Economics and Agricultural Science. Also seek attention of farmers who do commercial agriculture and the hunters with knowledge of the biodiversity of the community. Invite women of various categories – traders, housewives, farmers and leaders of women societies.

3. Explore the environmental issues and set priorities, by

(a) **Identifying the objectives for the exploration of the environmental issues** – To provide both men and women across societies with community environmental management education with the view to making them to acquire a high level of knowledge of sustainable environmental management and also develop desirable attitude towards it.

(b) Setting the priorities – Training the people to acquire knowledge and develop desirable attitude in the five core areas of sustainable environmental management – Conservation, Protection of Biodiversity, Discouragement of Pollution, Environmental Health and Sustainable Development

(c) Planning the action together

(a) deciding the objectives of the planning process – To have a balanced community environmental management education by having equal number of men and women in the training

(d) Acting together -

(a) **define the team's role in accompanying community action on environmental management** – To acquire knowledge of sustainable environmental management and go ahead to share among members of their society

(b) **strengthen the community's capacity to carry out environmental action plan** – Involve participants in knowledge sharing and clarification of sustainable environmental management concepts e.g. nutrient cycling, water cycling, air
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cycling, sulphur cycling, nitrogen cycling, pollution, environmental health, biodiversity and conservation.

(c) problem-solve, troubleshoot, advise and mediate environmental management conflicts – Clarify issues around meat protein and problem of loss of biodiversity; discuss alternatives such as renewable energy, renewable resources e.g. domestication of animals and fisheries; discuss alternatives to inorganic fertilisers, non-till farming; and pollution. Or simply put, discuss
i. What makes a good environment?

- ii. At what time does environment get bad?
- iii. What are activities that make environment bad? and
- iv. What can be done to make environment good?

(e) Evaluate together

- i. **Conduct participatory evaluation** – Review the training content and ask questions based on the five core areas of sustainable environmental management.
- ii. **Conduct post training evaluation** - Use the test of knowledge and attitude measurement scale.

- iii. **Analyse the results** – Subject the result to statistical analysis

(f) Provide feedback to the community - Seek avenue to disseminate the outcome of the training to community members, exploring the annual community meeting where possible.

(g) Document and share lessons learned and recommendations for the future – Present findings in seminars and conferences and also share with the community members.

(h) Prepare to reorganize – Explore a larger audience than the initial one. Seek funding where necessary in order to scale up.

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APPENDIX I

ORIGINAL PROTOTYPE FOR MOBILISATION FOR SOCIAL CHANGE

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APPENDIX III

TEST OF KNOWLEDGE OF SUSTAINABLE ENVIRONMENTAL MANGEMENT

WRITTEN IN YORUBA LANGUAGE

APPENDIX IV

SUSTAINABLE ENVIRONMENTAL MANGEMENT ATTITUDE SCALE WRITTEN IN YORUBA LANGUAGE
IHA WO LO KO SI AWON ORO AYIKA WONI I

OBAFEMI AWOLOWO UNIVERSITY