

## **THE PLACE OF ENVIRONMENTAL LITERACY EDUCATION IN CANCER PREVENTION AMONG RURAL NIGERIAN COMMUNITIES**

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**ABSTRACT:** *This paper is intended to portray the capacity of Environmental Literacy Education towards cancer prevention in Nigeria, particularly among the country's rural communities. Reliable data from the World Health Organization show that about 1 in 6 deaths is due to cancer globally. For Nigeria, information from the Global Cancer Observatory affirms that cancer is responsible for about 72,000 deaths annually in the country. The rural communities in Nigeria have been shown in this paper to be very much vulnerable to cancer from various sources due to a host of social and economic deprivations, unfavourable environmental factors as well as mass illiteracy and cancer unawareness. Nigeria's cancer prevention and care framework is an advocacy/awareness creation strategy which, unfortunately, lacks some vital content and delivery format. Following detailed analysis of the content, process and outcomes of Environmental Literacy Education (ELE) and its great potential to adequately inform/educate the rural community members about the nature and incidence of cancer and their individual/collective roles towards cancer prevention within their environment, the paper concludes and also recommends that ELE should occupy the pride of place in cancer prevention within Nigeria's rural communities. The paper also suggests and expatiates on the various modes (Formal, Non-Formal and Informal) through which the required ELE could be effectively implemented.*

**KEYWORDS:** environmental literacy, education, cancer, prevention, Nigeria's rural communities, vulnerability to cancer.

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### **INTRODUCTION**

#### **Some Vital Basic Information on Cancer Incidence and Prevention**

##### **The Notion of Cancer**

Cancer is a generic term applicable to a large group of diseases (including malignant tumours, neoplasms and so on) associated with the growth of abnormal cells in the human body when the body's normal control mechanism stops working (Oncopadi.com, 2020). A defining feature of cancer, however, is a rapid creation of abnormal cells that grow beyond their usual bounds, invading adjoining parts of the body and spreading to other organs in a

process referred to as *metastasis*, which process is recognized to be the major cause of death from cancer (WHO, 2018).

### **Types and Causes of Cancer**

Several types of cancer have been identified in relation to the organs or parts of the human body in which they occur. A number of them have been identified as the most common which collectively accounted for an estimated 9.6 million deaths globally in 2018 (WHO, 2018; Globocan, 2019). These include lung, breast, colorectal, prostate, skin, stomach, liver, cervix uteri, ovarian, pancreas and blood (leukemia) cancers.

Any substance or agent that causes and has the potential to cause cancer is known as a *carcinogen*. Carcinogens are usually classified according to their sources or agents. Accordingly, the World Health Organization (WHO) has succinctly described the causes of cancer as follows (WHO, 2018; p.2):

*Cancer arises from the transformation of normal cells into tumour cells in a multistage process that generally progresses from a pre-cancerous lesion to a malignant tumour. These changes are the result of the interaction between a person's genetic factors and 3 categories of external agents, including:*

- i. physical carcinogens, such as ultraviolet and ionizing radiation;*
- ii. chemical carcinogens, such as asbestos, components of tobacco smoke aflatoxin (a food contaminant), arsenic (a drinking water contaminant); and*
- iii. biological carcinogens, such as infections from certain viruses, bacteria, or parasites.*

### **Environment and Cancer Prevalence**

Man's environment could rightly be seen as a nexus of objects, conditions and circumstances which create a complex system of physical, chemical, social, biotic and abiotic factors. These factors act upon man as an individual, and even upon an ecological community within an ecosystem, ultimately affecting life and living conditions (Eheazu, 2016).

The '3 categories of external agents' described by WHO (2018) in the indented quotation above, in contrast to 'genetic factors', are generally referred to by scientists as "environmental factors of cancer" (NIH, 2003: p.1). Parsa (2012) even noted that contemporary biological mechanisms of cancer, suggest that all cancers originated from a combination of both multiple external (environmental) factors and genetical changes in

response to ageing, heredity and viral/bacterial infections. To determine the respective contributions of environmental and genetical risk factors to cancer prevalence, a number of data- and model-driven studies have been conducted, especially since the last few years (2015 precisely) to rebut a claim by two scientists (Tomasetti and Vogelstein, 2015) that majority of the variation in cancer risk among tissues is due to “bad luck” more than environmental factors or inherited genes as previously canvassed. Prominent among the said data- and model-driven studies are those by Wu et al. (2015), Stony Brook University (2015) and Whiteman (2015). These studies respectively established that life style, human behaviour and the environment (extrinsic factors) contribute 70 – 90% of cancer incidences.

Several substances in the environment have been identified to cause or are likely to cause cancer in humans, generally, where they exist (Hantel, 2018). The range and diversity of these substances are too numerous to accommodate in a paper of this kind with constraining space limitations. However, in view of their relevance to further discussion on the topic of the paper, examples of the biological, biophysical and biochemical extrinsic (environmental) carcinogens, their sources and sites of attack, are listed in table 1 below.

**Table 1: Examples of Sites and Sources of Extrinsic biological, biophysical and biochemical Carcinogens in Humans**

S/No	Carcinogens	Cancer Sites	Sources
1.	Arsenic	Lung, Skin	Metal smelting, insecticides, herbicides etc.
2.	Asbestos	Lung	Roofs, floor tiles etc.
3.	Benzene	Blood and lymph nodes	Petroleum, detergents, rubber etc.
4.	Cadmium	Prostate	Battery, painting, paints etc.
5.	Chromium	Lung	Preservatives, paints etc.
6.	Ethylene oxide	Blood	Gases from burnt polythenes, gases, fruit ripening agents etc.
7.	Nickel	Nose, lungs	Battery, ceramics, ferrous alloys
8.	Vinyl Chloride	Liver, brain	Regenerator gas, glues.
9.	Smoke	Lung, colon	Cigars, air pollution, smoke from cars, burnt polythenes.
10.	Hair dyes	Bladder	Hair dressers, barbers
11.	Soot	Skin	Chimneys
12.	Sunlight radiation	Skin	Excessive exposure to ultra violet radiation from the sun.

Adapted from: Parsa, N. (2012) table 1, p.3; NIH (2003), pp.7-12.

### **Prevention of Cancer**

The term ‘prevention’ has been given various definitions, but the most pertinent to cancer seems to be that on disease prevention. According to the Dictionary of Epidemiology (Porta, 2014), prevention of a disease refers to actions aimed at eradicating, eliminating, or minimizing the impact of the disease and its associated disability; or if none of these is feasible, retarding the progress of the disease and related disability. In apparent corroboration of this general definition of disease prevention, the Nigeria National Cancer Control Plan (NNCCP) has defined cancer prevention as (NNCCP, 2018-2022, p.16):

*The reduction of cancer mortality via reduction in the incidence of cancer ... by avoiding a carcinogen or altering its metabolism; pursuing lifestyle or dietary practices that modify cancer causing factors or genetic predispositions, medical interventions (e.g. chemotherapy); vaccination or risk reduction surgical procedures.*

Beyond definition, the International Agency for Research on Cancer (IARC) has postulated that cancer prevention occurs at three levels – primary, secondary and tertiary. The agency further explains the levels as follows (IARC, 2019, p.4):

*Primary prevention consists of actions that can be taken to lower the risk of developing cancer. Secondary prevention entails methods that can find and ameliorate precancerous conditions or find cancers in the early stages, when they can be treated more successfully. Tertiary prevention is the application of measures aimed at reducing the impact of long-term disease and disability caused by cancer or its treatment.*

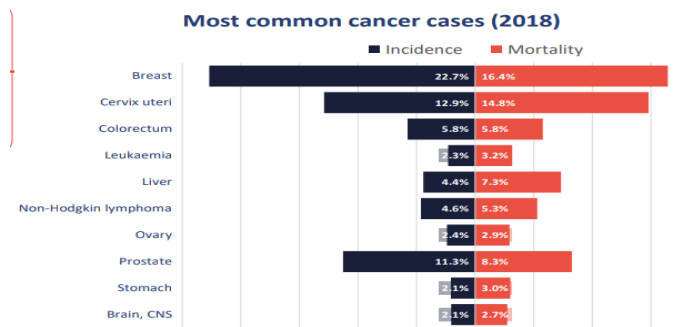
A close examination of table 1 above on the extrinsic sources of cancer in humans would reveal that modifying, avoiding or adopting desirable behavioural responses to life-style-related risk factors should be considered an important part of the cancer prevention processes, as it can significantly reduce the global incidence, mortality and economic impact of cancer.

**CANCER INCIDENCE AND ITS CHALLENGES IN NIGERIA**

As reported by Oncopadi.com (2020), cancer is responsible for 72,000 deaths every year in Nigeria, with an estimated 102 new cases annually. This mortality rate of cancer was also confirmed by Nigeria’s Minister of Education in a publication by Punch Newspapers (Ehanire, 2020). The incidence and mortality of cancer in Nigeria have been expounded by Globocan (2018,2020, 2021) with particular reference to top five cancers of greatest burden in the country; namely, breast, prostate, cervix uteri, colorectal and Non-Hodgkin lymphoma (usually referred to as lymphomatic cancer).

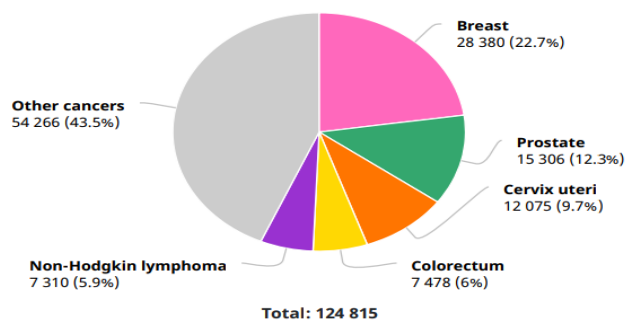
According to Globocan’s account, these five top cancers recorded a total of 66,390 (57.3%). Out of overall total of 115,950 cancer cases in Nigeria in 2018. As fig.1A below shows, and in relation to their respective incidences as percentages of the said overall total number of cancer cases in Nigeria in 2018 (115,950), breast cancer had the highest incidence (with 22.7%), followed by cervical, prostate, colorectum and Non-Hodgkin Lymphoma in that descending order. In 2020, the five top cancers in Nigeria under reference, recorded a total of 70,549 (56.5%) of the overall total of 124,815 cancer cases diagnosed in Nigeria. As fig. 1B below shows, in terms of their respective incidences as percentages of the overall total number of cancer cases (124,815) diagnosed in Nigeria in 2020, breast cancer still came first with 23,380 (22.7%) of the overall total cancer cases diagnosed. The other four top cases followed with lower incidences which, this time, placed prostate cancer second and cervix-uteri; third, while Colorectum and Non-Hodgkin Lymphoma maintained their fourth and fifth positions respectively as was the case in 2018.

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(A) 2018: Total: 115,950.



Source: Globocan (2018)

(B) 2020 Total: 124,815.



Source: Globocan (2020)

**Fig. 1 (A & B): Most common Cancer Cases in Nigeria: 2018;2020.**

On the level of challenge posed by cancer in Nigeria, Globocan (2019) has noted that based on the 2012 global data, the mortality incidence ratio of cancer for Nigeria is particularly challenging. For instance, the data show that while in the United States of America 19% of all breast cancer cases resulted in death, the death rate was 51% in Nigeria; i.e. almost triple that of America.

The purpose of this paper is to examine the vulnerability of Nigeria's rural communities to the various environmental and lifestyle-related factors of cancer and therefrom ascertain the place of environmental literacy education in cancer prevention among the communities.

## **RURAL COMMUNITIES IN NIGERIA AND THEIR VULNERABILITY TO CANCER**

### **Profile of the Nigerian Rural Communities and Environments**

As already explained elsewhere (Eheazu, 2017b), the concept, *rural*, is usually subjected to a variety of definitions because of the varied and non-universal indices used to delineate a rural entity, such as a community. For instance, while the National Bureau of Statistics of Nigeria (2009) defines rural areas in Nigeria as communities with less than 20,000 people, the United States of America Census Bureau (1995) considers a community not above 2,500 inhabitants as rural. Whatever yardstick is adopted to define a rural area or community, a basic attribute of rural entities in Nigeria is that, as has long established also for other developing countries (UNESCO, 1980), the greatest percentage of Nigeria's population are found in the rural areas. For instance, the World Bank (2016) has shown that the population

statistics of Nigeria's rural communities were 53% and 52% of the country's total population in 2014 and 2015 respectively.

Unfortunately, this teeming rural population is characterized by a host of social and economic problems, including high levels of illiteracy and low economic returns from occupational endeavours essentially caused by low productivity from the main livelihood (subsistence agriculture), and inadequate road networks and transportation systems for exchange of goods and services. In 2010 for instance, 50.5% of adults in rural Nigeria were illiterates in any language (NMEC, 2010). There are also the problems of inadequate health provisions. Olisa and Obiukwu (1992, p. 65) summarize this sombre situation in the following words.

*The main features of rural areas are depression, degradation and deprivation. Many rural villages are immersed in poverty so palpable that the people are the embodiment of it. In most rural areas in Nigeria, basic infrastructure where they exist at all, are too inadequate for meaningful development.*

Additional to the above documented unhealthy conditions in Nigeria's rural communities, is the existence of some other factors which researchers have identified as promoting the vulnerability of the communities to cancer. The factors include:

- environmental pollution;
- inadequate rural electrification
- drought and desertification;
- food insecurity, hunger and malnutrition;
- unhealthy sources of potable water;

To do justice to the topic of this paper, it would be important to highlight, albeit briefly how the above listed factors individually or in various combinations make rural populations vulnerable to some cancer types in Nigeria.

**i. Environmental Pollution and inadequate provision of electricity in Nigeria's Rural Areas**

Environmental pollution could simply be defined as introduction into the natural environment of contaminants that cause adverse changes. Among the several forms of contaminants that pollute the environment are (Wikipedia, 2015) Polycyclic Aromatic Hydrocarbons (PAHs). PAHs have been identified as containing carcinogenic substances and thus they constitute a major risk factor of cancer (Bostrom et al., 2002), particularly Colorectal Cancer (CRC) (Irabor, 2014). PAHs and other toxic substances (quinones) which

are also cancer causing (carcinogenic) are present in vehicle exhaust fumes as well as in exhaust fumes from electricity generators. Although there is inadequate provision of electricity in Nigeria generally, the rural areas are the worst hit (see images 1A and 1B in the Appendix to this paper). In effect, many of the rural households depend on their private generators to obtain energy and illumination. Accordingly, many of the rural inhabitants in Nigeria are exposed mostly to the carcinogenic substances (PAHs and quinones) from the generator exhausts. Again, Irabor (2014, p. 62) has further revealed that poor electricity services in Nigeria, especially in the rural areas has also led to poor refrigeration facilities, which in turn has encouraged the consumption of “deep-fried, smoked and charcoal grilled animal (including fish) protein” which he says are contributory to “reasons for increased Colorectal Cancer (CRC) incidence in Nigeria”. Additionally, incessant inhalation of various types of smoke from domestic cooking (especially from kerosene stoves) and burning of plastics contribute to vulnerability to the incidence of lung cancer in both Nigeria’s rural and urban communities (see S/No 9 in table 1 above).

## ii. Drought, Desertification and Cancer Incidence in Rural Nigeria

Although various criteria may be used to define drought (Olagunju, 2015), nonetheless, a drought may be simply and eclectically defined as a prolonged period with less than average precipitation within a given region, causing serious imbalance in soil water and thus adversely affecting/degrading natural resources (vegetation cover, soil moisture and so on) which usually promote land productivity. Desertification, on the other hand, involves the formation and extension of degraded areas of soil and vegetation cover caused by climatic variations (drought especially) and anthropogenic (human) activities (Wright and Nebel, 2002).

Nigeria is one of the Sub-Saharan African countries with serious desertification challenges. Olagunju (2015, pp. 196-197) reports the seriousness of the situation as follows:

*Desertification phenomenon has been reported in the northern Nigeria since 1920s, but the impact has been more glaring since the famine of 1971 to 1973 in this part of the country. Desertification affects fifteen northern-most states of the country ... and almost one-fifth of the total Nigeria land area is becoming desertified.*

The impacts of desertification are varied and far-reaching, ranging from loss of biodiversity and habitat, food insecurity, water scarcity, general socio-economic hardship to political unrest (Olagunju, 2015). Regarding cancer incidence, it has been noted that deterioration of vegetation, which is one of the consequences of desertification, results in outdoor workers (especially farmers and other agricultural labourers) being exposed to direct influence of excessive solar radiation which is capable of causing skin cancer and other diseases,



particularly on the hands, neck and face which are most frequently exposed to the sun. Obviously, skin cancers and other diseases should be most expected among rural populations in Nigeria and other Sub-Saharan African countries facing desertification as described above, especially given their low levels of illiteracy and environmental awareness as also already established in this paper. The scarcity of clean potable water occasioned not only by drought and desertification, but also by government neglect of rural health infrastructure as cited earlier, constrains the rural populations to obtain water from natural but unhealthy sources, including harvesting rain water from house roof tops (see plates 3A to 3D in the Appendix here). Many of such house roofs are made of asbestos sheets which are said to be carcinogenic (see S/No 2 in table 1 above). Water harvested from such roofs in a manner shown in plate 3D in the Appendix is likely to cause asbestosis (a lung cancer) when ingested. It is also established that inhalation of asbestos fibres could equally cause lung cancer and other diseases (Mayo Clinic, 2019).

### **iii. Food Insecurity, Hunger and Malnutrition as Factors of Cancer Vulnerability Among Rural Populations in Nigeria**

The deleterious negative effects of food insecurity, hunger and malnutrition are captured by the United Nations Education Scientific and Cultural Organization (UNESCO) devotion of Sustainable Development Goal 2 (SDG2) to the eradication of hunger, achievement of food security, improvement of nutrition and promotion of sustainable agriculture globally (UNESCO, 2017). One could adopt related words of Akinyele (2009, p.4) to define food insecurity as “a condition in which people do not, at all times, have physical, social or economic access to sufficient, self and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. Hunger, on the other hand though a multidimensional phenomenon, is defined by the Food and Agriculture Organization (FAO) as an uncomfortable or painful physical sensation caused by insufficient consumption of dietary energy otherwise known as calories and micro-nutrients required to lead a normal, active and healthy life (FAO, 2012). Hunger also arises when there is lack of access to any form of food at all. In a way therefore, hunger is a product of both food insecurity and poverty; and so is malnutrition which indeed is a very serious consequence of food insecurity. In brief, malnutrition usually results from eating a diet or habitual meal that does not supply a healthy amount of one or more nutrients required to live a healthy life or one that has so many nutrients that the diet causes such health problems as obesity. A lack of requisite nutrients in a meal is usually referred to as undernutrition or undernourishment; while a case of surplus nutrient is called overnutrition. Much of the cases of malnutrition in rural Nigeria is caused by undernutrition. According to the Global Hunger Index (GHI), Nigeria ranked 98<sup>th</sup> of the 107 countries with serious levels of hunger, undernourishment and other indices of malnutrition (GHI, 2020).

In the rural communities of Nigeria specifically, hunger and malnutrition are rife as the rural population depends largely on subsistence agriculture which hardly meets the food need of

the people. Besides, most rural people in Nigeria are so poor that they are unable to purchase appropriate amounts and quality of food needed in their homesteads. Plates 2A, 2B and 2C in the Appendix here provide images of the problem of and actions to combat hunger and malnutrition in rural Nigeria. Plates 2B and 2C, in the Appendix, illustrate the efforts of a foreign organization, “Action Against Hunger” in this direction. Malnutrition has been identified as a risk factor of cancers (including colorectal and colon cancers) among its other challenges on human health and child development (Irabor, 2014; Wikipedia, 2021). Accordingly, malnutrition is one of the factors promoting the vulnerability of Nigeria’s rural inhabitants to cancer.

### **NEED FOR SPECIAL STRATEGIES FOR CANCER PREVENTION IN NIGERIA’S RURAL COMMUNITIES**

The meaning of “cancer prevention” has been clearly explained in the introductory section of this study by reference to the Dictionary of Epidemiology (Porta, 2014). The three levels of cancer prevention have also been elucidated in the same section of this study as postulated by the International Agency for Research on Cancer (IARC, 2019). Furthermore, the high rates of cancer incidence and mortality challenges in Nigeria have equally been articulated earlier here. The information already provided in the said sections of this paper provide deductive hints on the quantum of cancer incidence one would expect in Nigeria’s rural communities. Again, in the light of the exposed several risk factors that make Nigeria’s rural dwellers vulnerable to cancer, it would be stating the obvious to say that cancer incidence in the rural communities is multidimensional and thus requires special strategies for its prevention.

#### **Present Strategies for Cancer Prevention in Nigeria’s Rural Communities**

So far in this paper, the ignorance and lack of awareness among Nigeria’s rural populations about the causes, prevention and treatment of cancer are notable. More information on the situation have been provided also by researchers. For instance, in their study on “cervical cancer awareness and screening uptake among rural women in Lagos, Nigeria”, Oluwole et. al. (2017) made the following among other findings:

- i. low awareness of cervical cancer and screening uptake among the respondents;
- ii. overall knowledge was equally poor;
- iii. respondents showed strong willingness for screening.

The researchers in their recommendation harped on the need for community education and awareness creation on cervical cancer among the rural women. These findings and the recommendation appear to be corroborated by those of Odukoye and Fayemi (2018) who, in their own study compared Rural-Urban Knowledge, Risk Factors and Preventive Practices for Colorectal Cancer (CRC) among adults in Lagos State of Nigeria. The latter researchers

discovered, among other facts, that only 13.5% of the rural respondents had some knowledge of CRC. Nigeria realizes the importance of awareness creation regarding the incidence and control of cancer in the country, hence in her current National Cancer Control Plan (NNCCP), she declares (NNCCP, 2018-2022, pp. 24-25):

*Currently, cancer control sensitization activities at all levels of government are very low or non-existent. Although human resources for cancer advocacy is poor, existing structures such as primary health care systems (PHC's), community based organizations and health workers are opportunities for advocacy. We have able existing structures mainly for HIV prevention that is motivated by NGOs and international organization's support and funding. If such can be sought for and applied to cancer control and prevention we are going very far.*

From this excerpt, it is obvious that Nigeria adopts advocacy as her approach/strategy for the necessary awareness creation on and control of cancer among her people. This strategy is further clarified in table 2 below and most probably accounts for the high level of ignorance and general lack of awareness of the causes and approaches for prevention and treatment of cancer among Nigeria's rural communities as reported above from related research findings.

**Table 2: Nigeria's Advocacy Framework for Cancer Prevention and Care**

Objectives	Strategies	Performance indicator
1. To plan and conduct effective cancer awareness and sensitization activities across the 36 states and FCT by 2022	1.1. National, Zonal, States, local government and grassroots cancer education and awareness.	Number of States implementing cancer awareness activities based on the national cancer control plan (2018-2022)
2. To increase by 25% yearly, human resource capacity in advocacy for effective cancer control among stakeholders in all sectors of society.	2.1 Capacity Building in advocacy for maximum dissemination of information on cancer control	Number of community health workers, nurses, journalists, clergy, youths and community leaders.
3. Advocate for the mainstreaming of cancer prevention interventions into existing structures at all levels by 2022.	3.1 Involve varied societal groups in the cancer awareness.	Percent of institutions at (primary and secondary levels) implementing prevention intervention.
4. To continuously advocate for cancer care and control legislation and support from policy makers, community leaders and philanthropists until 2022.	4.1 To advocate for additional registries.	Number of new Cancer care and Control legislation/policies passed.
5. To mitigate harmful cultural practices and beliefs.	5.1 Engage community influences and leverage on media links.	Number of sensitization meetings dialogues and trainings held with herbalists and faith healers.

Source: NNCCP (2018-2022), p. 25.

An analysis of the content of table 2 above reveals that though somewhat commendable, Nigeria's advocacy framework for cancer prevention and care lacks the ingredients and format of a sustainable mass education/awareness creation programme which should take into consideration the various classes of the citizenry concerned – the literate, illiterate, adolescents and adults. Besides, there is virtually no vivid depiction of how to cover various risk factors of cancer – environmental, lifestyle, poor diet and so on. Accordingly, there is a need to adopt at least as a necessary supplement to the advocacy framework, an education/awareness programme that would accommodate these omissions and further apply the appropriate method and techniques in situation-specific programme planning and communication processes (Eheazu & Akpabio, 2018). More importantly, the pre-eminent position of environmental and life-style-risk-related factors of cancer, also known as External Agents (NIH, 2003; Parsa, 2012) as well as the high levels of illiteracy among rural Nigerian communities (which were discussed earlier in this paper), make it necessary that an environmentally oriented literacy education programme be made a major part of a cancer prevention programme for the communities at every level of the programme – primary, secondary or tertiary (IARC, 2019). This brings to the fore the need to adopt Environmental Literacy Education (ELE) as a strategy for cancer prevention in Nigeria's rural communities.

## **THE CONCEPT, CONTENT AND PROCESSES OF ENVIRONMENTAL LITERACY EDUCATION FOR CANCER PREVENTION IN NIGERIA'S RURAL COMMUNITIES**

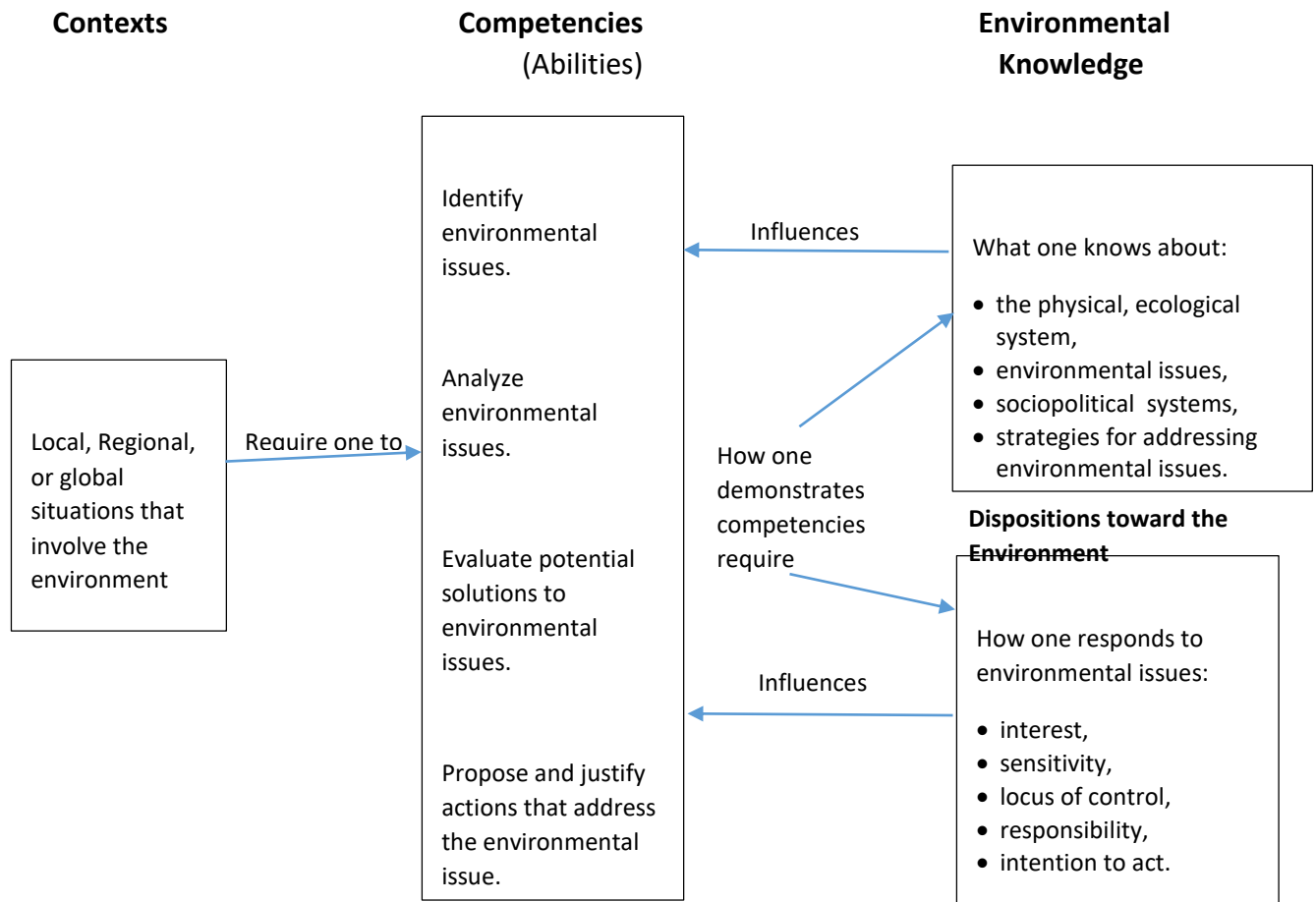
### **Concept and Content of Environmental Literacy (EL)**

Environmental literacy is one of the literacies that have emerged from the necessity to expand the original reference to the term *literacy* as the *ability to read and write and enumerate using symbols*, in order to cater for the need to internalize and apply the massive advancements in human knowledge, science, technology and human experiences which constitute important elements of modern life (Eheazu, 2013). Thus, just as there exist today, notions of literacies like computer literacy, adult literacy, digital literacy, visual literacy and so on, environmental literacy has become recognized as comprising an awareness of and concern about the environment and its associated problems, as well as the knowledge, skills and motivations to work towards solution of current problems and the prevention of new ones. Roth (1992, p.16) briefly outlines the content of Environmental Literacy (EL) as consisting of:

*... a set of understandings, skills, attitudes and habits of mind that empowers individuals to relate to their environment in a positive fashion and to take day-to-day and long term actions to maintain or restore sustainable relationships with other people and the biosphere ... The essence of EL is the way we respond to the questions we*

*learn to ask about our world and our relationship with it;  
the ways we seek and find answers to those questions; and  
the ways we use the answers we have found.*

In the same vein, the North American Association for Environmental Education (NAAEE) has identified four interrelated components of EL acquisition as competencies (Abilities), Knowledge, Dispositions and Environmentally Responsible behaviour (NAAEE, 2011). The Association has also identified contexts (from local to global) within which these components of EL acquisition are manifested as shown in fig. 2 below.



Adapted from: NAAEE (2011, p. 5)

**Figure 2. Contexts and Components of Environmental Literacy (EL)**

### **Process and Outcomes of Environmental Literacy Education**

Environmental Literacy Education (ELE) could be defined as the process of disseminating the above components of EL in order to develop in beneficiaries environmental responsible behaviour, expected of environmentally literate persons, which Hungerford et al. (1994) have identified to include:

- i. Belief in their ability, both individually and collectively, to influence decisions on environmental problems and issues; such as how to avert some cancer-related impacts of drought, desertification and pollution.
- ii. Assumption of responsibility for personal actions that would positively influence or avert environmental and lifestyle risk factors of various types of cancer.
- iii. Personal and/or Group involvement (inclusiveness) in environmentally responsible behaviours; such as tree planting to minimize personal exposure to excessive solar radiation which is capable of causing skin cancer on farmers and other outdoor workers.
- iv. Persuasion – e.g. using informal discussion to encourage one another to support a positive environmental position or action such as speaking directly to elected political officials to (a) improve rural electrification to avoid carcinogenic substances which emanate from generator exhaust and deep fried, smoked or charcoal-grilled protein in the absence of reliable electricity for illumination and refrigeration; (b) seek ways of improving food security to avoid malnutrition which has been identified by researchers as a risk factor of colorectal and colon cancers.

From the attributes of an environmentally literate person and the components of EL highlighted above, it stands clear that the development of environmental literacy is a multifaceted process which begins with basic environmental knowledge inculcation and acquisition. This basic knowledge component is predicated on the idea that before an individual can act on an environmental problem, that individual must first understand the problem (Pooley and O'Connor, 2000). The next step is training of the individual towards the application of their acquired knowledge to investigate and evaluate environmental issues and apply appropriate solutions. Finally, the individual must be equipped to be able to choose which course of action is best in a given situation. The said multifaceted process is applicable, if appropriately designed, at every level of education, including basic, formal, non-formal and informal as well as higher education. This presupposes that ELE could take place through every form of education – formal, non-formal and informal. In all, considerable attention must be paid to stressing the importance of viewing the environment within the context of human influences and environmental literacy as a vital goal for society (UNCED, 1992; United Nations, 2002).

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## **ELE for Promotion of Knowledge of the Nature, Causes and Preventive Processes of Cancer among Nigeria's Rural Communities**

From the above analysis of the components, process and expected outcomes of ELE and the already discussed demographics of rural communities in Nigeria, including their illiteracy levels, it is obvious that ELE has an important role to play towards the achievement of cancer prevention among the rural populations under focus. In performing this role, three major groups of rural community members would be targeted; namely, (i) young students/adolescents in formal education institutions; (ii) the illiterate and less educated rural adult population who may be farmers, herds keepers and/or fisher folk; (iii) the more informed rural community leaders. In effect, ELE for cancer prevention in rural Nigeria would have to adopt *Formal*, *Non-Formal* and *Informal* modes to accomplish its objectives as briefly discussed below.

### **The Formal Mode**

This mode would involve inclusion in appropriate sections of the syllabuses/programmes of the basic literacy, secondary and tertiary educational institutions being attended respectively by illiterate adults, adolescents and young adults in Nigeria's rural communities of relevant knowledges, skills and responsible behaviours required for the inculcation of the four expected attributes of the environmentally literate listed and summarized by NAAEE (2011) in fig. 2 above and further highlighted by Hungerford et. al., (1994), especially with respect to prevention of cancer in Nigeria's rural communities. The methods of delivery would be pedagogical for the secondary school young adults and adolescents, but andragogical for the adults in the basic literacy and tertiary institutions (Eheazu, 2017a).

### **The Non-Formal Mode**

The non-formal mode of ELE is an alternative to the institutionally based formal mode. Accordingly, it is not systematically or hierarchically arranged like in a school curriculum, but would address individual, group and community needs for awareness of environmental and lifestyle issues of cancer prevalence and prevention in Nigeria's rural communities and the responsibility of stakeholders to tackle them. The programme would be implemented virtually *in situ* or centrally, as many of the rural community members involved may not be able to leave their places of domicile. In effect, town halls, fishing ports, school halls, basic literacy centres, and so on would serve as veritable centres for the Non-Formal ELE on cancer prevention. The components of the programme would include the learning objectives and requisite behavioural changes identified by Hungerford et. al. (1994). and NAAEE (2011) as shown above, and would aim to enhance individual and group participation in activities that would promote acquisition of appropriate knowledge and skills as well as the motivation to work towards the solution of current environmental and lifestyle issues promoting their vulnerability to cancer and how to prevent new ones from emerging. The Non-Formal mode of ELE will take the forms of cancer education and awareness creation seminars and town hall meetings, conferences, workshops and short training programmes to

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be designed and organized by environmental literacy and community development education experts, who are also professionals in adult education, from relevant educational institutions. The programme would be funded by relevant Education Ministries in collaboration with local and international donor agencies like WHO and UNESCO under the auspices of the Nigeria National Cancer Control Plan (NNCCP).

### **The Informal Mode**

In the informal mode of education generally, learning takes place spontaneously, unintentionally and accidentally. It is also education that occurs outside an institutionalized or school setting and which is usually informative. It could take place anywhere and anytime. However, differences exist in delivery methods and materials between one type of informal education and another, based on the objectives to be achieved and the nature and dispositions of the target beneficiaries (Eheazu, 2016). In the context of the topic under discussion, the informal ELE being referred to, is the type that would focus on the need for the Nigeria's rural communities to embrace the various levels and methods of cancer prevention through the acquisition of relevant knowledge, skills, the necessary behavioural change and the application of same as already discussed under the non-formal mode above. The ultimate aim would be the inculcation of desirable attributes of the environmentally literate among the rural Nigerian community members as presented in the relevant section of this paper above. The radio, the television, bill boards and mobile megaphones (where practicable) are among the channels to be used to impart the requisite learning via the informal mode of ELE. Accordingly, well designed radio jingles and talks, television dramas, large attractive posters at strategic locations as well as information passed through mobile megaphones and loud speakers could be used to provide the desired Informal ELE to the rural communities. The services of environmental literacy and community development educators and professional artists would be required to design and midwife the Informal ELE programmes which should be funded by the various tiers of government in Nigeria (Federal, State and Local), with possible assistance from other agencies as mentioned in the case of Non-Formal ELE above.

### **CONCLUSION**

The notion, types and potential causes (risk factors) of cancer have been essentially discussed in the presentation above. Equally highlighted are research studies which have reported that lifestyle, human behaviour and the environment (extrinsic factors) contribute most (between 70 and 90%) of cancer incidences globally. In the case of Nigeria, both research studies and experience have proven that cancer is responsible for about 72,000 deaths in the country annually, with breast, prostate, cervix-uterine, colorectal and lymphomatic cancers being the most prevalent. After examining the vulnerability of Nigeria's rural communities to the various environmental and life-style-related factors of cancer fueled by ignorance and illiteracy, and following a comprehensive analysis of the



components and the expected outcomes of Environmental Literacy (EL) as provided by such agencies and experts as NAAEE (2011) and Hungerford et.al (1994) vis-à-vis Nigeria's ineffective advocacy/awareness creation strategies towards prevention of cancer, this paper concludes that Environmental Literacy Education (ELE) occupies the pride of place as a special education/awareness creation programme required for Nigeria's rural communities to acquire the necessary knowledge, skills and behaviour they need to effectively participate in cancer prevention within their environment. The paper has also gone further to suggest and discuss the various modes (formal, non-formal and informal) whereby the required ELE could be delivered to the target beneficiaries.

## RECOMMENDATION

In view of the lucid discussions on the topic of this paper and the conclusion arrived at, it has become glaringly appropriate to recommend that Environmental Literacy Education be adopted and made part of the Nigerian National Cancer Control Plan (NNCCP) to provide the necessary education and awareness creation needed by rural Nigerian communities to minimize their striking vulnerability to cancer arising mainly due to ignorance, illiteracy and their lack of the necessary skills and behaviour to counter especially, environmental and lifestyle risk factors in the rural environment.

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## APPENDIX

### SOME PROFILE IMAGES OF NIGERIA'S RURAL ENVIRONMENTS AND PEOPLE

#### 1. Poor electrification & little access to energy



1A



1B

Source of Images (1A & 1B): *Alamy Stock Photos*

#### 2. Hunger and Malnutrition: The Problem and Actions to combat it



2A

Source of Image 2A: <https://deeply.thenewhumanitarian.org>



2B



2C

Source of Images 2B & 2C: <https://www.actionagainsthunger.org>

**3. Some of the Many Unhealthy Natural Sources of 'Potable' Water in Nigeria's rural areas.**  
(3A & 3B: Surface ground water; 3C: Man-made pond water; 3D: Harvested rain water)



3A



3B

Source of mages 3A & 3B: *The guardian, Nigeria*



3C

(image 3C): en.wikipedia.org



3D

(i) Underground Tank (ii) Surface Tanks

Source of Image 3D:

<https://www.semanticscholar.org>

#### 4. Poor Environmental Sanitation in many rural areas and efforts towards improvement



4A

Source (Image 4A): The Guardian, Nigeria



4B

Source of Image 4B: The World Bank