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Role of Environmental Literacy Education in the Realization of SDG6 in Rivers State of Nigeria: A Case Study

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Abstract

Sustainable Development Goal 6 (SDG6) was adopted by the United Nations (UN) in 2015 for the purpose of ensuring availability and sustainable management of clean water and sanitation for all humanity by the year 2030. The UN considers realization of SDG6 an issue of utmost concern to governments and citizens all over the world. The purpose of the research study reported in this paper was to crystalize the role of Environmental Literacy Education (ELE) in the process of SDG6 realization in Rivers State of Nigeria. Two Local Government Areas (LGAs) of the State were used for case study. Two Research Questions and a Null Hypothesis guided the study. A questionnaire was used to provide data needed for the study. The population of the respondents was 7,717. A random sampling technique was adopted to select 20% of them for the study. Mean responses and the T-test were employed to analyze obtained data. The findings revealed general inadequate provision of clean water and effective sanitation management due to very low impact of the activities of Stakeholders entrusted with achievement of SGD6 in Rivers State. To remedy the lapses discovered, the researchers delineated five situation-specific ELE programmes, integrating relevant aspects of the UN Education 2030 Agenda for SDG6. The programmes clearly portray the vital role of ELE towards achievement of SDG6 and have thus been recommended, with their modes of implementation, for adoption by the Rivers State.

Keywords: case study, environmental literacy education, Nigeria, Rivers State, stakeholders, sustainable development goal 6

1. Introduction

1.1 Some Basic Facts

In 2015, the United Nations (UN) adopted 17 Sustainable Development Goals (SDGs) which are to be achieved by the year 2030 (UN, 2015). These goals are aimed at fostering humanity's survival through, among other processes, sustainable management of clean water and sanitation for all, reduction of poverty, protection of biodiversity, and promotion of peace and prosperity globally. It is pertinent to note that all the 193 member states of the UN (including Nigeria) agreed to work towards achieving these SDGs by aligning their national interests in the light of the goals. Many of the developing countries like Nigeria are struggling to provide basic utilities such as clean water and sanitation services. Ugwu and Ogunremi (2019) succinctly disclose that the Sustainable Development Goals serve as a target as well as yardstick for every country to measure and explore her response to and business of making life conducive for her present and future citizens. In all, however, the SDGs, as a pivot of the UN 2030 Agenda, target African and other countries facing special developmental challenges (OSAA, 2018).

SDG6 aims to ensure availability and sustainable management of clean water and sanitation for all mankind. As rightly observed by Ibrahim and Osman (2020), water resources are intertwined with all forms of human needs; namely, food security, health promotion, poverty reduction, sustaining economic growth through agriculture, industry and energy generation, as well as maintenance of healthy ecosystems. Clean water and sanitation are essential elements not only for humans, but also for plants, animals and other living organisms. Achieving SDG6 therefore is a matter that should be of great concern to both governments and the governed. Raising such general concern should require conscientizing everyone towards the actualization of the SDG, especially as it has been shown that children and adults in countries that have poor quality of water and lack good sanitation services are at risk of infection by such related diseases as cholera, diarrhea, malaria fever, typhoid fever and river blindness

(Akintaye & Opeyemi, 2014).

1.2 Background to the Study: Present Situation of Clean Water and Sanitation Provision and Management in Rivers State

There are several legislations on Waste Management at the Federal, State and Local Government levels in Nigeria. According to Okoli, Egobueze and Briggs (2014), in the Rivers State (which is the home of the two local government areas under study), the House of Assembly in 2013 passed the Waste Management Agency Bill into law that was assented to by the Governor, Rt Hon. Chibuike Rotimi Amaechi. The Agency became a parastatal of the Ministry of Environment charged with the responsibility of enhancing environmental cleanliness of the State. In addition, the Rivers State Rural Water Supply and Sanitation Agency (RUWASSA) is responsible for water supply and sanitation issues in the rural areas of Rivers State. On the other hand, the Rivers State Water Board (RSWB) was established in relation to the Water Board Law Cap 138, Laws of Rivers State, 1991. According to the Rivers State Ministry of Water Resources and Rural Development (2012), the **functions of the Rivers State Water Board** include to:

i. supply water to the public for drinking; domestic, industrial, commercial and other purposes;

ii. establish and manage water undertakings in the State;

iii. prospect for water by sinking wells and shafts or bore-holes;

iv. make, build, construct, lay down and maintain reservoirs, waterworks, cisterns, tanks, culverts, filter beds, main and other pipes and appliances;

v. execute and do all other things necessary or convenient for obtaining, storing, selling, delivering, measuring and distributing water;

vi. establish, operate and control sewage systems in the State.

Furthermore, **Rivers State Environmental Sanitation Authority** was established in 1983 to be solely responsible for (RSESA, 1983):

i. formulating policies and strategies aimed at promoting environmental hygiene and sanitation;

ii. facilitating the disposal of refuse and other waste products in the Port Harcourt metropolis and its environs;

iii. organizing and carrying out street cleaning, providing refuse collection points and ensuring that the refuse is cleared from the collection points;

iv. cleaning drains, controlling and supervision of night soil services in places where the pail or bucket system and pit latrine are in use; sewage disposal and other conservancy methods;

v. inspecting of houses, premises, restaurants, abattoirs, shops and factories to ensure that good sanitary conditions are maintained.

However, Okoli, Egobueze and Briggs (2014) have observed pitfalls in the discharge of Rivers State Environmental Sanitation Authority's statutory roles. The massive infringement eventually led to replacement of the Authority in 2013 with a new Agency; namely, The Rivers State Waste Management Agency (RIWAMA). Unfortunately, the new Agency which serves Port Harcourt and Obio-Akpor LGAs, has also come under criticisms for inability to discharge its statutory obligation satisfactorily. It is common nowadays to see the streets and major highways littered with solid waste and refuse heaps.

2. Review of Related Literature

2.1 UNESCO's Education 2030 Agenda for the SDGs: Environmental Literacy as Key

In its publication on Education for the SDGs, UNESCO (2017) has identified the Core Educational Competencies (knowledges, skills, attitudes.) necessary for achievement of each of the SDGs. In the same vein, Mabunda and McKay (2021) have observed that environmental literacy is at the heart of the SDGs. This observation is incontrovertible, given the fact that majority of the SDGs (e.g. SDGs 1, 2, 3, 6, 7, 11, 12, 13, 14 and 15) are in the environment domain. Evidently, therefore, environmental literacy education has much to do with achievement of SDG6.

2.2 UNESCO's Learning Programme for SDG6

To ensure effective implementation of SDG6 (Clean water and sanitation), UNESCO has proposed five objectives each for the three basic areas of learning; namely, "cognitive learning, socio-emotional learning and behavioural learning" (UNESCO 2017, pp. 22-23):

UNESCO has also gone further to suggest topics as well as examples of learning approaches and methods for SDG6. The learning approaches and methods, are addressed in the appropriate section of this paper below in the process of harmonizing them with Environmental Literacy Education for realization of SDG6 in the area of study in particular and Rivers State in general.

2.3 The Notion of Environmental Literacy (EL)

As already highlighted elsewhere (Eheazu, 2022), the notion of environmental literacy tacitly refers to an awareness of and concern about the environment and its associated problems, as well as possession of the competencies (knowledge, skills and motivations) to work towards solution of current problems and prevention of new ones. Roth (1992, p. 16) concisely described the content of environmental literacy (EL) as comprising:

> … a set of understandings, skills, attitude 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 relationship 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.

Roth further wrapped the above content in three levels of EL as follows:

i. Environmental Literacy Level One (ELL_1)
ii. Environmental Literacy Level Two (ELL_2)
iii. Environmental Literacy Level Three (ELL_3)

These levels Roth called *nominal, functional,* and *operational* respectively, showing an ascending expansion from basic understanding through a broader knowledge and interaction to a higher level of understandings and skills in dealing with the environment and its problems.

2.4 Process and Expected Outcomes of Environmental Literacy Education (ELE)

As explained elsewhere (Eheazu 2020), ELE could be defined as the process of disseminating the above content of EL in order to develop in beneficiaries environmental responsible behaviour expected of environmentally literate persons which include, among others, (Hungerford et al., 1994):

i. Belief in their ability, both individually and collectively, to influence decisions on environmental problems and issues; such as the right sources and processes of obtaining drinking/domestic water;
ii. Assumption of responsibility for personal actions that would positively influence or avert environmental disasters; such as establishing sanctions to ensure proper water management/disposal;
iii. Personal and/or Group involvement (inclusiveness) in Environmentally Responsible Behaviours; such as social action towards security of established water supply pumps and sanitation gadgets;
iv. Persuasion – e.g. using informal discussion to encourage one another to support a positive environmental position; such as involvement in processes of environmental sanitation.

From the above characteristics of an environmentally literate person, it stands clear that the development of environmental literacy is a multi-focal process. Succinctly put, the process begins with basic environmental knowledge inculcation and acquisition. This basic knowledge component is based on the idea that before an individual can act on an environmental problem, that individual must first understand the problem (Pooley & O'Connor, 2000). The next step is training of the individual towards the application of his/her 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 multi-focal process is applicable, if appropriately designed, at every level of education, including basic, formal and non-formal 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; UN, 2002).

Detailed articulation on ELE for SDG6 with reference to the topic of this paper is provided in the appropriate sub-section below in relation to the result of the associated case study.

3. Problem of the Study

Availability of sustainable clean water and sanitation management is part of the basic necessities of living to ensure a healthy society. This explains why the United Nations included it as one of the 17 Sustainable Development Goals (SDGs). Unfortunately, experience has shown that the essentiality of clean water and good sanitation does not seem to be seriously reflected in the activities of various Stakeholders (Government Ministries and Households) in Rivers State of Nigeria entrusted with achievement of SDG6 as already described above. For instance, in Etche and Obio-Akpor Local Government Areas of the State which are used for case study of the State, indiscriminate waste disposal in streams and lakes, delay in evacuation of wastes and ineffective implementation of government policies/laws regarding SDG6 generally, are easily observable. Specifically, the two Local Government Areas (LGAs) are known to engage in low-level environmental sanitation activities, poor water quality sourcing (cf plate 1) and inefficient use of water by households. Again, despite the highly orchestrated government provision of waste disposal/collection vans in some strategic areas, the inhabitants still engage in improper waste disposal on roads and in drainages (cf plate 2).

Given these unhealthy scenarios and the potential of Environmental Literacy Education (ELE) highlighted above, the need has arisen to ascertain what situation-specific ELE programme(s) would reorientate the Stakeholders (government agencies and citizens) towards appropriate responsible behaviour and actions to achieve clean water provision and effective sanitation management in Rivers State by the year 2030 with particular focus on the two LGAs under reference. To satisfy the said need through an empirical process was the problem of the study.

Plate 1. A river in Etche LGA of Rivers State which affords local people with water for drinking and other domestic uses

source: Wikimedia (2022)

Plate 2. Disposed waste nearly covering Elimgbu – Igwuruta road in Eneka in Obio-Akpor LGA

source: Snapshot by the researchers

4. Area of the Study

This study involved two out of the 23 Local Government Areas (LGAs) in Rivers State, located within the Niger Delta Region in the South-South Geopolitical Zone of Nigeria. The two LGAs, which constitute the area of this study, are Etche and Obio-Akpor.

Etche LGA (ELGA) has several towns and villages. Its Council headquarters is located in the town of Okehi. According to the JRCEC (2020), Etche LGA covers an area of 805.2km^2 and had an estimated population of 431,158 inhabitants by 2020. Economically speaking, the LGA is rich in oil (petroleum). Again, located within the estuaries of the River Niger, the inhabitants of ELGA have abundant water sources for drinking and other uses. Fishing is also an important economic activity next to farming. There are several markets in Etche and these contribute to the quantum of wastes generated within the LGA.

Obio-Akpor LGA (OBALGA), on the other hand, has its Council headquarters in the Rumuodomaya district within Port Harcourt City Metropolis. OBALGA occupies an area of 260km^2 and has an estimated population of 464,789 (Wikipedia, 2021). The LGA has two climatic seasons – dry and rainy seasons. The rainy season is usually characterized by heavy and prolonged showers which lead to flooding in many parts of the LGA. Like in the case of Etche, Obio-Akpor hosts many markets as trading is a major aspect of its economy. Hotels, restaurants, relaxation spots and industries, which are also found in many parts of OBALGA contribute not only to the LGA's economy, but also to the generation of various types of massive wastes. These wastes pose sanitation challenges in the area. Being near to Port Harcourt metropolis, OBALGA substantially benefits from the public water and sanitation projects of the Rivers State Government.

The choice of the two LGAs for this research study was based on the following considerations:

a) The proximity of the LGAs to the researchers; both Etche and Obio-Akpor are easily accessible to the researchers whose base is at the University of Port Harcourt.

b) The researchers felt the need to balance the usual rural-urban matrix impact on the patterning and distribution of utilities and services, especially in developing countries like Nigeria. Using the terms *rural* and *urban* interchangeably for *village* and *town* respectively as is the case in Nigeria, Etche LGA is more rural than urban and the reverse is the case with Obio-Akpor (Nigeriazipcodes, 2022). For clarity, distinction here between rural and urban follows the definition of the concept rural by the National Bureau of Statistics, Nigeria (2009) as communities with less than 20,000 people.

5. Aim and Objectives of the Study

The aim of the study was to identify appropriate Environmental Literacy Education programmes for the achievement of clean water and sanitation by stakeholders in Rivers State in general and Etche and Obio/Akpor LGAs in particular. The stakeholders under reference include Rivers State Ministry of Water Resources; the Water Board; Rivers State Environmental Sanitation Authority; Households and individual citizens. Specifically, the objectives of the study were to:

i. Ascertain the perceptions of the subjects of the study; namely, Members of the Community Based Organizations (CBOs) and of the two NGOs operating in the area of study regarding:

(a) the prevailing general situation of clean water provision and sanitation management in the area of study, taking together the two LGAs concerned;

(b) the extent to which the activities of the Stakeholders have led to the provision and management of clean water and sanitation in Etche and Obio-Akpor LGAs severally.

ii. In the light of the findings from Objectives 1(a) and (b), to determine the environmental literacy education processes required (along with UNESCO'S Education Agenda for SDG6) to mobilize the stakeholders to effectively engage in desirable activities towards effective provision and management of clean water and sanitation in Rivers State, with particular attention on the specified area of study.

6. Research Questions (RQs) & Hypothesis

A. Research Questions (RQs)

The two research questions that guided the study were:

RQ1: What are the perceptions of the subjects of the study on the existing situation regarding provision of clean water and sanitation in the area of study collectively?

RQ2: To what extent have the activities of Stakeholders in the area of study led to improved provision of (a) clean water and (b) effective sanitation management in Etche and Obio-Akpor LGAs severally?

B Null Hypothesis (H_0)

The H_0 for the study posits that "There is no significant difference between the perceptions of the two groups of respondents for the study (CBO Members from Etche LGA and NGO Members from Obio-Akpor LGA) regarding the extent to which the activities of Stakeholders have led to improved provision of (a) clean water (b) sanitation management in their respective Local Government Areas".

7. Design of the Study

A descriptive survey design which involved interpretation of existing conditions or relationships, opinions, on-going attitudes, prevailing practices, belief, effects that are being felt as well as current phenomena was used for the study.

8. Population of the Study

As shown in Table 1, the population of subjects of the study was 7,717 made up of 1,149 members of Community Based Organizations (CBOs) in Etche LGA and 6,568 members of two Non-Governmental Organizations (NGOs) in various wards in Obio-Akpor LGA; namely, RHEMA Integrated Development Organization (RIDO) and Victoria Clarion Foundation (VICLAF) with 2,960 and 3,608 members respectively.

Table 1. Population of the study

S/NO.	Locations/LGA	Groups	Total Memberships
1	ELGA	CBOs	1,149
2	OBALGA	NGOs	6,568
		Total	7,717

9. Sample and Sampling Technique

To ensure equitable representation of the two groups of subjects for the study (CBO members and NGO members) as listed in table 1, the proportionate random sampling technique was used. 20% of the population of each of the two groups were randomly selected as sample. Table 2 gives the resultant samples used for the study.

Table 2. Population sample for the study

S/no.	Group	Population	Sample (20%)
1	CBOs	1,149	230
2	NGOs	6,568	1,314
		Total Sample	1,544

10. Instrument used for Data Collection

An instrument titled "Questionnaire on Clean Water and Sanitation Management" (QUOCWASM) was developed and used by the researchers for data collection. The questionnaire was structured on modified four-point Likert scale as follows:

a) Strongly Agree (SA) = 4 points; Agree (A) = 3 points; Disagree (D) = 2 points; Strongly Disagree (SD) = 1 point.

b) Very High Extent (VHE) = 4points; High Extent (HE) = 3points; Low Extent (LE) = 2points; Very Low Extent (VLE) = 1 point.

Items of the questionnaire were meant to provide information for answering the research questions and for testing the null hypothesis which guided the study.

11. Validity and Reliability of Instrument

The instrument was subjected to face and content validity and reliability tests before it was used for the study. A split-half reliability coefficient (rh) of 0.86 was obtained using the Pearson Product Moment Correlation Statistic. This was further subjected to the Spearman-Brown error correction formula for split-half standard error. A final reliability index (rt) of 0.92 was obtained which confirmed the reliability of the instrument for the study.

12. Data Collection and Analysis

A total of 1,544 copies of the questionnaire were administered to the population samples in table 2 with the help of two trained research assistants who were conversant with the location and dialects of the respondents. 173 (75%) of the 230 copies of the questionnaire distributed among the sample of CBO members were found validly completed; while 880 (67%) of the 1,314 copies administered to the sample of NGO members were found valid for use. Altogether. 1,053 (68%) of the 1,544 administered copies of the questionnaire validly completed by the respondents were used for the study. The statistical tools used to answer the research questions and to test the null hypothesis were the response frequencies (F), the Means ($\overline{X}$), Pooled means ($P\overline{X}$), The Standard Deviations (SDs) and the T-test Statistic.

Since the items were rated on a 4point scale (modified Likert-type), the criterion mean of 2.5 was used in taking decisions. Thus, item responses that received a mean ($\bar{x}$) equal to or greater than 2.5 were considered to be positive, while items that scored below 2.5 were considered negative. The 2.5 criterion mean was arrived at by adding the weighted scale responses and dividing the total by 4 as in the example below.

$\overline{X}$ of responses = $\frac{Total\ sum\ of\ weights}{Total\ number\ of\ options}$

i.e. $\frac{SA+A+D+SD}{4}$

$= \frac{4+3+2+1}{4} = \frac{10}{4}$

= 2.5

The findings/results are shown in tables 3 – 8.

13. Findings/ Results

13.1 Research Question One (RQ_1)

RQ_1 was meant to establish, through the perceptions of the respondents, the prevailing situation regarding provision and management of clean water and sanitation in the area of study (Etche and Obio-Akpor LGAs) Tables 3 and 4 contain data used to answer RQ_1.

Table 3. Mean responses of subjects (CBO and NGO members) on present situation regarding provision of clean water in Etche and Obio-Akpor LGAs

S/N	ITEMS	CBO AND NGO RESPONDENTS (N = (1,053)				Total	MEAN ($\overline{x}i$)	DECISION
	What is your opinion on each of the following statements on present situation regarding provision of clean water in Rivers State, particularly in Etche/Obio-Akpor LGA where your organization is located?	SA (4)	A (3)	D (2)	SD (1)			
1.	Public places such as markets, worship centres, local health care centres and motor parks do not have clean public water supplies	725 (2900)	154 (462)	120 (240)	54 (54)	1,053 (3,654)	3.47	Agree
2.	Most water for domestic and other uses is gotten from private boreholes or local streams/rivers	660 (2640)	250 (750)	85 (170)	58 (58)	1,053 (3,618)	3.44	Agree
3.	There are no functional public water supply facilities within our many localities	590 (2360)	330 (990)	90 (180)	43 (43)	1,053 (3,573)	3.39	Agree
4.	Majority of us buy pure-water sachets for drinking	220 (880)	210 (630)	354 (708)	269 (269)	1,053 (2,487)	2.36	Disagree
5.	Boreholes are usually sunk anywhere, including close to soak-away pits and latrines.	452 (1,808)	340 (1,020)	150 (300)	111 (111)	1,053 (3,239)	3.08	Agree
6.	Some people defecate and throw wastes into nearby rivers and streams which the public make use of for drinking, etc.	480 (1,920)	357 (1,071)	130 (390)	86 (86)	1,053 (3,467)	3.29	Agree
Pooled/Aggregate Mean ($P\overline{X}1$) =							3.18	Agree

Table 3 shows that the mean scores ($\overline{x}$) for items 1 to 6 indicating various lapses in the provision of clean water in the area of study are respectively greater than the criterion mean of 2.5, except in one case (item 4) which was slightly below the criterion mean with 2.36. This result shows that the combined perceptions of the respondents (CBO and NGO members) from Etche and Obio-Akpor LGAs affirmed that the lapses existed in the area of study. The general perception (with means above 3.00 in 5 out of the 6 cases) is further confirmed by the pooled/aggregate mean ($P\overline{X}1 = 3.18$).

Table 4. Mean responses of subjects (CBO and NGO members) on present situation regarding provision of effective sanitation in Etche and Obio-Akpor LGAs

S/N	ITEMS	CBO AND NGO RESPONDENTS (N = (1,053)				Total	MEAN ($\overline{xii}$)	DECISION
	What is your opinion on each of the following statements on present situation regarding provision of effective sanitation in Rivers State, particularly in Etche/Obio-Akpor LGA where your organization is located?	SA (4)	A (3)	D (2)	SD (1)			
1.	Flies, cockroaches rats, ants, beetles, among others are too numerous nowadays in our environment due to poor sanitation	650 (2600)	305 (915)	55 (110)	43 (43)	1,053 (3,668)	3.48	Agree
2.	People throw wastes carelessly in the homes, markets, schools and along the road.	715 (2860)	238 (714)	67 (134)	33 (33)	1,053 (3,741)	3.55	Agree
3.	Waste is being abandoned at the dump site for days and this pollutes our environment.	585 (2340)	324 (972)	90 (180)	54 (54)	1,053 (3,546)	3.37	Agree
4.	There is inadequate drainage system in our locality and this causes flooding	512 (2048)	333 (999)	150 (300)	58 (58)	1,053 (3,405)	3.23	Agree
5.	There is open defecation in some places within many neighbourhoods.	480 (1920)	390 (1170)	112 (224)	74 (74)	1,053 (3,385)	3.21	Agree
Pooled/Aggregate Mean ($\overline{PX}2$) =							3.37	Agree

Table 4 bears the mean score ($\overline{xii}$) for items 1-5 showing the various indications of inadequate provision of effective sanitation management in the area of study (ELGA and OBALGA). All the mean scores as well as the pooled/aggregate mean ($\overline{PX}2 = 3.37$) are higher than the criterion mean of 2.50. In other words the respondents (CBO and NGO members respectively from ELGA and OBALGA) together perceived the massive prevalence of the five indicators of inadequate sanitation management in their LGAs.

13.2 Research Question Two (RQ_2)

RQ_2 was posed to ascertain, through the responses of the relevant respondents (CBOs in Etche and NGOs in Obio-Akpor) the extent to which the activities of Stakeholders (named in the questionnaire) led to improved provision of (a) clean water and (b) effective sanitation in Etche and Obio-Akpor LGAs severally. Tables 5 to 8 embody data used to provide answer(s) to RQ_2.

Table 5. Mean responses of CBO members on the extent to which the activities of stakeholders have improved provision of clean water in Etche LGA

S/N	ITEMS	CBO MEMBERS (N = (173)				Total	MEAN ($\bar{x}i$)	DECISION
	To what extent have the activities of the Stakeholders (Rivers State Ministry of Water Resources; Rivers State Water Board; Households and Individual Citizens) improved provision and management of clean water in Etche LGA?	VHE (4)	HE (3)	LE (2)	VLE (1)			
1.	The agency responsible for quality water supply in Rivers State comes around to inspect the quality of drinking water in my LGA	15 (60)	22 (66)	34 (68)	102 (102)	173 (296)	1.71	Very Low Extent
2.	Pure-water companies are usually licensed to operate by the Ministry in charge of water supply in Rivers State.	50 (200)	37 (111)	57 (114)	29 (29)	173 (454)	2.62	Low Extent
3.	Households are usually monitored to ensure that public water taps are not left open when not in use.	9 (36)	28 (84)	31 (62)	105 (105)	173 (287)	1.66	Very Low Extent
4.	Individuals are not allowed to sink their boreholes without proper supervision by the Ministry in charge of water supply	8 (32)	15 (45)	38 (76)	112 (112)	173 (265)	1.53	Very Low Extent
Pooled/Aggregate Mean ($P\bar{X}1$) =							1.88	Very Low Extent

Table 5 shows the mean responses of CBO members from Etche LGA (N = 173) on the extent to which activities of Stakeholders have improved the provision of clean water in the LGA. The responses focused on items 1 to 4 indicating activities of the Stakeholders that could enhance clean water provision. Except in one case (item 2; $\bar{x}i$ = 2.62), the other three mean responses and even the pooled/aggregate mean ($P\bar{X}1$ = 1.88) were below the criterion mean of 2.50; which shows that generally, the activities of the Stakeholders may have led to improved provision of clean water in Etche LGA to a "very low extent".

Table 6. Mean responses of NGO members on the extent to which the activities of stakeholders have improved provision of clean water in Obio-Akpor LGA

S/N	ITEMS	NGO MEMBERS (N = (880)				Total	MEAN ($\bar{x}ii$)	DECISION
	To what extent have the activities of the Stakeholders (Rivers State Ministry of Water Resources; Rivers State Water Board; Households and Individual Citizens) improved provision and management of clean water in Obio/Akpor LGA?	VHE (4)	HE (3)	LE (2)	VLE (1)			
1.	The agency responsible for quality water supply in Rivers State comes around to inspect the quality of drinking water in my LGA	55 (220)	99 (297)	121 (242)	612 (612)	880 (1,371)	1.56	Very Low Extent
2.	Pure-water companies are usually licensed to operate by the Ministry in charge of water supply in Rivers State.	50 (200)	175 (525)	115 (230)	540 (540)	880 (1,495)	1.70	Very Low Extent
3.	Households are usually monitored to ensure that public water taps are not left open when not in use.	149 (596)	202 (606)	111 (222)	418 (418)	880 (1,842)	2.09	Low Extent
4.	Individuals are not allowed to sink their boreholes without proper supervision by the Ministry in charge of water supply	56 (224)	162 (486)	142 (284)	520 (520)	880 (1,514)	1.72	Very Low Extent
Pooled/Aggregate Mean ($P\bar{X}2$) =							1.77	Very Low Extent

In Table 6, the mean responses ($\overline{xii}$) of NGO members from Obio-Akpor LGA (N = 880) on the extent to which some activities of Stakeholders, similar to those itemized in Table 5, have improved provision of clean water in Obio-Akpor. As table 6 shows, except in one case (item 3; $\overline{xii}$ = 2.09), the remaining three mean responses, as well as the pooled/aggregate mean ($P\overline{X}2$ = 1.77) were below the criterion mean of 2.50; showing that overall, the Stakeholders' activities could only be said to have led to improved provision of clean water in Obio-Akpor LGA to a "very low extent".

Table 7. Mean responses of CBO members on the extent to which the activities of stakeholders have improved provision of effective sanitation in Etche LGA

S/N	ITEMS	CBO MEMBERS (N = (173)				Total	MEAN ($\overline{xi}$)	DECISION
	To what extent have the activities of the Stakeholders (Rivers State Waste Management Agency; Households and Individual Citizens) improved provision and management of Effective Sanitation in Etche LGA?	VHE (4)	HE (3)	LE (2)	VLE (1)			
1.	Laws regulating sanitation in Rivers State are strictly enforced by the relevant State authority in my LGA.	12 (48)	21 (63)	41 (82)	99 (99)	173 (292)	1.69	Very Low Extent
2.	There is usually no delay in waste evacuation by the appropriate agency.	11 (44)	22 (66)	53 (106)	87 (87)	173 (303)	1.76	Very Low Extent
3.	Refuse disposal bins are placed in most of the dumpsites in my LGA by the Rivers State Waste Management Agency.	49 (196)	38 (114)	56 (112)	30 (30)	173 (452)	2.61	Low Extent
4.	The monthly environmental exercise in Rivers State is very effective in my LGA	64 (256)	35 (105)	50 (100)	24 (24)	173 (485)	2.80	Low Extent
5	Sanitary Inspectors regularly come around our localities for inspection.	10 (40)	18 (54)	44 (88)	101 (101)	173 (283)	1.64	Very Low Extent
Pooled/Aggregate Mean ($P\overline{X}1$) =							2.10	Low extent

Table 7 contains the mean responses ($\overline{xi}$) of CBO members from Etche LGA (N=173) on the extent to which the activities of Stakeholders (specified in the questionnaire) have improved provision and management of effective sanitation in their LGA. The responses were to items 1 to 5 showing Stakeholder-patronized activities that could foster improvement in the provision and management of effective sanitation. While responses to items 1, 2 and 5 showed "very low extent", each being below the criterion mean of 2.50, the remaining two items (3 and 4) attracted mean responses 2.61 and 2.80 respectively; i.e. above the criterion mean. However these responses to items 3 and 4 still showed "low extent". The pooled/aggregate mean ($P\overline{X}1$ = 2.10) also is below the criterion and indicates "lows extent". In all, the activities of the Stakeholders could be adjudged to have made their expected impact on improvement and management of sanitation in Etche LGA to be between "low" and "very low extent".

Table 8. Mean responses of NGO members on the extent to which the activities of stakeholders have improved provision of effective sanitation in Obio-Akpor LGA

S/N	ITEMS	NGO MEMBERS (N = (880)						
	To what extent have the activities of the Stakeholders (Rivers State Waste Management Agency; Households and Individual Citizens) improved provision and management of Effective Sanitation in Obio/Akpor LGA?	VHE (4)	HE (3)	LE (2)	VLE (1)	Total	MEAN ($\overline{xii}$)	DECISION
1.	Laws regulating sanitation in Rivers State are strictly enforced by the relevant State authority in my LGA.	55 (220)	95 (285)	140 (280)	590 (590)	880 (1,375)	1.56	Very Low Extent
2.	There is usually no delay in waste evacuation by the appropriate agency.	70 (280)	112 (336)	223 (446)	475 (475)	880 (1,537)	1.75	Very Low Extent
3.	Refuse disposal bins are placed in most of the dumpsites in my LGA by the Rivers State Waste Management Agency.	234 (936)	280 (840)	230 (460)	136 (136)	880 (2,372)	2.69	Low Extent
4.	The monthly environmental exercise in Rivers State is very effective in my LGA	352 (1,408)	291 (873)	180 (360)	57 (57)	880 (2,698)	3.01	High Extent
5	Sanitary Inspectors regularly come around our localities for inspection.	210 (840)	272 (816)	250 (500)	148 (148)	880 (2,304)	2.62	Low Extent
Pooled/Aggregate Mean ($P\overline{X}2$) =							2.33	Low extent

Table 8 shows the mean responses ($\overline{xii}$) of the NGO members from Obio-Akpor LGA (N = 880) on the extent to which specified Stakeholders have improved the provision and management of effective sanitation in Obio-Akpor LGA of Rivers State. The responses were to items similar to those referred to in the case of Etche LGA (table 7). Specifically, mean responses to items 1 and 2 which were below the criterion mean of 2.50 showed "very low extent". Again, mean responses to items 3 and 5 indicated "low extent". Only the mean response to item 4 showed "high extent". This notwithstanding, the pooled mean ($P\overline{X}2 = 2.33$) indicated overall "low extent". Accordingly, the activities of the Stakeholders could be said to have made a "low impact" on the improvement and management of sanitation in Obio-Akpor LGA.

14. Test of the Null Hypothesis (H_0)

The H_0 for this study posits that there is no significant difference between the perceptions of the two groups of respondents in the study (CBO members from Etche LGA and NGO members from Obio-Akpor LGA) regarding the extent to which the activities of Stakeholders have led to improved provision of (a) clean water and (b) sanitation management in their respective Local Government Areas. Mean responses of the two groups (including the pooled/aggregate means) in tables 5 and 6 are used to test the H_0 with regard to clean water provision, while the mean responses and the pooled means in tables 7 and 8 are used to test the H_0 with regard to sanitation management. Representing the sums of the mean responses in tables 5,6, 7 and 8 and N_1, N_2, N_3 and N_4 respectively and using the Standard Deviation (SD) formula:

$$SD = \sqrt{\frac{\sum(\overline{xi} - \bar{X}1)}{N}},$$

i. The SD for table 5 data (SD1) = 0.432;
ii. The SD for table 6 data (SD2) = 0.196;
iii. The SD for table 7 data (SD3) = 0.499;
iv. The SD for table 8 data (SD4) = 0.565.

Application of the SDs, for t-analysis of the differences in pooled/aggregate mean responses regarding clean water provision in tables 5 and 6 (PX1 = 1.88; PX2 = 1.77); and regarding sanitation management in tables 7 and 8 (PX

1 = 2.10, PX 2 = 2.33) is shown in tables 10 and 11 respectively, using the formula:

$$t = \frac{\bar{X}1 - \bar{X}2}{\sqrt{\frac{N1SD1^2 + N2SD2^2}{N1 + N2 - 2}\left[\frac{N1 + N2}{N1N2}\right]}},$$

Table 9. T-test of the significance of the difference in aggregate mean responses of CBO and NGO members on the extent to which the activities of Stakeholders have improved the provision of clean water in Etche and Obio-Akpor LGAs of Rivers State

N1	N2	$\bar{X}1$	$\bar{X}2$	SD1	SD2	df	t-cal	t-crit	P	Decision
173	880	1.88	1.77	0.432	0.196	1,051	0.041	1.960	0.05	Accept H_0

As table 9 shows, the calculated t (t-cal) = 0.041 while the table t (t-crit) = 1.96 with degree of freedom (df) (1,051) and the probability level (p) = 0.05. With the t-crit > t-cal, the H_0 is accepted; i.e. there is no significant difference between the perceptions of "very low extent impact" by the two groups of respondents on the extent to which the activities of Stakeholders led to improved provision of clean water in both Etche and Obio-Akpor LGAs of Rivers State.

Table 10. T-test of the significance of the difference in aggregate mean responses of CBO and NGO members on the extent to which the activities of Stakeholders have improved Sanitation in Etche and Obio-Akpor LGAs of Rivers State

N1	N2	$\bar{X}1$	$\bar{X}2$	SD3	SD4	df	t-cal	t-crit	P	Decision
173	880	2.10	2.33	0.499	0.565	1,051	-0.001	1.960	0.05	Accept H_0

Using the already specified formula for calculation of 't', the t-cal as shown in table 10 is -0.001, while the table t (t-crit) = 1.960 with the probability level (p) = 0.05. Thus with t-crit > t-cal, H_0 is accepted; i.e. no significant difference between the "low extent" perceptions of the two groups of respondents on the extent to which the activities of Stakeholders have improved sanitation in the area of study.

15. Discussion of Findings

This study was designed to identify, through an empirical process, situation-specific environmental literacy education approaches that could foster realization of clean water and sanitation (SDG6), through the activities of Stakeholders in Rivers State of Nigeria in general and Etche and Obio-Akpor LGAs of the State in particular.

15.1 The Prevailing General Situation of Clean Water and Sanitation Provision in the Area of Study

The general situations of (a) clean water provision and (b) sanitation management in the area of study (Etche and Obio-Akpor LGAs of Rivers State) are presented in tables 3 and 4 respectively from the aggregate responses of respondents from the two LGAs. On clean water provision, the 1,053 respondents agreed that each of the six items showing circumstances depicting inadequate provision of clean water existed in the area of study with the pooled/aggregate mean (PX1) of 3.18 much above the criterion mean of 2.5 and the 6 items also had a mean (xi) above 3.00 each. Again with respect to provision of effective sanitation, the respondents also agreed that each of the 5 items showing conditions depicting ineffective provision and management of sanitation prevails in the area of study with a pooled/aggregate mean (PX2) of 3.37 and each mean response (xii) greater than 3.00, much above the criterion mean of 2.50. The overall import of these findings is that the respondents shared a strong opinion that there was inadequate provision of both clean water and sanitation in Etche and Obio-Akpor LGAs of Nigeria's Rivers State.

15.2 Extent to Which the Activities of Stakeholders Have Positively Influenced Provision and Management of Clean Water and Sanitation Severally in the Two LGAs That Constitute the Area of Study

Table 5 contains 4 items representing activities of identified Stakeholders which should promote the provision of clean water in Etche LGA. Table 6 on the other hand contains same activities of the Stakeholders which should serve the same purpose in Obio-Akpor LGA. The 173 subjects from Etche and 880 from Obio-Akpor indicated the extent to which the activities of Stakeholders in their respective LGAs fostered provision of clean water. In table 5, the pooled/aggregate mean response (PX1) was 1.88, much below the criterion mean of 2.50. This was the case also with the responses (xi) in 3 of the 4 items in table 5 which were below the criterion mean. This clearly

showed generally that the activities of the stakeholders promoted provision of clean water in Etche LGA to a very low extent. The situation was not any different in Obio-Akpor where also the mean responses (xii) to 3 of the 4 items were below the criterion mean just as was the case with the pooled mean (PX2) which was 1.77. This also showed that the Stakeholders' activities impacted provision of clean water in Obio-Akpor LGA also to a "very low extent"

Regarding provision and management of sanitation in the area of study, tables 7 and 8 present the mean responses of subjects on the impacts of Stakeholders' activities in Etche and Obio-Akpor LGA respectively. In each of the two tables, five similar Stakeholders' activities expected to promote effective sanitation were listed. As table 7 shows, 3 of the 5 mean responses (items 1,2 and 5) showed "to a very low extent" (xi < 2.50) while 2 responses (items 3 and 4) showed "low extent". The pooled mean also showed "low extent" (PX1 = 2.10). All in all, the verdict of "low extent" for the impact of Stakeholders' activities on sanitation in Etche could be accepted especially considering the pooled mean response of PX1 = 2.10. The case of Obio-Akpor (table 8) does not look different with respect to provision and management of sanitation as revealed by the mean responses and the pooled mean of PX1 = 2.33. However, the mean response to item 4 (xii = 3.01) showed "high extent" which means that "the monthly environmental sanitation in Rivers State is very effective in Obio-Akpor LGA. This is not surprising as the LGA, as noted earlier in this paper, is within the Port Harcourt Metropolis which is strictly served by the Rivers Waste Management Agency (RIWAMA). Nonetheless, given the overall mean responses culminating in the pooled/aggregate mean of PX2 = 2.33 (below the criterion mean of 2.5), the overall impact of Stakeholders' activities on provision and management of sanitation in Obio-Akpor could also be described as "low".

15.3 Commonality of the Views/Perceptions of the Respondents

Results of this study as the discussion above revealed that:

i. All the subjects of the study (CBO and NGO members) from Etche and Obio-Akpor LGAs collectively perceived massive prevalence of a situation of inadequate provision of clean water and sanitation management in the area of study generally, as shown by data in tables 3 and 4;

ii. The activities of Stakeholders identified in this study had from "low" to "very low" extent promoted provision and management of clean water and sanitation in Etche and Obio-Akpor LGAs.

To determine the level of commonalty/congruence of the perceptions/views of the respondents, and thereby the seriousness of the overall situation described above, the researchers advanced a null hypothesis (H_0) which posited that there is no significant difference between the perceptions of the two groups of respondents in the study regarding the extent to which activities of stakeholders enhanced provision of clean water and sanitation management in the two LGAs that constituted the area of study. Adopting the t-test statistic and using data in tables 9 and 10, no significant difference was found in the perceptions of the two groups of respondents regarding the "low" to "very low" extent of promotion of clean water and sanitation in the two LGAs. This, obviously, highlights the seriousness of the situation of ineffectiveness of the activities of the stakeholders towards provision and management of clean water and sanitation in the area of study and, by implication, the Rivers State. The situation indeed calls for urgent sensitization and mobilization of the Stakeholders and their superintendents towards effective design of and engagement in desirable activities that would enhance provision and management of clean water and sanitation in Rivers State in general and the area of study in particular. The researchers believe that the said sensitization and mobilization could be achieved by subjecting the Stakeholders to special Environmental Literacy Education Programmes along with relevant aspects of UNESCO's Education Agenda for SDG6.

16. Environmental Literacy Education Programmes for Realization of SDG6 (Clean Water and Sanitation) in Rivers State

By way of clarification, it is reasonable to recapitulate that the Stakeholders referred to in this study, as identified earlier here, are Rivers State Ministry of Water Resources, the State Water Board; Rivers State Waste Management Authority (RIWAMA) and households. As the mean analyses of data in tables 3 and 4 revealed, the collective responses of the 1,053 respondents in the study affirmed that there was massive prevalence of inadequate provision and management of clean water and sanitation in the area of study. Again, the responses of the two groups of respondents to items in tables 5 to 8 severally showed that the overall impact of the activities of the Stakeholders on provision and management of clean water and sanitation in the area of study range from "low" to "very low". Apparently, this could have contributed to the respondents' perception in tables 3 and 4 of the massive prevalence of inadequate provision of clean water and sanitation in the area of study. The seriousness of this situation was further amplified by the high level of congruency/commonalty of the perceptions of the two groups of respondents in both cases of clean water and sanitation provision and management as established from the null hypothesis tested for this study. Given the obvious environmental and health hazards imbued in this situation, there is no

gainsaying the fact that the Stakeholders need appropriate environmental education that would sensitize and mobilize them through inculcation in them of knowledge, skills and desirable behaviour to predispose them towards engaging in activities that would promote effective provision and management of clean water and sanitation not only in the two LGAs covered in this study, but also in the Rivers State in general.

Here, the role of Environmental Literacy Education becomes obvious to design situation-specific programmes (based on its content, expected outcomes and integrated relevant aspects of UNESCO's Education 2030 Agenda for SDG6 highlighted earlier under literature review) to provide for the Stakeholders sensitization, awareness creation and mobilization programmes aimed at developing in them the following among other possible enablements:

i. Knowledge and appreciation of the wide range of environmental hazards that could emanate from inadequate provision of clean water in local communities as well as the consequences of water pollution on account of improper planning and implementation of waste management techniques and procedures;

ii. Skills for domestic and industrial waste water treatment, recycling and reuse; technologies to achieve sustainability of clean water provision and appropriate disposition of left over effluents for environmental safety;

iii. Confidence and ability, both individually and collectively, to influence government decisions/policies on environment-related problems and issues, such as on adequate waste management and pollution control which border on effective sanitation arrangement;

iv. Capacity for informal discussions to encourage one another to support a given position, such as involvement in environmental protection and preservation through sustenance of water-related ecosystem;

v. Environmentally and socially responsible behaviours towards active discouragement of (a) indiscriminate waste dumping and defecation into artisanal waters used by local communities/households for drinking and other domestic purposes, and (b) improper/wasteful use of clean water from installed sources such as public taps/ pumps.

17. Processes of Achieving the Above Environmental Literacy Education (ELE) Programmes Related to SDG6

Within the identified groups of Stakeholders of clean water provision and sanitation management in Rivers State, one could further pick out educated personnel; basically educated and semi-literate labourers (especially among the sanitation workers); illiterate adults; children and adolescents (within the households). In effect, the already highlighted characteristic of ELE as a multifaceted process which could take place through every mode/form of education (formal, non-formal and informal) applies here to accommodate the various sets of humans that make up the Stakeholders. A brief description of the involvement of the three modes in the implementation of the ELE programmes for SDG6 is given below.

i. The Formal Mode

This mode of ELE for SDG6 involves inclusion in the syllabuses (curricula of basic literacy, primary, secondary and tertiary institutions patronized by members of households who are also stakeholders in the provision and management of clean water and sanitation as specified in this paper) of appropriate levels of the *nominal, functional* and *operational* contents of environmental literacy related to SDG6. This will provide children in primary schools, adolescents in secondary institutions and adults in basic literacy and tertiary levels of education the opportunity to systematically and hierarchically acquire necessary knowledge, technology and skills for engaging in processes for optimal provision of clean water and effective sanitation.

ii. The Non-Formal Mode

Unlike the formal mode which is institutionally based, and where programmes are systematically and hierarchically arranged, the Non-Formal mode of ELE for SDG6 would address group needs of relevant communities for awareness of issues and challenges facing provision of clean water and sanitation in their domains, the way forward using available resources, as well as the responsibilities of government and citizens to tackle the challenges. This would involve the following among other approaches (Eheazu, 2019):

(a) Seminars for rural and urban grassroots people in their usual village meeting places or town halls, basic literacy centres and so on, as the people may not be able to leave their places of domicile or business to attend the seminars;

(b) Awareness creation conferences, workshops and short training programmes for the more enlightened government policy makers and agencies concerned with provision of clean water and effective sanitation in Rivers State. The focus of activities would be on how to solve the problems of clean water and sanitation provision within

the ambits of the ELE programmes for SDG6 articulated above. In all, the seminars, conferences, workshops and short training programmes involved in Non-Formal Mode of ELE for SDG6 would be organized by commissioning Environmental Literacy Education (ELE) experts/professionals from relevant educational institutions who would be jointly funded by government, with possible solicited assistance from local and international donor agencies, including UNESCO.

iii. The Informal Mode of ELE for SDG6

Informal ELE for SDG6, like its Non- Formal counterpart, would occur outside an institutionalized or school setting. It is usually informative and could take place anywhere and anytime. However, differences exist in delivery methods and materials among informal modes of education, based on the objectives to be achieved and the target beneficiaries involved (Eheazu 2018). In the particular context of the topic of this paper, the Informal Environmental Literacy Education (ELE) being discussed is the type that would focus on the need for various groups of the target Stakeholders to be made aware of the implications of inadequate provision and management of clean water and sanitation in their various areas of domicile and how to solve the attendant problems. The Radio, Television, billboards and mobile megaphones are among the avenues for imparting learning and for mobilization of necessary public opinion and interest on clean water provision and sanitation management. Here, the assistance of public opinion leaders would be required to identify volunteer professionals and artists within and outside relevant education institutions to design radio and television jingles and dramas, megaphone talks, posters and so on. Since the resultant pubic pressure on government might not find favour with policy makers, Informal ELE for SDG6 could be sponsored by concerned Non-Governmental Organizations (NGOs), Human Rights Agencies and Concerned members of the public.

18. Summary and Conclusion

Sustainable Development Goal 6 (SDG6), which is among the 17 SDGs adopted by the United Nations (UN) in 2015 to foster humanity's survival, is aimed at ensuring availability and sustainable management of clean water and sanitation for all by the year 2030. Given the several deleterious consequences of the absence of clean water and effective sanitation to mankind and other living organisms, the UN considered achieving SDG6 as a matter of serious concern to both governments and citizens of the world. The Rivers State of Nigeria has, overtime, established policies, laws and various Ministries and Agencies to ensure provision of clean water and effective sanitation within the State. To determine the level of success of the State's endeavours and how Environmental Literacy Education (ELE) could help to bring about the desired outcome, a case study involving two Local Government Areas of the State (one predominantly rural and the other part of the State metropolitan capital) was conducted by the researchers of the study reported above. As the study revealed, the present situation of clean water provision and sanitation management in Rivers State leaves much to be desired as confirmed by the activities of the Stakeholders which were found to be generally inadequate in terms of achieving SDG6 in the State. The role of ELE in upgrading the SDG6 realization process through adoption of situation- specific programmes integrating relevant aspects of the UN 2030 Education Agenda for SDG6, has been articulated here as a positive approach which will remedy, inter alia, the clear lack of necessary knowledges, skills and environmentally and socially responsible behaviour among the Stakeholders revealed in the case study. In the light of the detailed discussion on the potential of the said ELE approach, the researchers have found it apt to conclude that ELE has a vital role to play in the realization of SDG6 in Rivers State and indeed in other climes experiencing poor outcomes from their efforts towards ensuring availability and sustainable management of clean water and sanitation for their peoples. The researchers have also gone further to succinctly articulate relevant content and processes for conducting the SDG6 related ELE programmes.

19. Recommendation

Following the clarifications provided in this paper and the conclusion arrived at, it becomes quite pertinent to recommend adoption of the situation-specific Environmental Literacy Education Programmes described in this paper as a veritable tool for realizing SDG6, not only in Nigeria, but also in any other country experiencing lapses in sustainable provision of clean water and effective sanitation. However, a research study similar to the one discussed in this paper might be required to determine the nature of the lapses and the situation-specific ELE programmes needed to address them in each affected country.

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