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Prevention of River and Creek Pollutions by Creating Mobile Toilets (Case Study of Lagos)

ABSTRACT
Boosting sanitation practice minimizes deterioration of water and land production, protects water resources, and keeps the rivers clean. It is to this end that serviced or mobile toilets which can be described as compact toilet units are built to be used in communities and homes. This study therefore investigated the impact of mobile toilets for the protection of rivers and creeks in Lagos state. The study was guided by four research questions. Self-made questionnaire was adopted for data collection and the analyses were carried out descriptively. One of the findings of this study revealed that some of the water pollution are water pollution include domestic sewage; urbanization; Plastics and polythene bags; Weak management system; Pesticides and fertilizers; Industrialization; Population growth; Human excreta. The second result revealed that river pollution has significant impact on health as it increases the risk of infection to humans and other respiratory disease among others. The third research question was meant to investigate the extent to which mobile toilet minimizes water pollution. As indicated in the table, mobile toilets increases access to excreta disposal facilities; discourages feces from being thrown into the river to prevent further pollution; prevent devastation by eliminating contamination of water and spread of communicable disease; and finally, mobile toilets increase standard of living and enhance human dignity. Finally, the study revealed that to prevent river pollution, there should be proper waste disposal system, among others. Based on these findings, conclusion was drawn and recommendation made.

Keywords: Prevention, river, creek, pollutions, mobile toilets

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I. INTRODUCTION

Lagos state is a city surrounded by water and its surrounding environment is made up of water from creeks and lagoons. In the past, Lagos has been described with negative terms such as being one of the dirtiest in the world, basically because of the bodies of polluted water surrounding it (Lagos Water Corporation, 2010) (LWC). According to Jideonwo (2014) the quality of water is challenged by human wastes, industrial waste, agricultural runoff and sewer leakages. In Adebodun's view, the rapid increase in population also contributes to the reduced quality of water. The study further explained that with the increasing population comes increased use of water, which translates to increased wastewater, which finds its way to canals and then larger water bodies. Given the susceptibility of Lagos state to water pollution as a result of its environment being surrounded by water, the soil becomes contaminated. This is aided by the ineffective waste collection system and absence of a central system for sewage treatment, which results in wastes being thrown in the lagoons. The immediate effect of this is the pollution of the lagoon and destruction of aquatic life (Jideonwo, 2014).

A major part of the world's population resides in cities, thus increasing the pace of urbanizations, especially in developing countries, further deepening urban poverty. A large number of this population resides in communities with improper sewage system, resulting in open defecation in moving streams. Many of these people have no good sanitation practice which further causes diseases and ill health. As a way of addressing this problem, social enterprises innovated mobile toilets which are a huge improvement over these sanitation and pollution menace. The World Bank (2016) estimated that up to 40 percent of urban dwellers reside in slums; and estimated that urban sanitation was 64 percent in South Asia, 40 percent in Sub-Saharan Africa, and 40 percent in low-income countries. In slums areas without public sewerage connections, people tend to engage in traditional options, such as hanging toilets (temporary structure built over a moving stream), open defecation, pit latrines, or flying toilets (small sacks containing human waste and flung into water, sewage or bushy areas. The consequence of this act is the widespread of preventable diseases (UN Water, 2008).

Boosting sanitation practice minimizes deterioration of water and land production, protects water resources, and keeps the rivers clean. It is to this end that serviced or mobile toilets which can be described as

compact toilet units are built to be used in communities and homes. These toilets are not owned by a company which empties, treats and converts the waste into fertilizer or fuel.

Statement of problem

Reportedly, Lagos has experienced its own share of diseases arising from polluted water due to rapid population increase and poor planning that causes pipes to be laid alongside drains and sewages (Jideonwo, 2014). The lack of efficient toilet, especially in slum communities leads to open defecation and most times these are channeled towards streams and flowing waters and into the sea. This is considered unsafe as it exposes the vulnerable population to these human wastes or faeces and contains dangerous parasites and bacteria. In a lot of cases the water from rivers and streams are used in household activities such as drinking, cooking and washing. Based on this, the paper seeks to investigate the prevention of river and creek pollutions through the creation of mobile toilets in Lagos state.

Research objectives

1. Determine the causes of river pollution
2. Assess the impact of river pollution to health
3. Determine the extent to which mobile toilets serve to prevent pollution of rivers.
4. Suggest other preventive measures against river pollution.

Research questions

1. What are the causes of river pollution?
2. What is the impact of river pollution to health?
3. To what extent do mobile toilets serve to prevent pollution of rivers?
4. What other measures can be used to prevent river pollution?

II. LITERATURE REVIEW

Water pollution

Alrumman, El-kott and Kehsk (2016) were of the view that water pollution takes place when unacceptable and useless materials come into contact with water and changes its quality, thus becoming harmful to humans and the environment. Water, though a significant natural resource and important to human development is a major source of infection. The world health organization (WHO) stated that 80% of diseases are water borne and that the drinking water available in most countries is not acceptable to WHO standards. Unhygienic and poor quality of water is also reported to be responsible for the occurrence of 3.1% deaths (Pawari & Gawande, 2015). Other causes water pollution includes marine dumping discharge from domestic and industrial wastes, atmospheric deposition, leakage from water tanks, and radioactive waste. The toxins in this waste polluted water cause infectious diseases affecting plants and animals as well, which are also sources of food to humans; thus when consumed becomes harmful (Haseena, et al, 2017).

The impact of waste and pollution on the environment

Provision of proper sanitation facilities such as toilet aid in health promotion and enable the efficient and proper disposal of human waste. The developing world has been found to have a large number of people without access to sanitation facilities causing the improper disposal of waste (Centers for Disease Control and Prevention, 2015). The absence of basic sanitation facilities spells unpleasant consequences for the environment when contaminated by human waste. It also allows the water and the land to be contaminated by waste from infected individuals, which increases the possibility of other individuals to become infected. To guard against this cycle and slow the risk of infection, proper waste disposal is seen as a necessity (Centers for Disease Control and Prevention, 2015). Furthermore, the improper disposal of human waste promotes the spread of illness causing diseases or even death. Also, the absence of proper sanitation facilities will leave people with no alternative but to reside and use the water from a contaminated environment caused by waste from individuals, some of whom have infections of various types. This action encourages the cycle of infection that can be spread through contamination of water, soil, insect and foods (Centers for Disease Control and Prevention, 2015).

Pollution has been linked to health problem; as there are microorganisms also referred to as pathogens which directly spread disease among humans (Kamble, 2014). According to Halder and Islam (2015), floods lead to extreme weather and contribute to various diseases for developed and developing countries. A part of the population residing in these polluted areas grow their foods and vegetables in contaminated water, which results to infection and greater health risks such as diarrhea, cardiovascular disease, respiratory disease, cancer, neurological disorder and cardiovascular disease. The improper sanitation and unhygienic water also contributes to the high rate of mortality among pregnant women as a result of chemical exposures during pregnancy.

Empirical review

Mehtab, et al. (2017) examined water pollution and human health in Pakistan. The study made use of both primary and secondary sources. The study revealed that about 70% of Earth's surface is covered by water. Thee major sources of pollution were found to include increased population, industrialization, radioactive wastes, human discharge and excessive use of pesticides. The water was further found to negatively affect people's health; and that bacteria and virus are easily spread through this polluted water.

Jabeen, Mehmood, Tariq, Nawab and Elahi (2011) examined the impact of poor water and sanitation on health in district Abbottabad**,** given their lack of access to safe drinking water and proper sanitation. Utilizing both qualitative and quantitative, the study randomly selected households and questionnaires distributed to them, as well as scheduled interview and group discussion in order to obtain relevant data. The study found that both the urban and rural community had poor water and sanitation conditions; however, it was worse in the rural community. It further found their drinking water to be contaminated by bacteria such as salmonella, E. coli, Clostridium and Enterobacter.

Ogbonna and Idam (2007) determine the extent to which sanitation in the area was affected by industrial effluents discharged from oil operations. Standard methods were used to analyze water samples from the river for nitrogen, temperature, pH, total dissolved solids, phosphorus, and alkalinity amongst others. The study made use of questionnaire and interview with community members in order to derive data. The findings made revealed that polluted water was a result of the effluent discharges made into the river containing contaminants which is harmful to humans.

III. METHODOLOGY

In conducting this study, descriptive survey was used. The city of Lagos was chosen s the place of study based on its urban feature and having an increasing population. It is also surrounded by large bodies of water, most of which are polluted. Close to most of these rivers or bodies of water are communities which are home to an ever increasing population of people. These areas are often referred to as slums. Thus for this study, Makoko, a slum community located on the Lagos mainland was purposively selected. Using he random sampling technique, 250 residents were selected to constitute the respondents for the study. These respondents were selected based on their willingness and knowledge of issue under study. Using questionnaires structured from the formulated research objectives data was derived. The questionnaires were constructed adopting the four point likert scale of Strongly Disagree (SD=1), Disagree (D=2), Agree (A=3), Strongly Agree (SA=4). Analysis of the data collected was done descriptively with the aid mean and standard deviation. Condition for acceptance was based on the average means with the acceptance level being 2.5 and above.

IV. DATA ANALYSIS

Two hundred and fifty questionnaires were distributed however; only 196 were properly filled and retrieved. Thus the actual sample studied is the 196 returned questionnaires. The analysis was carried out using mean and standard deviation. Decision rule for acceptance was based on the average means with the acceptance level being 2.5 and above.

Demographic data

Table 1: Demographic data of the respondents

Demographics	**Perimeter**	**(n=196)**	
		Frequency	**Percentage**
Gender	Male	115	58.7
	Female	81	41.3
Highest educational qualification	OND/Technical/NCE	99	50.5
	B.Sc/ B.A./HND or Equivalent	81	41.3
	Master's Degree	8	4.1
	Others	8	4.1
Occupation	Private sector	53	27.0
	Self-employed	44	22.4
	Government worker	16	8.2
	Apprentice	19	9.7
	Student	33	16.8
	Unemployed	28	14.3
	Others	3	1.5

Field survey (2021)

The table above revealed the demographic data of the respondents. As indicated in the table above, the study comprises both male (58.7%) and female (41.3%). Also presented in the Table is the respondents' highest educational qualification in which 50.5% had OND/NCE; 41.3% had BSc/BA/Bed, or its equivalent; 4.1% had Master's degree, while the remaining 4.1% selected others. Finally, the result shows that the respondents cut across different works of live with about 27.0% working on private sector; 22.4% are self-employed, 8.2% worked with government body; 9.7% were apprentice; 16.8% were students; 14.3% were unemployed while the remaining 1.5% selected others.

RQ1: What are the causes of river pollution?

Table 2: Causes of river pollution

	Mean*	**Stdev**	**Decision: to accept ≥2.5**
Domestic sewage	3.86	0.79	Accepted
Urbanization	3.84	0.99	Accepted
Plastics and polythene bags	4.43	0.92	Accepted
Weak management system	4.57	0.73	Accepted
Pesticides and fertilizers	3.77	0.83	Accepted
Industrialization	3.73	1.17	Accepted
Population growth	4.43	1.09	Accepted
Human excreta	3.56	0. 68	Accepted
Average	**4.02**	**0.90**	

*** 1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree**
Source: Field survey, 2021

Table 2 above comprises suggested items that could be seen as cause of river pollution. As indicated in the table, all the items were selected above the baseline ≥2.5 which shows that they were accepted as causes of rivers pollution. Among this are: Domestic sewage (3.86 and 0.79) for its mean and standard deviation respectively; Urbanization (3.84 and 0.99) for mean and standard deviation; Plastics and polythene bags (4.43 and 0.92); Weak management system (4.57 and 0.73 stdev.); Pesticides and fertilizers (3.77 and 0.83); Industrialization (3.73 and 1.17); Population growth (4.43 and 1.09); Human excreta (3.56 and 0.68) for means and standard deviation. This shows that all the items mentioned above are responsible for water pollution.

RQ2: What is the impact of river pollution to health?

Table 3: the impact of river pollution to health

	Mean*	**Stdev.**	**Decision: to accept ≥2.5**
Increases the risk of infection to humans	4.77	0.97	Accepted
Respiratory disease	4.03	0.98	Accepted
Increased Mortality rate	4.19	0.63	Accepted
Increased rate of low birth weight	4.21	0.79	Accepted
Destroys the crop production and infects our food	4.13	0.78	Accepted
Bacterial diseases	4.13	0.78	Accepted
Viral diseases	4.76	1.04	Accepted
Average	**4.32**	**0.85**	

*** 1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree**
Source: Field survey, 2021

Table 3 presents the impact of river pollution to health. As indicated in the table above, all the items in the table were accepted as they were above 2.5. As indicated in the Table, the study indicated that rivers pollution increases the risk of infection to humans (4.77and 0.97); Respiratory disease (4.03 and 0.98); Increased Mortality rate (4.19 and 0.63); Increased rate of low birth weight (4.21 and 0.79); Destroys the crop production and infects our food (4.13 and 0.78); Bacterial diseases (4.13 and 0.78); and Viral diseases (4.76 and1.04). This shows that continuous water pollution results in all the items mentioned in table 3 above.

RQ3: To what extent do mobile toilets serve to prevent pollution of rivers?

Table 4: The extent to which mobile toilets prevent pollution of rivers

	Mean*	**Stdev.**	**Decision: to accept ≥2.5**
Mobile toilets increases access to excreta disposal facilities	3.31	1.04	Accepted
Mobile toilets discourage feces from being thrown into the river to prevent further pollution.	4.18	0.78	Accepted
Mobile toilets prevent devastation by eliminating contamination of water and spread of communicable disease	3.30	1.03	Accepted
Mobile toilets increase standard of living and enhance human dignity	4.22	0.68	Accepted
Average	**3.75**	**0.88**	

*** 1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree**
Source: Field survey, 2021

The table above presents the opinion of the respondents on extent to which mobile toilets prevent pollution of rivers as indicated in the table, all the mean score is above 2.5 which are thus accepted. This shows that mobile toilets increases access to excreta disposal facilities (3.31 and 1.04); it discourage feces from being thrown into the river to prevent further pollution (4.18 and 0.78); it prevent devastation by eliminating contamination of water and spread of communicable disease (3.30 and 1.03); and finally, mobile toilets increase standard of living and enhance human dignity (4.22 and 0.68).

RQ4: What other measures can be used to prevent river pollution?

Table 5: Other measures to prevent river pollution

	Mean*	**Stdev.**	**Decision: to accept ≥2.5**
Proper waste disposal system	4.00	0.87	Accepted
Treatment of waste before entering the river	4.16	0.75	Accepted
Educational and awareness programs to control the pollution	4.15	0.72	Accepted
Average	**4.10**	**0.78**	

*** 1= strongly disagree, 2= disagree, 3= undecided, 4= agree, 5= strongly agree**
Source: Field survey, 2021

The final research question was meant to suggest other measures that could be adopted to prevent rivers pollution. As indicated in the Table, all the items were accepted. This shows that other measures to prevent river pollution include the use of proper waste disposal system (4.00 and 0.87); Treatment of waste before entering the river (4.16 and 0.75); and promoting Educational and awareness programs to control the pollution (4.10 and 0.72).

V. DISCUSSION OF FINDINGS

Lagos is a city surrounded by water. Because of the present of water, Lagos state is exposed to diseases arising from polluted water from drains and sewages (Jideonwo, 2014). The problem is further compounded because of lack of efficient toilet systems, especially in slum communities leading its habitants to open defecation which are most often channel towards streams and flowing waters and into the sea. This is considered unsafe as it exposes the vulnerable population to these human wastes or faeces and contains dangerous parasites and bacteria. In a lot of cases the water from rivers and streams are used in household activities such as drinking, cooking and washing. This paper investigated the prevention of river and creek pollutions through the creation of mobile toilets in Lagos state. The first research question was therefore meant to identify cause of water pollution. There were several causes of water pollution include domestic sewage; urbanization; Plastics and polythene bags; Weak management system; Pesticides and fertilizers; Industrialization; Population growth; Human excreta. This items supports that mentioned in the study by Mehtab, et al. (2017)

The second research question was meant to investigate the impact of river pollution to health. The result revealed that river pollution has significant impact on health as it increases the risk of infection to humans and other respiratory disease ; Increased Mortality rate; Increased rate of low birth weight; Destroys the crop production and infects our food; Bacterial diseases; and Viral diseases. This result supports the outcome of the study by Kamble (2014) and Halder and Islam (2015) who found water pollution detrimental to health.

The third research question was meant to investigate the extent to which mobile toilet minimizes water pollution. As indicated in the table, mobile toilets increases access to excreta disposal facilities; discourages feces from being thrown into the river to prevent further pollution; prevent devastation by eliminating contamination of water and spread of communicable disease; and finally, mobile toilets increase standard of living and enhance human dignity.

Finally, the study investigated other measures which could be adopted to prevent river pollution. The result indicated that the of proper waste disposal system; Treatment of waste before entering the river; and promoting Educational and awareness programs to control the pollution.

VI. CONCLUSION AND RECOMMENDATIONS

One of the characteristics of human being is that they excrete. The urge to excrete can come to man at any point and at any place, which makes mobile toilet inevitable to man. This study has indicated that mobile toilet is essential in eliminating river pollution. Based on the findings of this study, the following recommendations were made. There should be availability of mobile toilet at every point in the city. All convenience store and eateries must have a number of mobile toilets to help people that will have the need for it to prevent them from emptying their bowel in the rivers. Government should institutes taskforce who will ensure compliance meant to protect the rivers against pollutions.

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Appendix

PREVENTION OF RIVER AND CREEK POLLUTIONS BY CREATING MOBILE TOILETS IN LAGOS STATE
REQUEST FOR INFORMATION

Dear Respondent,

I am carrying out a study on "prevention of river and creek pollutions by creating mobile toilets in Lagos state", and you have been chosen to be part of the study. This questionnaire is only for academic purposes. Kindly select the response which applies to you and all information will be kept confidential

SECTION A

Gender: Male ( ) Female ( )

Education qualification

a) OND/NCE ( )
b) B.Sc./ HND ( )
c) M. Sc./MBA ( )

d) Others ( ) Specify……

Occupation

a) Private sector ( )
b) Self-employed ( )
c) Government worker ( )
d) Apprentice ( )
e) Student ( )
f) Unemployed ( )
g) Others ( )

SECTION B:

Instructions: Please tick **(√)** as appropriate where

SA = Strongly Agree (SA), A = Agree, D Undecided, UN; = Disagree (D), SD = Strongly Disagree (SD)

Key: Strongly agree (5), Agree (4), Undecided (3), Disagree (2), and strongly disagree (1).

S/N	ITEMS	SA	A	UN	D	SD
RQ1	**What are the causes of river pollution?**					
1	Domestic sewage					
2	Urbanization					
3	Plastics and polythene bags					
4	Weak management system					
5	Pesticides and fertilizers					
6	Industrialization					
7	Population growth					
8	Human excreta					
RQ2	**What is the impact of river pollution to health?**					
9	Increases the risk of infection to humans					
10	Respiratory disease					
11	Increased Mortality rate					
12	Increased rate of low birth weight					
13	Destroys the crop production and infects our food					
14	Bacterial diseases					
15	Viral diseases					
RQ3	**To what extent do mobile toilets serve to prevent pollution of rivers?**					
16	Mobile toilets increases access to excreta disposal facilities					
17	Mobile toilets discourage feces from being thrown into the river to prevent further pollution.					
18	Mobile toilets prevent devastation by eliminating contamination of water and spread of communicable disease					
19	Mobile toilets increase standard of living and enhance human dignity					
RQ4	**What other measures can be used to prevent river pollution?**					
20	Proper waste disposal system					
21	Treatment of waste before entering the river					
22	Educational and awareness programs to control the pollution					

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