

Spatial Assessment of the Perception of Environmental Pollution in Rivers State

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Abstract

This study examines the perception of pollution in Rivers state, to find out the inhabitants opinion of how the government is handling pollution in the area. The study used the survey research design and primary data which were collected using copies of questionnaire were the main data used for the study. Data collected were presented using tables and statistical diagrams, while data analysis was achieved using the welch statistics. It was observed that 37.75% of the respondents suggested that the air quality in the area is very bad, suggesting that they were suffering as a result. The main sources of environmental pollution were petroleum refining (44.25%), illegal refining of petroleum products (52.75%) and fumes from vehicles (46%). Also noted was that vast majority of inhabitants (86.75%) were willing to partake in the cleaner environmental process, but they stated that the government was not forceful enough to achieve the pollution free environment in the area. The welch statistics identified that there was no statistically significant difference in the perception of polluted environment in the area at $P > 0.05$. The study as a result of the findings advocates partnership between government, individuals and NGOs to achieve cleaner and safer environment in the area.

Keywords

Spatial, Pollution, Africa, Rivers-State

1. Introduction

Since the period 1950s, many nations have developed from an agrarian-based rural economy to an industrial-based economy (Adoki, 2012; Akukwe & Ogbodo, 2015; Ede & Edokpa, 2015). As a result, several anthropogenic activities in

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the hitherto under developed countries have now joined in the emission of toxic particulate matter (PM) (such as PM₁₀ or PM_{2.5}) and gases (such as ozone, nitrogen dioxide), which in turn, results in atmospheric pollution (Eludoyin & Weli, 2011; Fagbeja, Hill, Chatterton, Longhurst & Akinyede, 2013; Gobo, Richard & Ubong, 2010). The World Health Organization (WHO) puts it succinctly that every year, air pollution results in over 7 million untimely deaths worldwide, and the developing countries are the most hit since they do not have adequate technology and the knowhow to manage the environment (Adoki, 2012; Akukwe & Ogbodo, 2015). The negative impacts of pollution on human health subsequently degrade life and environmental satisfaction (Rim-Rukeh, 2015).

Over the years the debate for a cleaner environment has been of topical interest, both to government and the public (Godson, Sridhar & Asuzu, 2010; Kio-Lawson & Dekor, 2014). The reason for this is not farfetched; people need clean air to maintain good health and productivity (Lelieveld, Evans, Fnais, Giannadaki, & Pozzer, 2015). A clean environment is also required for keeping a functional agricultural system (Nwachukwu, Chukwuocha & Igbudu, 2012), and a polluted environment may intensify the health problems of persons who already has health challenge(s) (Odum & Ogbada, 2014; Okonkwo, Kumar, & Taylor, 2015; Okonkwo, Okpala, & Opara, 2014). As a result there has been summits held (such as the Rio de Janeiro summit) with the idea that if cleaner environment is pursued temperature which has been on the increase since the industrial revolution will reduce or not pass where it is now. To achieve the aim, targets have been set in motion. This has resulted in the halting of gas flaring in the developed environments, while converting the waste gas for energy generation or other uses. Similarly, there have been frantic efforts by governments of the developed nations to remediate the environment by investing in research, policy formulation and enforcement. Today that has manifested in the types of vehicle produced there, the kinds of electrical appliance used, and the green city approach to urban development. Well in the developing world there is a sharp contrast between what is said and done in the environment. The political leaders plan development in such a way that the environment (whether it is an exploration of oil, building of roads or mining) is impacted. This has led to serious environmental pollution (Ozabor & Obisesan, 2015). Yet every time there is an opportunity to speak, political leaders promise that the right thing will be done.

Furthermore, Nigeria has witnessed rapid industrial development and urbanization. With the economic benefits that come with such industrialization and urban development is pollution. What is established in literature (Rim-Rukeh, 2015; Weli, 2014; Weli, & Efe, 2014; Weli & Worlu, 2011; Yakubu, 2017), is that the air quality in Nigeria has been seriously loaded with pollutants. The cause of pollution in the country to the north is the Sahara desert and pockets of industries there (Sacks, Stanek, Luben, Johns, Buckley, Brown, & Ross, 2011; Ubong, Ubong, Ubong, Ukonta, & Ishmael, 2015); to the south, the country is plagued by gas flaring from the oil gas mining, effluents from industries, fumes from vehicles, slash and burn farm, deforestation (Adoki, 2012; Akukwe & Ogbodo, 2015; Ede & Edokpa,

2015; Eludoyin & Weli, 2011; Fagbeja, Hill, Chatterton, Longhurst & Akinyede, 2013; Gobo, Richard, & Ubong, 2010; Godson, Sridhar, & Bamgboye, 2009; Godson, Sridhar, & Asuzu, 2010; Kio-Lawson & Dekor, 2014; Lelieveld, Evans, Fnais, Giannadaki, & Pozzer, 2015; Nwachukwu, Chukwuocha, & Igbedu, 2012). Rather than solve the problem of pollution in the area, political statements and flag offs are made, and the money meant for the clean-ups is embezzled. A case in point is the Ogoni clean-up, which was flagged off some years ago by the current administration. Till now no visible work has been done. The government in the country has continued to shift the goal post when it comes to the issue of ending gas flaring. Instead fines are collected from the owners of the rig(s) and well heads. These fines are so marginal, that these companies pay without much ado; nevertheless at the expense of the locals, who have to inhale the polluted air.

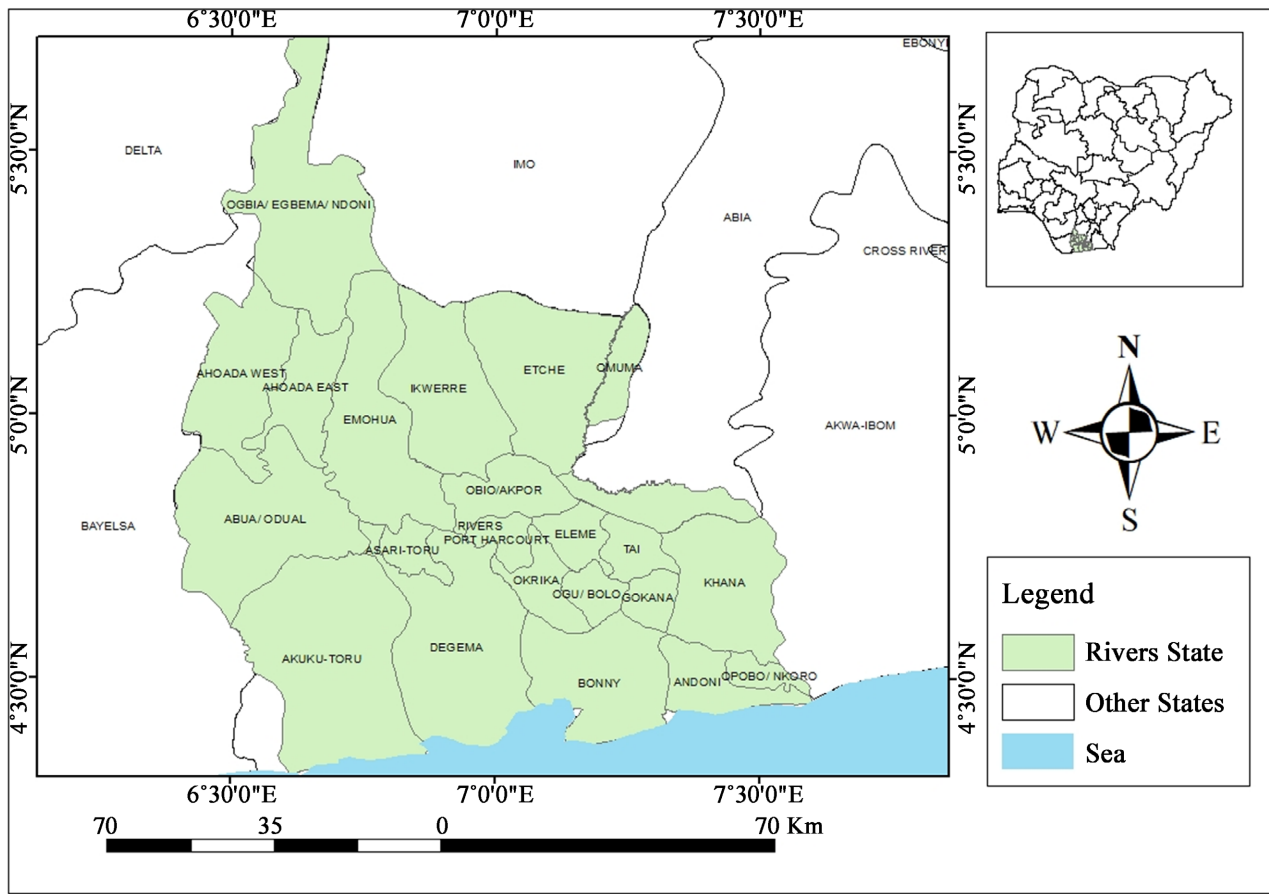
In Rivers State, the case is not different as there have been anthropogenic activities that have impacted the air quality in the state. These activities include the mining of crude oil, the clearing of the vegetal belts to cater for roads and housing, vehicular fumes, and more recently, illegal mining of petroleum products (especially in the creeks) (Obisesan & Weli, 2019). With these activities thriving, and on the increase, it gives one the impetus to think that there is possibly a political undertone to the policing of pollution in the area. This study therefore is aimed at examining the spatial perception of Pollution in Rivers State; and the objectives are to 1) identify the sources of pollution in Rivers State; 2) examine the consequences of pollution in Rivers State; 3) evaluate the efforts of government towards pollution management in Rivers State.

2. Materials and Methods

The study was conducted in Rivers State, Nigeria. The location is physically bounded by latitudes $4^{\circ}51'30''\text{N}$ & $4^{\circ}57'30''\text{N}$ and longitudes $6^{\circ}50'00''\text{E}$ & $7^{\circ}00'00''\text{E}$ (Figure 1). This state was created on May 27, 1967. Rivers State is clipped to the south by the Atlantic Ocean, on the west by Bayelsa & Delta States, north by Imo, Abia and Anambra States and east by Akwa Ibom State. Rivers State has 23 local government areas currently (Weli et al., 2017).

The area enjoys the tropical type of climate, and rainfall occurs almost all year round. Temperature also ranges between 27°C and 30°C . Also, the vegetation is very luxuriant and produces a lot of timber for economic use hitherto. However, as a result of the unguided environmental management practices these forests have been severely depleted and the areas ecology altered. There is therefore the fear that if these go on unabated, there will be severe consequences for the locals and persons who live in the adjoining areas.

The study used the survey research design and primary data were gathered using the developed copies of questionnaire. The population of the area is fairly large (see Table 1) as such the Taro Yamane equation was used to arrive at a sample size for the study as deployed by Famous & Adekunle (2020); and Nwagbara et al. (2017) (see Equation (1)) and a sample size of 400 was realized.



Sources: Ndubueze-Ogaraku, Udensi, & Adedokun (2017).

Figure 1. Rivers state showing the local government areas.

Table 1. The senatorial districts of rivers state.

Senatorial district	LGAs	Communities visited	Total population (NPC)	Taro Yamane size
Rivers West senatorial district	Ogba/Egbema/Ndoni, Ahoada West, Ahoada East, Abua/Odual, Degema, Akuku-Toru, Asari-Toru and Bonny	Abada, Anyu, Ihuaba, Ebiro, Emazi, Dama, Damina, Bokana, Bukuma, Abonnema, Kalu, Aluka, Orukalama, Okpobakiri, Otutunbi	1,924,407	146
Rivers East senatorial district	Port-Harcourt, Ikwerre, Okirika, Ogu/Bolo, Obio-Akpor, Etche, Omuma and Emouha	Abuloma, Diobu, Aluu, Mgbuodo, Mbikiri, Abioboama, Utu, Ndoni, Kpeng, Kpong, Isu, Mbaa, Uwuoka, Umusu, Ogbola, Ndele	2,044,060	155
Rivers South-East senatorial district	Opobo/Nkoro, Andoni, Oyigbo, Tai, Eleme, Gokana and Khana	Opum, Olum, Okoro-Iro, Otiga, Asa, Oyigbo, Gio, Horo, Onne, Alejoh, Yeghe, Kpor, Sii, Bori	1,316,780	99
Total	23		5,285,247	400

$$n = N / (1 + N(e^2)) \tag{1}$$

where n = the sample size,
 N = the total population size,

e = sampling error (in this case 0.05),

1 = constant.

After doing this, the copies of the questionnaire were administered in the field using the systematic sampling technique. To effect an even and effective distribution of the research instrument, the researcher used the help of some field research assistants for the distribution of the copies of the questionnaire. Data generated were presented in tables and statistical diagrams; while data analysis was achieved using the brown-Forsythe test.

3. Results and Discussions

Table 2 presents the respondents perception of the air quality characteristics in Rivers State. In the table the proportion of the respondents that were undecided accounted for only 5.75%, while those that claimed that the air quality was good, accounted for 3% of the total respondents. The proportion of the respondents that suggested that the air quality was not so good was 7%, while those that suggested that the air quality was bad and very bad accounted for 46% and 37.5% respectively.

Generally, this result suggested that the air quality in the study area is generally poor and by extension confirms the work of [Obisesan and Weli \(2019\)](#), who suggested that the air quality in Rivers state had been seriously impacted due to proliferation of industries and crude oil extraction in the state.

Table 3 presents the perception of respondents regarding types and sources of pollution in Rivers state. From the table we can deduce that there is a serious air pollution problem in the area as those that agreed and strongly agreed jointly accounted for 87.5% of the total respondents. Conversely, water pollution is also a problem in the area as the majority of the respondents suggested that they agreed (47.25%) and strongly agreed (41%) with the opinion that water in the area is polluted. The same can be said of Land and soil pollution in which case, respondents suggested that they strongly agreed (28.5%) and agreed (45.75%) with the opinion that land surfaces in the area has been seriously polluted. Of course, this finding is not new in the literature. [Weli and Ayode \(2015\)](#) suggested that there have been a serious impact on the atmosphere, of land and water resulting from anthropogenic activities in the area. This has also been corroborated by

Table 2. Perception of the air quality characteristics in river state.

Perception	Frequency	%
Undecided	23	5.75
Good	12	3
Not so good	28	7
Bad	186	46.5
Very bad	151	37.75
Total	400	100

Table 3. Perception of the types and sources of pollution in River State

	Undecided	disagree	Strongly disagree	agree	Strongly agree	Total
Types of Pollution						
Air pollution	09	27	14	211	139	400
%	2.25	6.75	3.5	52.75	34.75	100
Water pollution	00	12	35	189	164	400
%	00	3	8.75	47.25	41	100
Land/soil pollution	24	45	34	183	114	400
%	6	11.25	8.5	45.75	28.5	100
Sources of pollution						
Domestic cooking	00	115	89	103	93	400
%	00	28.75	22.25	25.75	24.25	100
Petroleum refining	00	15	20	188	177	400
%	00	3.75	5	47	44.25	100
Illegal refining of petroleum products	10	00	00	179	211	400
%	2.5	00	00	44.75	52.75	100
Fumes from vehicles	00	09	11	196	184	400
%	00	2.25	2.75	49	46	100
Poor waste management	11	25	15	193	156	400
%	2.75	6.25	3.75	48.25	39	100

Odum & Ogbada (2014); Okonkwo, Kumar & Taylor (2015); Okonkwo, Okpala & Opara (2014); Rim-Rukeh (2015), who suggested that the cases of sabotage in the study area have been so alarming, of which its impacts are now being felt by inhabitants and farmers who have to cope with polluted environments and soils.

On the other hand, the respondents were divided about the opinion that domestic cooking was a source of pollution in the area. This conclusion is based on the fact that those that strongly disagreed and disagreed with the fact that domestic cooking is a major source of pollution in the area jointly accounted for 51% of the total respondents, while those that agreed and strongly agreed were 22.25% and 25.75% respectively. This finding was similar to the finding of Ozabor & Obaro (2016). Nevertheless, poor waste management, fumes from vehicles, illegal refining of petroleum products and petroleum refining are major sources of pollution in the area as pointed out by the respondents (see Table 3). Generally, rivers state is one of the major commercial hubs of Nigeria. This is because apart from its being a coastal environment, the area is a host to several oil wells, from which extraction activities are taking place regularly. Nevertheless, years of extraction petroleum products in the area, without corresponding social benevo-

lence on the part of government, resulted in sabotage of the oil installations. The haste and panic with which the sabotage activities are carried out coupled with the fact that these saboteurs are not skilled, results in oil spills. Similarly, the industries located in the area are a serious pull factor for auto mobiles and people. However, because transportation is not regulated in the area, it is common a sight to find rickety vehicles with weak engines in the area. This in turn, leads to air pollution. These findings have been corroborated by [Nwachukwu, Chukwuocha, & Igbudu \(2012\)](#); [Adoki \(2012\)](#); [Godson, Sridhar, & Bamgboye \(2009\)](#).

Table 4 presents the perception of the consequences of environmental pollution in the area. From the table, it is lucid that respondents suggested that crops (64.25%) have been totally affected; aquatic life (94.5%) have been totally affected the same as indoor and outdoor air quality (58.75%). As corroborated by [Obafemi et al. \(2012\)](#), these pollution patterns can, exacerbate existing health conditions, trigger severe cases of asthma and cause species extinction.

Table 5 presents the willingness of respondents to participate in the cleaner environment process in the area. From the table, 2.75% of the respondents suggested that they were unwilling to participate in the cleaner environment process. These folks believe that it is the responsibility of the government to remediate the environment. On the other hand, majority of the respondents (86.75%) suggested that they were willing to participate in the cleaner environment process of the area.

Table 4. Perception of the consequences of environmental pollution in rivers state.

	Frequency	%
Effects on crops		
Not affected	24	6
Partial affected	119	29.75
Totally affected	257	64.25
Total	400	100
Effects on aquatic life		
Not affected	00	00
Partial affected	22	5.5
Totally affected	378	94.5
Total	400	100
Effects on indoor & outdoor air quality		
Not affected	00	00
Partial affected	165	41.25
Totally affected	235	58.75
Total	400	100

Nevertheless in **Table 6**, where the respondents were asked about their perception of government's effort for a cleaner, Rivers state, only 3% of the respondents adduced that the government was doing its best to curb pollution in the area.

On the other hand, 61.5% of the respondents suggested that the government was not being forceful enough in the area. Whereas the respondents that suggested that the government is being political about arresting pollution rates in the area accounted for 31.75% of the total respondents.

Table 7 present the result of the spatial variation in the perception of polluted environment in the study area. From the table, both the Brown-Forsythe and the Welch statistics were not significant at $P > 0.05$. The implication is that the null hypothesis is retained and by extension implies that there is no statistically significant variation in the perception of polluted environment in the study area. This finding is in line with those of *Weli & Efe (2014)*; *Gobo, Richard, & Ubong (2010)*; *Yakubu (2017)*; *Okonkwo, Okpala & Opara (2014)*.

Table 5. Willingness to participate in the cleaner environment process.

Perception	Frequencies	%
I am not willing	11	2.75
I am willing to	347	86.75
Undecided	42	10.5
Total	400	100

Table 6. Perception of government's effort for a cleaner rivers state.

Perception	Frequencies	%
Government is doing its best	12	3
Government is not forceful enough	246	61.5
Government is being political about policing the environment	127	31.75
Undecided	15	3.75
Total	400	100

Table 7. Result for spatial variation in the perception of polluted environment in the area.

Robust Tests of Equality of Means				
Independent				
	Statistic ^a	df1	df2	Sig.
Welch	883.545	2	20,865.811	0.341
Brown-Forsythe	859.113	2	31,278.173	0.056

^aAsymptotically F distributed.

4. Conclusion and Recommendation

This study investigated the spatial perception of pollution in River State. The general opinion in the area is that the area has been severely impacted through series of oil spills, poor waste management, and the proliferation of industries in the area. Nevertheless, locals are willing to participate in the environmental remediation process; they however suggested that the government should show more commitment to environmental management in the study area.

As fallout from the findings in this study the following smart recommendations area advanced. There is need for partnership between government, individuals and NGOs to achieve cleaner and safer environment in the area. Similarly, there is need to detribalise and depoliticise the environmental management cum policing process in the area—no favouritism. Finally, there is need to introduce the smart surveillance technology in pipeline surveillance in the area for policing the oil installations; while developing initiatives that will engage youth from the area. This will compensate for the past years of neglect and foster as life of hope on the path of the youth from the area.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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