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Effects of Marine Litters on Ferryboat Transportation in Coastal Areas of Rivers State Nigeria

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Abstract

This is an empirical study on effects of marine litters on ferryboat transportation in coastal areas of Rivers State. Primary data was collected with the help of well-structured questionnaire designed by the researcher in four Likert scales and was analyzed using charts, percentage and independent samples T test statistics to determine the significant difference in the mean of the independent group variables in the data sets. Four hypotheses were postulated from the objectives of the study to answer the research questions. It was found in all the hypotheses tested that; there were statistically significant difference in mean of the grouped data sets. This means that the difference between the mean of the grouped data were statistically significant in all the hypotheses tested. Therefore, the null hypotheses were rejected and the alternative hypotheses accepted, inferring that marine litters cause ferryboat accident, siltation on water channels; damages to ferryboat propeller, slow speed of ferryboats, and cause irritation to passengers. Based on these findings, some recommendations were made which suggest urgent clean-up of the waterways.

***Keywords*:** *Marine litters, Ferryboat, Transportation, Rivers State*

1.0 Introduction

Rivers State is one of the major states in the Niger Delta region of Nigeria. It is located along the bight of bonny river basin with majority of its population settled in the coastal areas and economy heavily depend on the resources from the River basin. Rivers State has about twenty three (23) local government areas of which more than eight local government areas are settled in the coastal region and can mostly be accessed through the water ways (Matthew, *et al.,* 2022). These local governments include: Opobo/Nkoro, Andoni, Bonny, Degema, Okrika, Ogu Obolo, Asari Toru, Akuku Toru and Abua/Odual, among others which are partly upland with its communities and farmlands located in the creeks and accessible with canoes and flying boats. The overwhelming majority of the people are involved in two primary occupations which are farming and fishing, however, in the recent time of industrialization, the people have engaged in coastal commercial transportation by the use of speed boats, dugout engine boats and canoes. People travelling from one location to another for jobs and recreation. Farm produce are transported to the markets in various places within the coastal areas and to Port Harcourt city, building materials, food items, drinking water and so many other products supplied are transported along the waterways to the local communities from Port Harcourt city vice versa, generating income and improving the peoples' standards of living (Matthew, *et al.,* 2022).



Figure 1: Rivers State and LGAs

Source: NIWA, 2006

Water transportation has been a very lucrative business of the people of Rivers State especially those connected to the riverine or coastal areas. In this modern time of industrial evolution, industries and businesses are situated in different locations provided it is accessible and lives exist; movement or transportation becomes very necessary to enable free flow of materials, communication and mobility of labour. The jobs for speed boats, canoes and dugout engine boats have increased over time in the waterways (Matthew, *et al.,* 2022). This can further be supported by the study of Praveen and Jegan (2015), which indicated that in the year 2011, Inland Water Transportation sector provided a higher employment coefficient per unit of investment than any other mode of transportation in India and Matthew, *et al.,* (2022) concludes that inland transport contributes to the overall economic development of Bonny Island through job creation among the youths and traders.

The problem this study is concerned to address is the effects of marine litters on ferryboat transportation in coastal areas of Rivers State Nigeria. Marine litter are the major physical, solid or material pollutants along the waterways and coastal communities in Rivers State. According to Elenwo and Akankali (2015), plastics, industrial material, woods, and other forms of debris are most commonly discharged into our coastal waters which is quite common off the coasts of Lagos and major industrialized cities of the Niger delta region of Nigeria such as Warri and Port Harcourt. There are numerous problems and threats associated with marine litters directly or indirectly affecting the environment, social and economic system (Elenwo and Akankali, 2015).

Marine litters threatens the realization of a shared vision for clean, healthy, safe, productive, socially diverse marine activities and coastal environments, managed to meet the long term needs of nature and people (Onepageafrica**,** 2022**)**. Most noticeably by researchers is the threat marine litters pose on health and productivity of marine ecosystems (Tran and Le Hong, 2022; Abdulaziz 2010). Notwithstanding, the presence of marine litters in our seas also have impacts on transportation, especially on the ferry boats operations and safe movement of people within the coastal regions for economic and recreational activities. As noted on this study, many works have been carried out on the environmental impacts of marine litters on ecosystem, health and aquaculture, however, there has not been any literature and empirical study on the effects of marine litters on ferryboat transportation in coastal areas of Rivers State Nigeria. Hence, this study is focused to evaluate the effects of marine litters on ferryboat transportation in coastal areas of Rivers State Nigeria with the following objectives to find out if marine litters cause ferryboat accident; siltation on water channels; damage to ferryboat propeller; slow speed of ferryboats; and irritation to passengers.

The study was designed to answer the questions: do marine litters cause ferryboat accident; siltation on water channels; damage to ferryboat propeller; slow speed of ferryboats and cause irritation to passengers?

In attempt to answer the research questions theses hypotheses were proposed: marine litters do not cause ferryboat accident, siltation on water channels; damage to ferryboat propeller; slow speed of ferryboats and irritation to passengers.

2.0 Review of Literatures

Marine litter problem has gained great attention globally in the recent time as it has led to degradation of the marine ecosystem and has threaten the aquatic lives and marine environment as a whole (Abdulaziz, 2010; BSC, 2007). In Nigeria today, marine litters have become a big challenge and major pollutant in our waterways. Measures and regulations remain inadequate to protect the coastal regions against these litters emanating from the industry waste, commercial activities of market women, commuters of the ferryboats, domestic materials and refuse discharged on streets being carried by erosions or flowing waters through the gutters discharging into the rivers and some are also deliberately being discharge directly into the rivers (Armitage and Rooseboom, 2000).

Plastic bottles, sachet water, fruit drink cans, woods, polythene and debris contribute the most significant part of marine litter deposits and solid wastes dumped into marine environments in Rivers State (Edene, *et al*., 2020). Plastics are dumped in huge volumes in well-used beaches, lakes, navigation channels and other forms of water masses (BSC, 2007). In the north-western Mediterranean, plastics constituted most of the debris, at an average of about 77% (Daoji, and Daler, 2004). In a survey on the stranded and buried litter on beach in Japan and Russia along Japan Sea, it is reported that plastics contributed 72.9% by number and 53.8% by weight of the total litter deposits in the beaches of Japan (Fanshave and Everard, 2002) and 55.1% by number 23.4% by weight in the beaches in Russia (Inıguez and Ficsher, 2003). The bulk of plastic materials are even bigger in developing countries with poor waste disposal regulations (Edene, 2020).

The use of ‘Plastic’ and ‘Can’ materials in Nigeria have witness a skyrocketing growth for its good features based on durability, cheap and lightweight. Global production of plastic soared from 25 million tonnes in 1970 to 400 million in 2018 (Beloved, 2020). According to an Ellen MacArthur Foundation report cited in Beloved (2020), the demand for plastic doubled since the year 2000 and

could double again by 2050. The durability and lightweight that made plastics and cans most appealing, and in turn had made them environmental time bomb.

The report of World Resources Institute (WRI) on global review shows that out of 192 countries reviewed, 127 have adopted some forms of legislation to regulate plastic waste and Africa is leading the world in plastic regulations with 34 countries adopting taxes or ban (Edene, 2020; Beloved, 2020). However, Nigeria is yet to adopt any proactive measure to curb plastic despite been ranked the ninth in the world for mismanagement of plastic waste (Earth Day, 2018). According to Our World in Data (OWID), an online science publication estimates that Nigeria generates 5.96 million tons of plastics (Hannah and Max, 2022). Annually, over 20 thousand tonnes of plastics wastes are littered by coastal populations within 50 kilometres away from a coastline (Hannah and Max, 2022).



Plate 1: Okrika jetty

Source: Field survey, (2022)



Plate 2: Abonnema wharf

Source: field survey, (2022)



Plate 3: Kaa waterside

Source: field survey, (2022)



Plate 4: Iwofe waterside

Source: field survey, (2022)



Plate 5: Abuloma Jetty.

Source: Beloved, (2022)

The pictures in the figures above showed various watersides in Rivers State. Plastics are the most abundant debris found in those environments. Obviously, it comprises more than half of the garbage in the waterways. The garbage never reduces. At first, they persist at the water front/surface before making their way offshore. Plastics and other floating materials are accumulating in mass across the country waterways. Its viability is increasing just as its negative impacts on the surrounding environment, safety of navigation and human health is becoming noticeably affected.

According to Beloved (2020), most of these plastics and debris flow from gutters and creeks within the city. According to the report, Nta wogba stream is a creek exposed to this environmental hazard, situated in the town with dense human settlement and massive non-biodegradable waste problem, the stream cuts across

Diobu and three other local government areas in Rivers State. It flows beneath several highways and empties out in Bonny River. Again, behind the suburban Amadi-Ama community in southern Port Harcourt is a vital inland water body. This is Amadi creek, an estuary which lies on the north of the Bonny River, upstream from the Bight of Benin. Aside the destructive oil spills, the waterway is also struggling with the challenges of plastic junks and other floating materials threating maritime operations (Beloved, 2020).

Plastic wastes are channeled into the stream through underground gutters after a heavy rain fall. These garbage cluster mostly on the water front/surface for a very long time becoming irritating to the sight and cause the water body to change colour.

A good example is the Nta Wogba stream which changes its colour as often as possible. It can be brown, black or dirty green. When the stream flows back, it comes with a very bad irritating odour that upsets the stomach (Beloved, 2020). The chunks of plastics on the coast of Abuloma are deposited by the flowing river. It is majorly influenced by high tides and the wave pattern. The river bank represents a major sink for plastic waste due to the wide network of water connections in the city. When the tide is high, the water flows down with countless plastics and is directed by the wave pattern. Wastes are moved from distant or neighbouring towns and are abandoned offshore until the tide is high enough to take them back. These plastics come from Elelenwo, Apajor, woji and many other communities as stated in Beloved (2020) and when the tide is high, plastic wastes flow down from these communities. Some are abandoned offshore while the others are carried down to the high sea.





Plate 6: Ferryboat operations in River State

Source: Field survey, (2022)

3.0 Material and Method

On this study, the researcher considered most viable areas of coastal transportation in Rivers State which include the loading point to and fro the commercial areas and communities which generate goods and passenger traffic such as Marine Base waterside, Iwofe waterside, Okrika waterside, Bonny waterside, Abuloma waterside, Nembe waterside and kaa waterside.

The data collected were primary data from field survey and use of questionnaire suitably designed by the researcher for the purpose of gathering firsthand information required on this study. The questionnaire was

constructed to collect information on the demography of the respondents and used the 5 likert scales of Strongly Agree (SA), Agree (A), Strongly Disagree (SD) and Disagree (D) to elicit responses from the targeted respondents to achieve the objectives of the study. The affirmative responses were categorized as group A and non-affirmative as group B. A total number of 370 questionnaire were distributed but 350 were properly and recovered filled. The instrument reliability and content validity were ascertained by experts. The data collated were analyzed using charts, percentage, and descriptive analysis was carried out to quantify the responses. Independent samples T test was employed which compares the means of the two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. MS Excel and SPSS version 22 were useful computer base software applied during analysis.

Decision Rule

Accept the null hypothesis H_0; μgroupA=μgroupB, i.e. the means for the two populations are equal. Accept the alternative hypothesis H_1; μgroupA≠μgroupB, i.e. the means for the two populations are not equal. If the p-value is less than the significance level (0.05), we reject the null hypothesis, the alternative is accepted. Then, difference between the two means is statistically significant.

Data Presentation

Table1: Estimated waterways transport passenger traffic in various jetties in River State

S/n	Jetties/waterside	Mean Weekly passenger Traffic
1	Marine Base	950
2	Iwofe	556
3	Okrika	2512
4	Bonny	8500
5	Abuloma	240
6	Nembe	5426
7	Kaa	4200
	Total	22384

Source: Field survey, (2022)

The information gathered on field survey revealed the mean passenger traffic in various jetties/watersides to be 22,384 passengers per week, which means an estimated total number of 156,688 passengers use the waterways transport on weekly basis in Rivers State Nigeria. However, this was an estimated figure provided by the ferryboat operators being that there is no organized system of ferryboat operations in the areas. There are no records or registers showing the list of operators, no manifest to show the number of passengers, except Bonny waterside which is a bit more organized with statistical records of operators and manifest for passengers.

Table2: Categories of goods transported along waterways in Rivers State

S/N	Category of goods	Examples
1	Farm produce	Yam, Maize, Cassava, Vegetables
2	Forestry	Fire wood, Shrub, Timbers
3	Manufactured/industrial goods	Metals, Plastics, furniture, etc.
5	Harvested fish	Fishes harvest in the rivers
6	Building materials	Sand, gravels, zinc, stores
7	Oil and gas products	Petrol, kerosene, diesel
8	Machinery/equipment/spare parts	Industrial equipment and spare part
9	Other Food items	Rice, beans , Noodles, vegetable oil etc.
10	Household items	Furniture, Electronics and other housewares

Source: field survey, (2022)

Table2 shows the categories of goods transported on the waterways. These are the commercial activities which include the movement of goods and household items to and fro the waterways within coastal areas and Port Harcourt city.

Table3: Demographic characteristics of the Respondents

Demography	Variables	No. of respondents	Percentage
Gender	Male	152	43.43%
	Female	198	56.57%
Age	Under 20	21	6%
	20-29	52	14.86%
	30-39	118	33.71%
	40-49	124	35.43%
	50-59	25	7.14%
	60 and above	10	2.86%
Educational Level	Postgraduate (PhD, MSc, PGD)	38	10.86%
	Graduate (BSc, HND, ND)	127	36.29%
	Under Graduate (Students)	104	29.71%
	Secondary/Primary (O' Level, FSLC)	52	14.86%
	No. Formal Education	29	8.28%
Occupation	Civil/Public Servants	68	19.43%
	Private/Company Staff	99	28.29%
	Ferryboat Operator	75	21.43%
	Trader/Fisher/Farmer	108	30.85%
Waterside/	Marine Base	40	11.43%

Jetties	Iwofe	40	11.43%
	Okrika	45	12.85%
	Bonny	100	28.57
	Abuloma	50	14.29
	Nembe	40	11.43%
	Kaa	35	10%
Total		350	100%

Source: Field Survey, (2022)

This table shows the characteristics of the respondents from the seven watersides visited during the study. The study cut across persons of various educational levels, occupations, ages and gender. The table also showed the distribution of the questionnaire among the seven watersides visited during field survey. The chart is shown on the figure below.

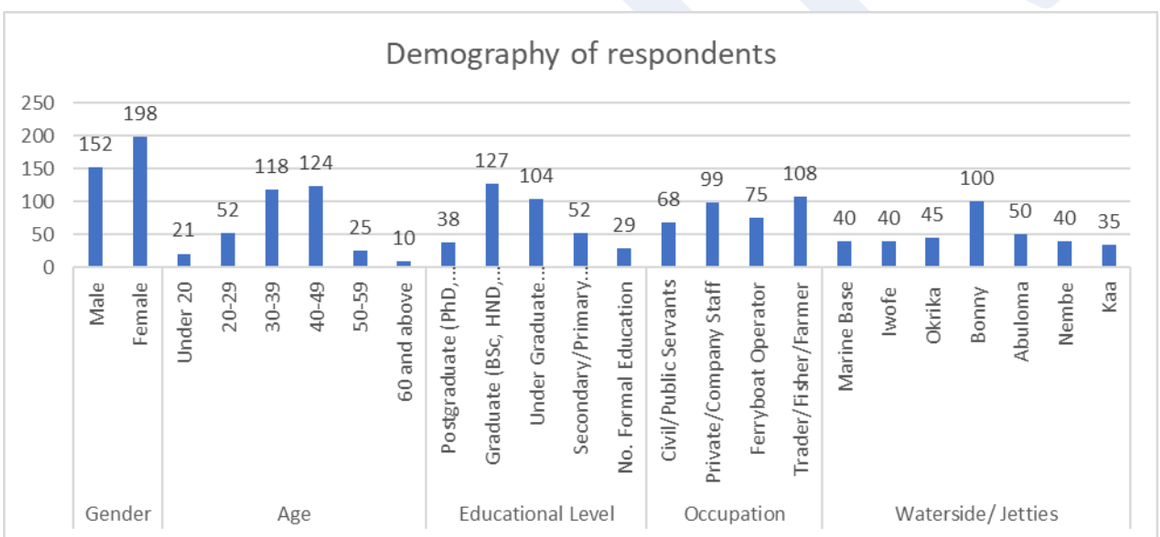


Figure 2: Demographic characteristics of the Respondents

Table 4: How often do you travel with ferryboats on the waterways?

Response	Every Day	Every Week	Every Month	Never	Total
Marine Base	20	13	5	2	40
Iwofe	25	10	4	1	40
Okrika	30	10	2	3	45
Bonny	30	55	15	0	100
Abuloma	29	17	4	0	50
Nembe	5	28	5	2	40
Kaa	30	5	0	0	35

Total	169	138	35	8	350

Source: field survey, (2022)

Table4 highlighted the responses from respondents on how often they travel with ferryboats on the waterways. The responses identified that 169 (48.28%) travel on daily basis, 138 (39.43%) on weekly basis, 35(10%) on monthly basis and 8 (2.29%) never travelled on ferryboats. Therefore, a total of 342 (97.71%) out of 350 respondents travel by ferryboats on the waterways.

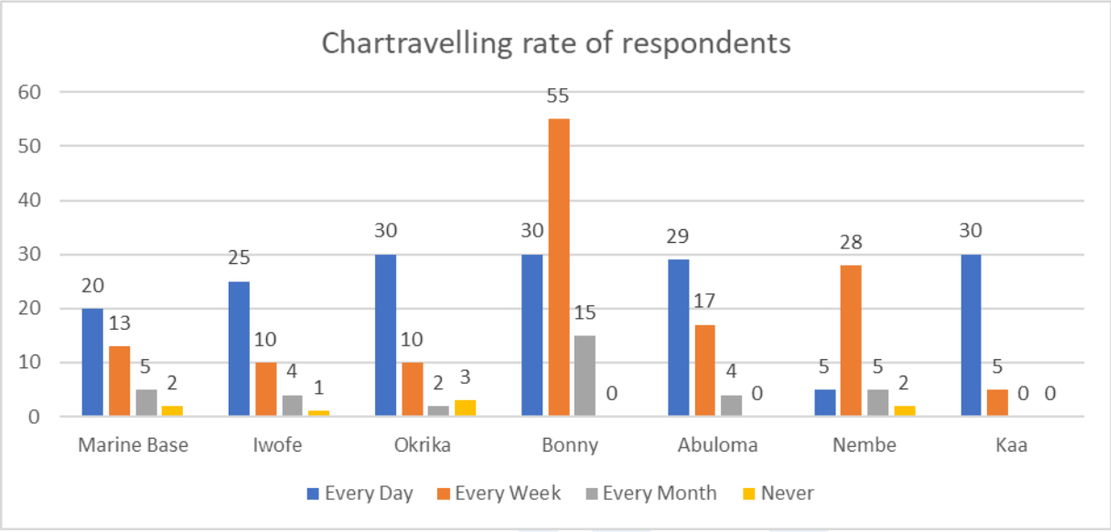


Figure 3: travelling rate of respondents

Table 5: Question 1. Does marine litters cause ferryboat accident on the waterways?

Variables	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Male	77	54	11	10	152
Female	78	85	18	17	198
Under 20	5	12	3	1	21
20-29	27	17	5	3	52
30-39	57	29	20	12	118
40-49	35	61	18	10	124
50-59	7	9	5	4	25
60 and above	2	7	1	0	10
Postgraduate (PhD, MSc, PGD)	30	2	4	2	38
Graduate (BSc, HND, ND)	51	49	17	10	127
Under Graduate (Students)	61	30	9	4	104
Secondary/Primary (O' Level, FSLC)	27	10	7	8	52
No Formal Education	2	17	7	3	29

Civil/Public Servants	47	11	8	2	68
Private/Company Staff	64	17	8	10	99
Ferryboat Operator	32	29	9	5	75
Trader/Fisher/Farmer	48	31	21	8	108
Marine Base	18	14	4	4	40
Iwofe	10	24	6	0	40
Okrika	20	12	7	6	45
Bonny	38	41	16	5	100
Abuloma	14	21	8	7	50
Nembe	17	10	8	5	40
Kaa	10	13	5	7	35

Source: field survey, (2022)

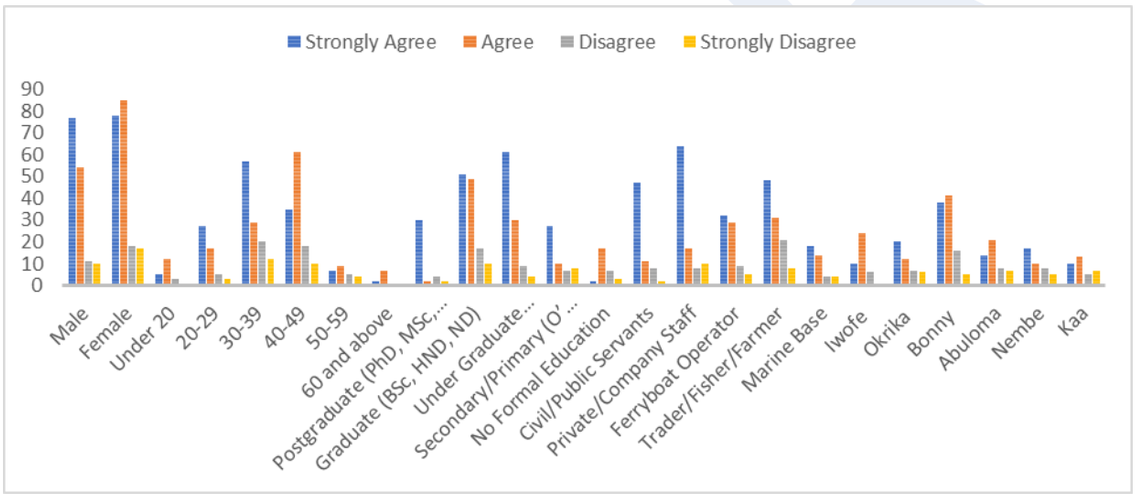


Figure10: Marine litters cause ferryboat accident

Figure 10 shows the responses on the question 'does marine litters cause ferryboat accident on the waterways'. The statistics shows that greater number of the respondents affirmatively concord that marine litters cause ferryboat accident in the waterways. Interview with flying boat drivers revealed that woods, waterproof and sachet water nylons are the common risk of accidents as these materials can cause the speedboat lost control and capsize.

Table 6: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Responses	Group A	24	57.58	39.658	8.095
	Group B	24	14.92	8.657	1.767

The group statistics table 6 above shows the means of the two independent variables group A and group B. Group A has the higher mean of 57.58 and the group B the lower mean of 14.92. The standard deviation of 39.658 of the group is an indication that there are more respondents to group A than group B, with large mean difference of 42.667, hence, the means of the two groups are not equal, and the null hypothesis is rejected.

Table 7: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Responses	Equal variances assumed	32.764	.000	5.149	46	.000	42.667	8.286	25.988	
	Equal variances not assumed			5.149	25.187	.000	42.667	8.286	25.608	

Furthermore, from the independent sample test table 7, shows the significance at p-value as 0.001 which is less than the significance level at 95% confidence (0.05), hence, there is statistical evidence that difference between the two means is statistically significant. Therefore, the null hypothesis is rejected and the alternative is accepted.

Table 8: Question2. Does marine litters cause siltation on water channels?

Variables	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Total**
Male	64	54	21	13	152
Female	68	85	21	24	198
Under 20	5	12	3	1	21
20-29	27	17	5	3	52
30-39	38	53	15	12	118
40-49	46	49	17	12	124
50-59	10	7	4	4	25
60 and above	4	4	2	0	10
Postgraduate (PhD, MSc, PGD)	17	9	6	6	38
Graduate (BSc, HND, ND)	45	51	14	17	127
Under Graduate (Students)	35	42	19	8	104
Secondary/Primary (O' Level, FSLC)	19	21	7	5	52
No Formal Education	8	12	4	5	29

Civil/Public Servants	24	25	10	9	68
Private/Company Staff	46	27	14	12	99
Ferryboat Operator	34	25	9	7	75
Trader/Fisher/Farmer	53	21	18	16	108
Marine Base	11	16	4	9	40
Iwofe	12	13	8	7	40
Okrika	12	15	10	8	45
Bonny	30	42	19	9	100
Abuloma	20	18	8	4	50
Nembe	20	12	4	4	40
Kaa	15	12	5	3	35

Source: field survey, (2022)

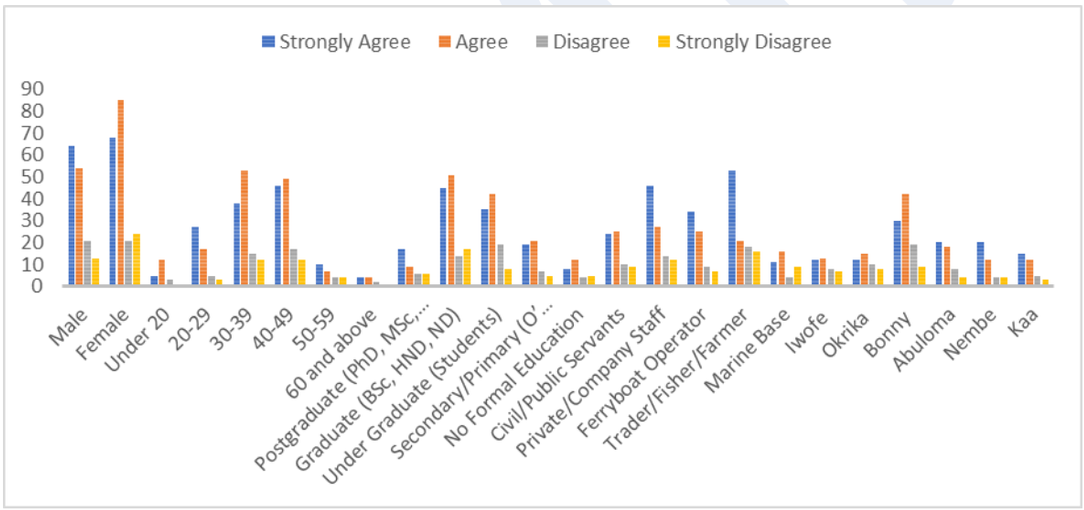


Figure 11: Marine litters cause siltation on water channels

Figure 11 is the responses on the question 'does marine litters cause siltation on water channels'. The statistics shows that greater number of the respondents affirmatively responded that marine litters cause siltation on water channels. The interview with canoe, speedboat drivers and community residents inform that debris affect the depth of the water; it covers the water channels, silt and make the water shallow.

Table 9: Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Responses	GroupA	24	54.38	36.848	7.522
	GroupB	24	18.54	11.287	2.304

The group statistics table 9 above gave the means of group A as 54.38 and Group B as 18.54. The mean difference is 35.833 and standard deviation of group A is given as 36.838 signifies that many respondents are from group A and the means of the two groups are not equal. Group A which represents the affirmative responses has a higher mean and the group B a lower mean. This implies that the higher population of the respondents concord with the fact that marine litters cause siltation on water channels. Hence, the null hypothesis is rejected.

Table 10: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Responses	Equal variances assumed	24.238	.000	4.555	46	.000	35.833	7.867	19.999	
	Equal variances not assumed			4.555	27.278	.000	35.833	7.867	19.700	

Furthermore, from the independent sample test table 10, shows the significance at p-value is 0.001 which is less than the significance level of 0.05, which implies the difference between the two means is statistically significant. Therefore, the null hypothesis is rejected and the alternative accepted.

Table 11: Question 3. Does marine litters cause damage to ferryboat propeller?

Variables	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Total**
Male	67	64	11	10	152
Female	78	85	18	17	198
Under 20	5	12	3	1	21
20-29	27	17	5	3	52
30-39	40	53	15	10	118
40-49	46	49	17	12	124
50-59	10	7	4	4	25
60 and above	4	4	2	0	10
Postgraduate (PhD, MSc, PGD)	17	9	6	6	38
Graduate (BSc, HND, ND)	50	51	14	12	127

Under Graduate (Students)	35	42	19	8	104
Secondary/Primary (O' Level, FSLC)	19	21	7	5	52
No. Formal Education	8	12	4	5	29
Civil/Public Servants	24	25	10	9	68
Private/Company Staff	46	27	14	12	99
Ferryboat Operator	34	25	9	7	75
Trader/Fisher/Farmer	53	21	18	16	108
Marine Base	20	8	8	4	40
Iwofe	16	12	8	4	40
Okrika	10	25	5	5	45
Bonny	52	20	18	10	100
Abuloma	15	16	9	10	50
Nembe	20	12	4	4	40
Kaa	15	12	5	3	35

Source: field survey, (2022)

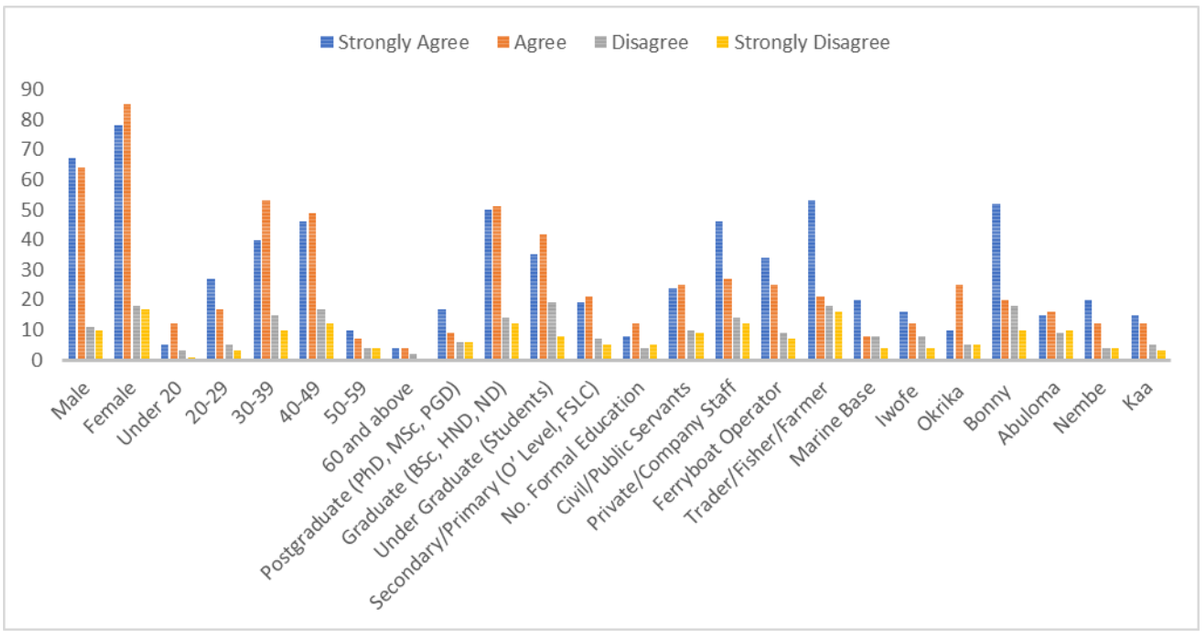


Figure5: Marine litters cause damages to ferryboat propeller

The figure shows responses on the question 'does marine litters cause damages to ferryboat propeller'. The statistics of the responses show that majority of the respondent concord with agree and strongly agree which in inclusion implies that marine litters cause damages to ferryboat propeller. Interviews also inform that debris

especially nylon materials, weeds and wood often times can stack under the boat propeller and damage the propeller which most result to accidents on the waterways.

Table 12: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Responses	GroupA	24	26.21	20.612	4.207
	GroupB	24	7.38	4.470	.912

Here, the table 12 shows the mean value of group A to be 26.21 and group B 7.38 with mean difference of 18.833 and standard deviation of group A 20.612 which very high compare to 4.470 of the group B. This shows that group A has a higher respondent mean than the group B. which implies that more of the respondents accepted the fact that marine litters cause damages to ferryboat propeller. Therefore the alternative hypothesis is accepted.

Table 13: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Responses	Equal variances assumed	19.341	.000	4.374	46	.000	18.833	4.305	10.167	27.499
	Equal variances not assumed			4.374	25.159	.000	18.833	4.305	9.969	27.697

Similarly, the independent sample test table 13 shows p-value of 0.01 which is less that the significance level of 0.05 at 95%. Hence, there is statistically significant difference in the means of the two independent variables in group A and group B. Therefore, reject the null hypothesis and accept the alternative, that marine litters cause damage to ferryboat propeller.

Table 14: Question 4. Does marine litters increase travelling time of passengers by reducing speed of ferryboats?

Variables	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Total**
Male	77	64	6	5	152
Female	80	88	13	17	198

Under 20	5	12	3	1	21
20-29	27	17	5	3	52
30-39	27	17	5	3	118
40-49	38	53	15	12	124
50-59	46	49	17	12	25
60 and above	10	7	4	4	10
Postgraduate (PhD, MSc, PGD)	4	4	2	0	38
Graduate (BSc, HND, ND)	17	9	6	6	127
Under Graduate (Students)	45	51	14	17	104
Secondary/Primary (O' Level, FSLC)	35	42	19	8	52
No. Formal Education	19	21	7	5	29
Civil/Public Servants	8	12	4	5	68
Private/Company Staff	24	25	10	9	99
Ferryboat Operator	46	27	14	12	75
Trader/Fisher/Farmer	34	25	9	7	108
Marine Base	53	21	18	16	40
Iwofe	11	16	4	9	40
Okrika	12	13	8	7	45
Bonny	12	15	10	8	100
Abuloma	30	42	19	9	50
Nembe	20	18	8	4	40
Kaa	20	12	4	4	35

Source: field survey, (2022)

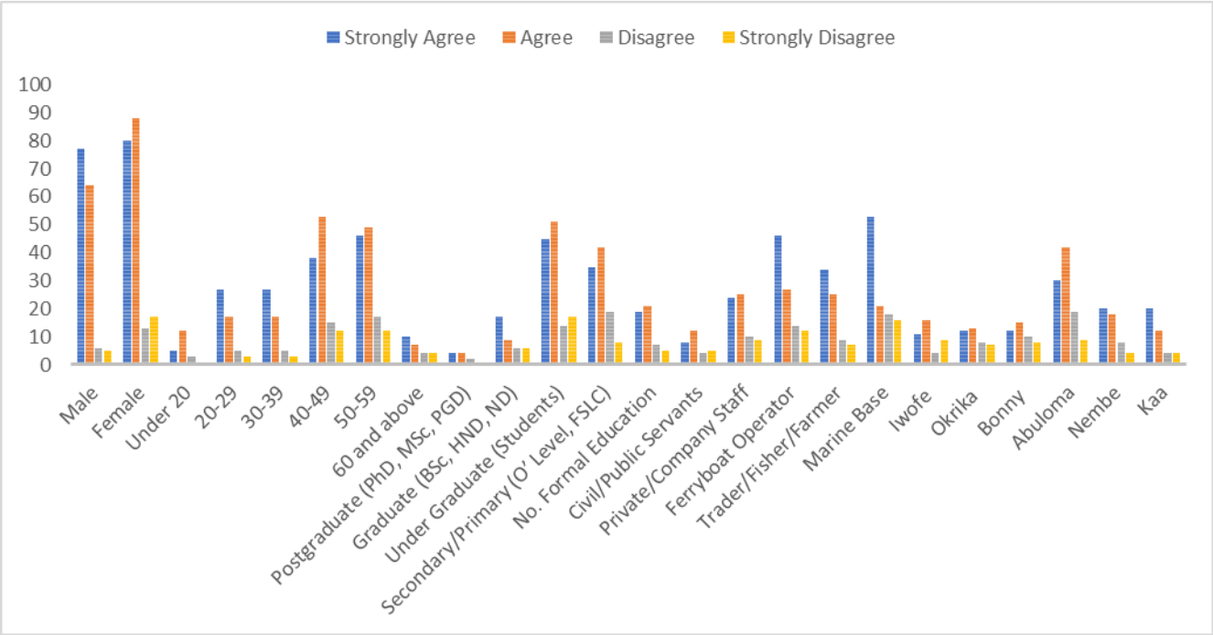


Figure6: Marine litters increase travelling time of passengers by reducing speed of ferryboats along the waterways

The figure shows responses on the question 'does marine litters increase travelling time of passengers by reducing speed of ferryboats'. The statistics of the responses show that majority of the respondent affirmatively accept (agreed and strongly agreed) that marine litters increase travelling time of passengers by reducing speed of ferryboats along the waterways.

Table 15: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Responses	GroupA	24	57.04	39.965	8.158
	GroupB	24	16.96	9.598	1.959

Here on table 15, the mean value of group A is 57.04 and group B is 16.38 with mean difference of 8.390. This shows that group A has a higher mean than the group B. more of the respondents accepted the fact that marine litters slow speed of ferryboats and thereby increasing travelling time of passengers. Therefore, the alternative hypothesis is acceptable.

Table 16: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Responses	Equal variances assumed	21.346	.000	4.778	46	.000	40.083	8.390	23.196	56.971

	Equal variances not assumed			4.778	25.645	.000	40.083	8.390	22.826	57.340

Similarly, the independent sample test table 16 shows p-value of 0.01 which is less that the significance level of 0.05 at 95%. The shows that difference between the two means is statistically significant. Therefore, we reject the null hypothesis and accept the alternative, that marine litters slows speed of ferryboats and thereby increase the travelling time of passengers on the waterways.

Table 17: Question5. Does marine litters cause irritation to passengers?

Variables	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Male	77	54	11	10	152
Female	78	85	18	17	198
Under 20	5	12	3	1	21
20-29	27	17	5	3	52
30-39	57	29	20	12	118
40-49	35	61	18	10	124
50-59	7	9	5	4	25
60 and above	2	7	1	0	10
Postgraduate (PhD, MSc, PGD)	30	2	4	2	38
Graduate (BSc, HND, ND)	51	49	17	10	127
Under Graduate (Students)	61	30	9	4	104
Secondary/Primary (O' Level, FSLC)	27	10	7	8	52
No. Formal Education	2	17	7	3	29
Civil/Public Servants	47	11	8	2	68
Private/Company Staff	64	17	8	10	99
Ferryboat Operator	32	29	9	5	75
Trader/Fisher/Farmer	48	31	21	8	108
Marine Base	18	14	4	4	40
Iwofe	10	24	6	0	40
Okrika	20	12	7	6	45
Bonny	38	41	16	5	100
Abuloma	14	21	8	7	50
Nembe	17	10	8	5	40
Kaa	10	13	5	7	35

Source: field survey, (2022)

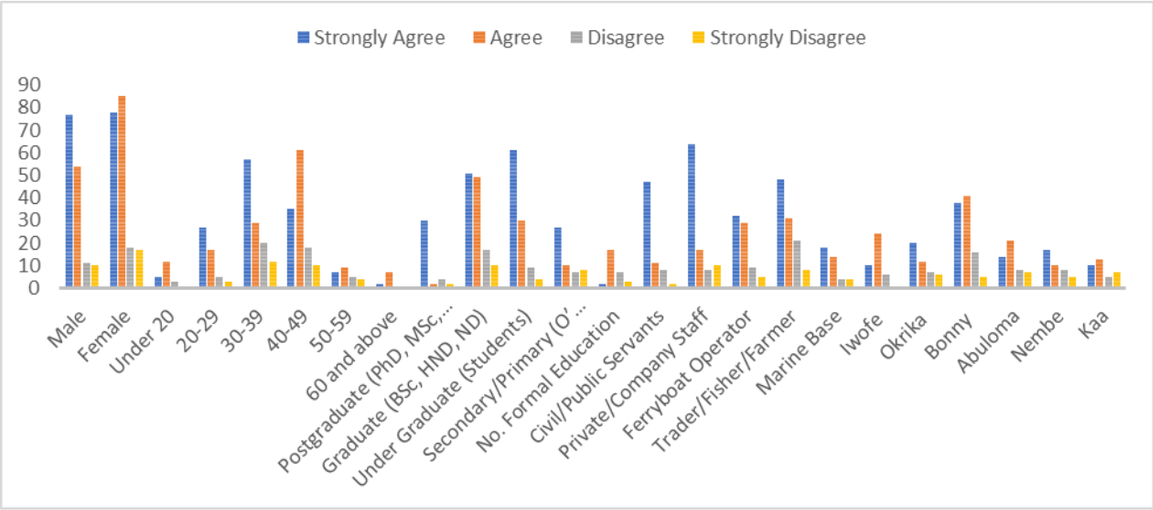


Figure7: Marine litters cause irritation to passengers

The figure shows responses on the question 'does marine litters cause irritation to passengers'. The statistics shows that majority of the respondents affirmatively accept by "agree and strongly agree" that marine litters cause irritation to passengers.

Table 18: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Responses	GroupA	24	25.21	20.030	4.089
	GroupB	24	15.33	9.234	1.885

Here in table 18, the mean value of group A is 25.21 and group B 15.33 with mean difference of 9.857. This shows that group A has a higher mean than the group B. and more of the respondents accepted that marine litters cause irritation to passengers. Therefore the alternative hypothesis is accepted.

Table 19: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Responses	Equal variances assumed	7.733	.008	2.193	46	.033	9.875	4.502	.812	18.938
	Equal variances not assumed			2.193	32.354	.036	9.875	4.502	.708	19.042

Similarly, the independent sample test table 19 shows p-value of 0.033 which is less that the significance level of 0.05 at 95%. Hence, difference between the two means is statistically significant. Reject the null hypothesis and accept the alternative, that marine litters cause irritation to passengers.

4.0 Conclusion

The study focused to investigate the effects of marine litters on ferryboat transportation in Rivers State. Seven jetties which serve as loading and offloading points for goods and passengers where considered. The researcher interviewed various class of respondents to explore their knowledge on the study and it was found that a total of 342 persons representing 97.71% out of 350 respondents have good knowledge and travel often by ferryboats on the waterways. The analysis on this study also show that there is statistically significant difference in the mean of the groups in all observed cases from which the researcher draws the conclusions that marine litters cause ferryboat accident, siltation on water channels, damage to ferryboat propeller, slow speed of ferryboats and irritation to passengers.

4.1 Recommendations

- People should be sensitized on how to manage the debris and plastic waste to avoid littering the environment which consequently flow down to the waterways.
- Government as matter of urgency should mobilize for clean-up of the waterways as well as dredging for better water dept.
- Policies should be formulated and prosecute defaulters who deliberately dump refused and plastic waste in the water body.
- State's waste management should be considered most necessary because its negative impacts are much to humanity and economy.

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