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Research Article

An investigation into the impacts of dredging on aquatic and terrestrial lives in Oto-Awori local council development area, Lagos state, Nigeria

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Abstract

This study investigated the impacts of dredging on aquatic and terrestrial lives in the Oto-Awori Local Council Development Area (OALCDA) of Lagos State, Nigeria. Descriptive Survey Design was adopted for the study. The target population of the study comprised all the residents of OALCDA. Two hundred respondents were sampled using a simple random technique. The instrument for data collection was a structured questionnaire. The questionnaire was personally administered by the researcher and collected by him. Seven research questions and two hypotheses guided the study. Frequency count, bar chart, percentage, and mean were used to answer the research questions while the hypotheses were tested at 0.05 level of significance using *t* - test and Chi-square. The findings of the study were as follows: plant and animal species were high before the commencement of the dredging operation, but became low after its commencement. The main reason for embarking on dredging operation in the study area was found to be for monetary gain from the sale of excavated materials. The relationship between aquatic organism loss and dredging was found to be significant. It was therefore recommended among others that there should be pre and post-dredging environmental impact assessments to better understand the extent of impacts of dredging on living things and the environment, and proper awareness should be created on the consequences of dredging operations. The elected chairman of Oto-Awori Local Council Development Area and his team should raise awareness among the people on the impact of their actions on both aquatic and terrestrial species and initiate a comprehensive remediation program with stringent monitoring. Higher institutions within the study area should partner with relevant bodies to organize seminars on educating the residents on what dredging is, the purpose of dredging, and its impacts on the ecosystem as a whole, since the loss of medicinal and research species has an efficacy impact on the teaching and learning of science.

Introduction

Black Law Dictionary defines environment as the aggregate of all economic, socio-cultural, and natural conditions and facts that influence human life and living organisms. Encyclopedia Britannica defined environment as the entire range of external influence, both physical and biological acting on an organism. From the above definitions, it could be deduced that the environment is the sum total of external factors operating on animals, plants including man, which plays a vital role in the well-being of all lives. Living organisms include aquatic (organisms that live predominantly in different water forms, such as seas, rivers, lakes, ponds, etc.) and terrestrial (organisms adapted to life on land) lives.

The natural environment consists of four interlinking systems namely, the atmosphere, the hydrosphere, the lithosphere, and the biosphere [1]. The basic components of the environment can be broadly divided into biotic and abiotic components. Biotic components consist of living beings, flora, and fauna (terrestrial and aquatic organisms), and microorganisms amongst others while abiotic components include water resources (sea, lakes, ponds, rivers, underground water, etc), climatic elements (sun, temperature, air, humidity, rain, light, etc.), and soil element, mountains, slopes, rock, and underground mineral resources. There exists a complex interaction between biotic and abiotic components which enhances the maintenance of a stable ecosystem. These interactions had largely benefitted man and other living organisms.

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These interaction benefits include the provision of sunlight to generate power, the use of sunlight by plants to manufacture their food, rainfall to improve agricultural production, and the availability of water bodies, which ensure aquatic organisms continue to flourish amongst others.

Human activities such as dredging, deforestation, mining, agricultural practices, industrialization, and urbanization disrupt these valuable services and alter the aggregate equilibrium balance of the environment, which brings about a sharp decline in both aquatic and terrestrial resources [2].

Dredging is a mining exercise carried out in water bodies with the aim of putting together the sediments gathered and disposing of them for various uses. The main aim is to make waterways easily navigable [3-5]. Dredging involves the removal and relocation of sediment from lakes, rivers, estuaries, or seabed and is a critical component of most major marine infrastructural development along the coast. It is commonly used to improve the navigable depth in ports, harbours, and shipping channels, as a tool in water and flood management, creation of new lands, and natural habitats, and provides materials for land reclamation [6].

The positive impacts of dredging cannot be overlooked, as it has become a necessary activity in infrastructural development. It improves navigable depths in ports, harbours, and shipping channels, water and flood management, creation of new lands and habitats, and derivation of minerals from underground deposits which is crucial for the sustainable development of nature resources, economic values, and quality of life [7].

Rapid alteration in water quality can lead to stress and death of aquatic life [8]. Ecological effects emanating from dredging of vulnerable environments are damages to flora and fauna, topographic and hydrological alterations coupled with water quality impairments, zooplankton, phytoplankton, benthic invertebrates, and vegetation are other components of the aquatic environment affected by dredging activities [9,10]. Other effects may result from the dredging of polluted areas with an associated release of anoxic bottom sediments to the surface, leading to the oxidation of metal sulphides [11].

The socio-economic functions of coastal environments are also often hampered by dredging operations thus creating ecosystem imbalance. Mangrove zones bothering estuarine environments are characterized by sediments and soil rich in iron sulphides. Exposing these sulphides containing sediment through dredging initiates oxidative reactions which result in the acidification of estuarine environments. Acidification of estuarine systems has been implicated as the cause of death in fish and vegetation, change in water quality, and contamination by heavy metals [12].

Statement of the problem

The impact of dredging on various lives on Earth has received global attention from relevant bodies and researchers. Dredging activities can now be found in almost all parts of the world both developed and developing countries, towns, villages, and communities. Some communities are dredged to improve waterways, connect communities, create new habitats for aquatic organisms and for land reclamation, and increase water carrying capacity, flood control, and recreational amenities amongst others [13]. As dredging is addressing these needs in one hand, same vein, it is creating another problem for both terrestrial and aquatic lives on the other hand.

The effect of dredging cannot be over-emphasized any longer, as it creates a filthy environment, changes in physiochemical components of the water, altered topography, loss of flora and fauna, and water source contamination. Dredging activity has recently become a norm in some communities in the Oto-Awori Local Council Development Area, without any checks and balances to understand the impacts such act has on the well-being of the ecosystem. Water bodies are now dredged without prior knowledge of these consequences on both aquatic and terrestrial organisms. This is a telling sign that there exists a wide gap between the residents and the impacts of dredging. This is the void this research work intends to fill.

From the aforementioned, it is imperative to investigate the impacts of dredging on aquatic and terrestrial organisms in the Oto-Awori Local Council Development Area.

Objectives of the study

The purpose of the study is to investigate the impacts of dredging on aquatic and terrestrial species in the Oto-Awori Local Council Development Area (OALCDA).

Specifically, the study intends to:

1. Ascertain if there is a dredging activity in OALCDA.
2. Find out the level of dredging in OALCDA.
3. Determine the level of availability of plant and animal species before and after the commencement of dredging in OALCDA
4. Ascertain the impacts of dredging on aquatic species in OALCDA.
5. Establish the reason for embarking on dredging activities in OALCDA.
6. Determine the socio-economic effects of dredging on the residents of OALCDA.

Research questions

The study was guided by the following research questions:

1. Is there dredging activity in OALCDA?
2. What is the level of dredging in OALCDA?
3. What are the prevalent plant and animal species before the commencement of dredging operations in OALCDA?
4. What was the level of availability of both aquatic and terrestrial species before the commencement of dredging and what it is after the commencement of dredging operations in OALCDA?

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5. What are the effects of dredging on aquatic species in OALCDA?

6. What is the reason for embarking on dredging operation in OALCDA?

7. Does dredging have any socio-economic effect on the residents of OALCDA?

Research hypotheses

For the purpose of this study, the following null hypotheses were formulated and tested,

Ho_1: There is no significant difference between the availability of plant and animal species before and after the commencement of dredging operation in OALCDA.

Ho_2: There is no significant relationship between the loss of aquatic and terrestrial species and dredging operations in OALCDA.

Materials and methods

Description of the study area

The study was carried out in Oto-Awori Local Council Development Area, Lagos State (Figure 1). Oto-Awori Local Council Development Area (OALCDA) Secretariat is in Ijanikin, Lagos State, Nigeria. It was carved out of Ojo Local Government in 2003 by the Bola Ahmed Tinubu-led administration. OALCDA is subdivided into 5 wards i.e. Ward A (Oto, Ketu, Era, Adaloko, and Abule), B (Ijanikin, Alasia, Ayetoro, and Federal), C (Ilogbo, Jakande, Imude, Shibiri, and Oke-Agbo). D (Ilemba-Awori, Ido-oluwo, and Etegbin) and E (Ishagira, Egan, Ese-Ofin, and Ojota).

OALCDA lies between latitude 6° 27' 44North and longitude 3° 8' 27 East, in the west region of Lagos State. The area experiences two seasons, the dry season (November-March) and the wet season (April-October), and has appreciable coastal areas, where various anthropogenic activities are been carried out. The Yoruba/Benin-speaking people of the state popularly called "AWORI" are the major indigene with other tribes who engage in different economic activities such as crop farming, fishing, and trading. Some are civil servants, artisans, students, and others. Felling of trees, fishing, mat weaving, and crop production are the major activities of indigenes in the area.

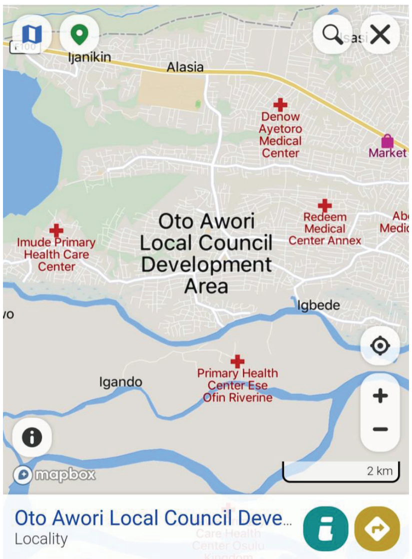

Figure 1: Location of Oto-Awori Local Council Development Area.

Sampling procedure

A simple random sampling technique was used to select two hundred respondents from ten communities in Oto-Awori Local Council Development Area, to ensure fair representation of the entire area.

Data collection

Structured questionnaires were administered to the selected respondents in order to elicit information from them. The questionnaire was administered in both English and the native language to aid effective communication. Dredging activity, level of dredging, and effects of dredging on aquatic and terrestrial were the variables considered.

Method of data analysis

Data collected were analyzed using frequency count, percentage, mean, *t* - test, and chi-square. The independent samples *t* - test was used since it is suitable to test statistical differences between the mean of the two groups. The chi-square test of association was used since it is suitable to determine if there is an association between two categorical variables (dependent and independent).

Results

Research question 1: Is there dredging activity in OALCDA?

Bar chart 1 shows that there is high frequency and percentage (190) 95% for the yes responses and (10) 5% for the no responses. This indicates that there is dredging activity in the study area

Research question 2: What is the level of dredging in OALCDA?

Bar chat 2 reveals that dredging activity in the Oto-Awori Local Council Development Area is high. There is a high frequency and percentage (104) 52% for the high responses (32) 16% for the moderate responses and (64) 32% for the low responses.

Research question 3: What are the prevalent plant and animal species before the commencement of dredging operations in OALCDA?

Table 1 above shows that, there is high frequency and percentage (5944) 87.41% for the available responses, and (856) 12.59% for the unavailable responses.

Items 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33 and 34 respectively

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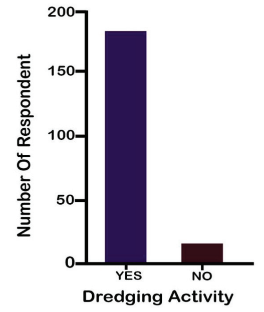
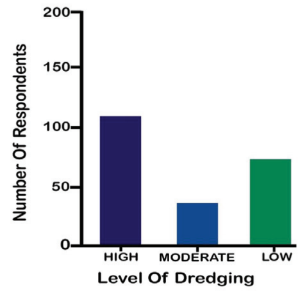


Bar Chart 1: Analysis of dredging activity. Source: Field Survey, 2024.



Bar chart 2: Analysis of the level of dredging. Source: Field Survey, 2024.

were identified as the prevalent plant species while items 1, 4, and 27 were identified not to be prevalent plant species.

From Table 2, the results showed that all the listed items 1 to 20 were identified as prevalent animal species with frequency and percentage (3728) 93.20% for the available responses. However, (272) 6.80% of the respondents identified listed animal species as unavailable.

Research question 4: What was the level of availability of both aquatic and terrestrial species before the commencement of dredging and what it is after the commencement of dredging operations in OALCDA?

Table 3 shows that the availability of plant species in OALCDA was high before the commencement of the dredging operation. There is a higher percentage and mean 75.50% (1.50) for the high responses and 16.20% (0.30) for the low responses. However, 8.20% (0.20) of the respondents indicated that Ayu (Allium sativum), Jinja, atale (Zingiber officinale), and Asala (Tetracarpidium conophorum) were not available.

Based on the data in Table 4, indicates that animal species in OALCDA were high before the commencement of the dredging operation. 85.55% of the respondents indicated a high level of availability while 14.45% objected to this position.

Based on the data in Table 5, revealed that the availability of plant species in OALCDA is low after the commencement of the dredging operation. There is a higher frequency and percentage (3652) 56.06% for the low responses and (2436) 35.82% for the high responses. Nevertheless, items 1, 4, and 27 with frequency and percentage (552) 8.12% were not available.

Results in Table 6 show that the level of availability of animal species is low in OALCDA after the commencement of dredging. 67% of the respondents with a mean of 1.34 indicated a low level of availability of animal species while 33% with a mean of 0.66 indicated high availability of animal species.

Research question 5: What are the impacts of dredging on aquatic species in OALCDA?

Table 7 reveals that 92.89% of the respondents with a mean of 1.86 agreed with the listed items as the effects of dredging on aquatic organisms in OALCDA while 7.11% with a mean of 0.14 disagreed with the position. Items with a mean of 1.0 and above are accepted to be the major effects of dredging on aquatic organisms.

Research question 6: What is the reason for embarking on a dredging operation in OALCDA?

Table 8 above reveals that 28% (56) of the respondents agreed with item one as the reason for embarking on dredging in OALCDA while 72% (144) disagreed with this position. 32% (64) of the respondents agreed with item 2. However, 68% (136) of the respondents disagreed 20% (40) of the respondents agreed with item 3, and 80% (136) of the respondents reacted to the contrary. In the same vein, 22% (44) of the respondents affirmed item 4 while 78% (156) objected to this position. Also, it can be seen from the table that 24% (48) of the respondents agreed with item 5 while 76% (152) did not. Regarding item 6, 100% (200) of the respondents agreed with the item while none reacted to the contrary.

This implies that dredging was carried out in OALCDA for monetary gain from the sale of excavated materials.

Research question 7: Does dredging have any socio-economic effect on the residents of OALCDA?

Results from Table 9 show that 90.75% of the respondents affirmed items 1, 2, 3, 4, 5, 6, and 8 to be the major socio-economic effects of dredging on residents of OALCDA while 10.75% of the respondents reacted on the contrary.

From Table 10 above, the mean of plant and animal species before the commencement of dredging in OALCDA was 42.78, while the mean of plant and animal species after the commencement of dredging was 18.78. The difference between the availability of plant and animal species before and after the commencement of dredging was found to be significant with a *t* - test value of 12.06. This implies that dredging enhances the loss of plant and animal species in the Oto-Awori Local Council Development Area.

From Table 11, the relationship between aquatic organism loss and dredging was found to be significant as the X^2 value of 1020.37 was greater than the *p* - value of 26.96 at a 0.05 significance level. This indicates that dredging contributes to the loss of aquatic organisms.

Discussion

Bar chat 1 and 2 analyses showed that there is dredging activity in the study area and dredging is high. An indication that both aquatic and terrestrial resources bear the consequences

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Table 1: Analysis of the prevalent plant species before the commencement of dredging.

S/N	Items	Available F	%	Mean Score	Unavailable F	%	Mean Score
1	Ayu (*Garlic*)	68	34.0	0.68	132	66.0	1.32
2	Ata-wewe (*Hot pepper*)	164	82.0	1.64	36	18.0	0.36
3	Abamoda (*miracle leaf/life plant*)	164	82.0	1.64	36	18.0	0.36
4	Atale (*Ginger*)	100	50.0	1.00	100	50.0	1.00
5	Awopa (*Africa yellow wood*)	192	96.0	1.92	8	4.00	0.08
6	Efirin/scent leaf (*basil-clove*)	192	96.0	1.92	8	4.00	0.08
7	Butuje (*physic nut*)	196	98.0	1.96	4	2.00	0.04
8	Ibepen (*Pawpaw*)	192	96.0	1.92	8	4.00	0.08
9	Lali (*Henna*)	196	98.0	1.96	4	2.00	0.04
10	Ewe-ipin (*Fig tree*)	184	92.0	1.84	16	8.0	0.16
11	Oruwo (*Brimstone tree*)	164	82.0	1.64	36	18.0	0.36
12	Ata-ile pupa (*Turmeric*)	180	90.0	1.80	20	10.0	0.20
13	Ewuro (*Bitter leaf*)	196	98.0	1.96	4	2.00	0.04
14	Werepe (*Cowitch*)	192	96.0	1.92	8	4.00	0.08
15	Mangoro (*Mamgo tree*)	200	100	2.00	0	0.00	0.00
16	Igi owu (*Cotton plant*)	156	78.0	1.56	44	22.0	0.44
17	Oju ologbo (*Rosary pea*)	184	92.0	1.84	16	8.00	0.16
18	Oparun (*Bamboo*)	196	98.0	1.96	4	2.00	0.04
19	Dagunro (*Starburr/goat head*)	180	90.0	1.80	20	10.0	0.20
20	Dongoyaro (*Neem*)	192	96.0	1.92	8	4.00	0.08
21	Osan wewe (*Lemon*)	192	96.0	1.92	8	4.00	0.08
22	Bomubomu (*Sodom apple*)	188	94.0	1.88	12	6.00	0.12
23	Agbalumo (*White star apple*)	196	98.0	1.96	4	2.00	0.04
24	Egusi bara (*Bitter apple*)	188	94.0	1.88	12	6.00	0.12
25	Ewe tea (*lemon grass*)	176	88.0	1.76	24	12.00	0.24
26	Ewe Akintola (*Siam weed*)	156	78.0	1.56	44	22.0	0.44
27	Asala (*Walnut*)	60	30.0	0.60	140	70.0	1.40
28	Igi iru (*African locust bean*)	184	92.0	1.84	16	8.00	0.16
29	Ewedu (*Jute plant*)	160	80.0	1.60	40	20.0	0.40
30	Ogede (*Banana.*)	200	100	2.00	0	0.00	0.00
31	Ope oyinbo (*Pineapple*)	180	90.0	1.80	20	10.0	0.20
32	Akoko (*boundary leave*)	188	94.0	1.88	12	6.00	0.12
33	Gbure (water leaf)	196	98.0	1.96	4	2.00	0.04
34	Agbon (*Coconut*)	192	96.0	1.92	8	4.00	0.08
	TOTAL	5944	87.41	1.75	856	12.59	0.25

Source: Field Survey, 2024

Table 2: Analysis of the prevalent animal species before the commencement of dredging.

S/N	Items	Available F	%	Mean Score	Unavailable F	%	Mean Score
1	Eja Epiya (Spotted tilapia)	192	96.0	1.92	8	4.00	0.08
2	Eja epiya (Red belly tilapia)	196	98.0	1.96	4	2.00	0.04
3	Eja orombo (Frill fin goby)	196	98.0	1.96	4	2.00	0.04
4	Eja Obokun (Silver catfish)	200	100	2.00	0	0.00	0.00
5	Eja igbun (Lady fish)	152	76.0	1.52	48	24.0	0.48
6	Eja efolo (Bonga shad)	196	98.0	1.96	4	2.00	0.04
7	Eja ofun (Royal threadfin)	164	82.0	1.64	36	18.0	0.36
8	Kuta (Guinean barracuda)	152	76.0	1.52	48	24.0	0.48
9	Ede (Prawn)	188	94.0	1.88	12	6.00	0.12
10	Oya (Hedgehog)	152	76.0	1.52	48	24.0	0.48
11	Eja osan (knife fish, frank fish)	196	98.0	1.96	4	2.00	0.04
12	Ahonrihon (Alligator)	192	96.0	1.92	8	4.00	0.08
13	Akan (Crab)	188	94.0	1.88	12	6.00	0.12
14	Oni (Crocodile)	196	98.0	1.96	4	2.00	0.04
15	Eja aro (Catfish)	196	98.0	1.96	4	2.00	0.04
16	Okere (Squirrel)	192	96.0	1.92	8	4.00	0.08
17	Igbin (Snail)	200	100	2.00	0	0.00	0.00
18	Obo (Monkey)	192	96.0	1.92	8	4.00	0.08
19	Konko (Toad)	192	96.0	1.92	8	4.00	0.08
20	Opolo (Frog)	196	98.0	1.96	4	2.00	0.04
	TOTAL	3728	93.20	1.86	272	6.80	0.14

Source: Field Survey, 2024

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Table 3: Analysis of the level of availability of plant species before the commencement of dredging operation.

S/N	Items	High F	%	Mean Score	Low F	%	Mean Score	Not Available	%	Mean Score
1	Ayu (*Garlic*)	0.00	0.00	0.00	10	5.00	0.10	190	95	1.90
2	Ata-wewe (*Hot pepper*)	150	75.0	1.50	50	25.0	0.50	0.00	0.00	0.00
3	Abamoda (*miracle leaf/life plant*)	140	70.0	1.40	60	30	0.60		0.00	0.00
4	Atale (*Ginger*)	5	2.50	0.05	15	7.50	0.15	180	90	1.80
5	Awopa (*Africa yellow wood*)	142	71.0	1.42	58	29.0	0.58	0.00	0.00	0.00
6	Efirin/scent leaf (*basil-clove*)	186	93.0	1.86	14	7.00	0.14	0.00	0.00	0.00
7	Butuje (*physic nut*)	180	90.0	1.80	20	10.0	0.20	0.00	0.00	0.00
8	Ibepen (*Pawpaw*)	178	89.0	1.78	22	11.0	0.22	0.00	0.00	0.00
9	Lali (*Henna*)	182	91.0	1.82	18	9.00	0.18	0.00	0.00	0.00
10	Ewe-ipin (*Fig tree*)	192	96.0	1.92	8	4.00	0.08	0.00	0.00	0.00
11	Oruwo (*Brimstone tree*)	152	76.0	1.52	48	24.0	0.48	0.00	0.00	0.00
12	Ata-ile pupa (*Turmeric*)	181	90.5	1.81	19	9.50	0.19	0.00	0.00	0.00
13	Ewuro (*Bitter leaf*)	176	88.0	1.76	24	12.0	0.24	0.00	0.00	0.00
14	Werepe (*Cowitch*)	160	80.0	1.60	40	20.0	0.40	0.00	0.00	0.00
15	Mangoro (*Mamgo tree*)	182	91.0	1.82	18	9.00	0.18	0.00	0.00	0.00
16	Igi owu (*Cotton plant*)	153	76.5	1.53	47	23.5	0.47	0.00	0.00	0.00
17	Oju ologbo (*Rosary pea*)	145	72.5	1.45	55	27.5	0.55	0.00	0.00	0.00
18	Oparun (*Bamboo*)	184	92.0	1.84	16	8.00	0.16	0.00	0.00	0.00
19	Dagunro (*Starburr/goat head*)	152	76.0	1.52	48	24.0	0.48	0.00	0.00	0.00
20	Dongoyaro (*Neem*)	124	62.0	1.24	76	38.0	0.76	0.00	0.00	0.00
21	Osan wewe (*Lemon*)	162	81.0	1.62	38	19.0	0.38	0.00	0.00	0.00
22	Bomubomu (*Sodom apple*)	176	88.0	1.76	24	12.0	0.24	0.00	0.00	0.00
23	Agbalumo (*White star apple*)	172	86.0	1.72	28	14.0	0.28	0.00	0.00	0.00
24	Egusi bara (*Bitter apple*)	158	79.0	1.58	42	21.0	0.42	0.00	0.00	0.00
25	Ewe tea (*lemon grass*)	130	65.0	1.30	70	35.0	0.70	0.00	0.00	0.00
26	Ewe Akintola (*Siam weed*)	148	74.0	1.48	52	26.0	0.52	0.00	0.00	0.00
27	Asala (*Walnut*)	0.00	0.00	0.00	7	3.50	0.07	193	96.5	1.93
28	Igi iru (*African locust bean*)	185	92.5	1.85	15	7.50	0.15	0.00	0.00	0.00
29	Ewedu (*Jute plant*)	152	76.0	1.52	48	24.0	0.48	0.00	0.00	0.00
30	Ogede (*Banana.*)	170	85.0	1.70	30	15.0	0.30	0.00	0.00	0.00
31	Ope oyinbo (*Pineapple*)	166	83.0	1.66	34	17.0	0.34	0.00	0.00	0.00
32	Akoko (*boundary leave*)	176	88.0	1.76	24	12.0	0.24	0.00	0.00	0.00
33	Gbure (water leaf)	182	91.0	1.82	18	9.00	0.18	0.00	0.00	0.00
34	Agbon (*Coconut*)	192	96.0	1.92	8	4.00	0.08	0.00	0.00	0.00
	TOTAL	5133	75.50	1.50	1104	16.20	0.30	563	8.30	0.20

Source: Field Survey, 2024

Table 4: Analysis of the level of availability of animal species before the commencement of dredging operation.

S/N	Items	High F	%	Mean Score	Low F	%	Mean Score
1	Eja Epiya (Spotted tilapia)	194	97.0	1.94	6	3.00	0.06
2	Eja epiya (Red belly tilapia)	182	91.0	1.82	18	9.00	0.18
3	Eja orombo (Frill fin goby)	158	79.0	1.58	42	21.0	0.42
4	Eja Obokun (Silver catfish)	164	82.0	1.64	36	18.0	0.36
5	Eja igbun (Lady fish)	134	67.0	1.34	66	33.0	0.66
6	Eja efolo (Bonga shad)	194	97.0	1.94	6	3.00	0.06
	Eja ofun (Royal threadfin)	176	88.0	1.76	24	12.0	0.24
8	Kuta (Guinean barracuda)	165	82.5	1.65	35	17.5	0.35
9	Ede (Prawn)	192	96.0	1.92	8	4.00	0.08
10	Oya (Hedgehog)	164	82.0	1.64	36	18.0	0.36
11	Eja osan (knife fish, frank fish)	138	69.0	1.34	62	31.0	0.62
12	Ahonrihon (Alligator)	148	74.0	1.48	52	26.0	0.52
13	Akan (Crab)	180	90.0	1.80	20	10.0	0.20
14	Oni (Crocodile)	166	83.0	1.66	34	17.0	0.34
15	Eja aro (Catfish)	186	93.0	1.86	14	7.00	0.14
16	Okere (Squirrel)	154	77.0	1.54	46	23.0	0.46
17	Igbin (Snail)	190	95.0	1.90	10	5.00	0.10
18	Obo (Monkey)	177	88.5	1.77	23	11.5	0.23
19	Konko (Toad)	186	93.0	1.86	14	7.00	0.14
20	Opolo (Frog)	174	87.0	1.74	26	13.0	0.26
	TOTAL	3422	85.55	1.71	578	14.45	0.29

Source: Field Survey, 2024

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Table 5: Analysis of the level of availability of plant species after the commencement of dredging operation.

S/N	Items	High F	%	Mean Score	Low F	%	Mean Score	Not Available	%	Mean Score
1	Ayu (*Garlic*)	0	0.00	0.00	20	10.0	0.20	180	90	1.80
2	Ata-wewe (*Hot pepper*)	60	30.0	0.60	140	70.0	1.40	0.00	0.00	0.00
3	Abamoda (*miracle leaf/life plant*)	80	40.0	0.80	120	60.0	1.20	0.00	0.00	0.00
4	Atale (*Ginger*)	4	2.00	0.04	16	8.00	0.16	180	90	1.80
5	Awopa (*Africa yellow wood*)	68	34.0	0.68	132	66.0	1.32	0.00	0.00	0.00
6	Efirin/scent leaf (*basil-clove*)	32	16.0	0.32	168	84.0	1.68	0.00	0.00	0.00
7	Butuje (*physic nut*)	100	50.0	1.00	100	50.0	1.00	0.00	0.00	0.00
8	Ibepen (*Pawpaw*)	152	76.0	1.52	48	24.0	0.48	0.00	0.00	0.00
9	Lali (*Henna*)	72	36.0	0.72	128	64.0	1.28	0.00	0.00	0.00
10	Ewe-ipin (*Fig tree*)	128	64.0	1.28	72	36.0	0.72	0.00	0.00	0.00
11	Oruwo (*Brimstone tree*)	60	30.0	0.60	140	70.0	1.42	0.00	0.00	0.00
12	Ata-ile pupa (*Turmeric*)	40	20.0	0.40	160	80.0	1.60	0.00	0.00	0.00
13	Ewuro (*Bitter leaf*)	92	46.0	0.92	108	54.0	1.08	0.00	0.00	0.00
14	Werepe (*Cowitch*)	64	32.0	0.64	136	68.0	1.36	0.00	0.00	0.00
15	Mangoro (*Mamgo tree*)	140	70.0	1.40	60	30.0	0.60	0.00	0.00	0.00
16	Igi owu (*Cotton plant*)	60	30.0	0.60	140	70.0	1.40	0.00	0.00	0.00
17	Oju ologbo (*Rosary pea*)	56	28.0	0.56	144	72.0	1.44	0.00	0.00	0.00
18	Oparun (*Bamboo*)	68	34.0	0.68	132	66.0	1.32	0.00	0.00	0.00
19	Dagunro (*Starburr/goat head*)	48	24.0	0.48	152	76.0	1.52	0.00	0.00	0.00
20	Dongoyaro (*Neem*)	124	62.0	1.24	76	38.0	0.76	0.00	0.00	0.00
21	Osan wewe (*Lemon*)	64	32.0	0.64	136	68.0	1.36	0.00	0.00	0.00
22	Bomubomu (*Sodom apple*)	44	22.0	0.44	156	78.0	1.56	0.00	0.00	0.00
23	Agbalumo (*White star apple*)	72	36.0	0.72	128	64.0	1.28	0.00	0.00	0.00
24	Egusi bara (*Bitter apple*)	52	26.0	0.52	148	74.0	1.48	0.00	0.00	0.00
25	Ewe tea (*lemon grass*)	80	40.0	0.80	120	60.0	1.20	0.00	0.00	0.00
26	Ewe Akintola (*Siam weed*)	72	36.0	0.72	128	64.0	1.28	0.00	0.00	0.00
27	Asala (*Walnut*)	0	0.00	0.00	8	4.00	0.08	192	96	1.92
28	Igi iru (*African locust bean*)	60	30.0	0.60	140	70.0	1.40	0.00	0.00	0.00
29	Ewedu (*Jute plant*)	68	34.0	0.68	132	66.0	1.32	0.00	0.00	0.00
30	Ogede (*Banana.*)	72	36.0	0.72	128	64.0	1.28	0.00	0.00	0.00
31	Ope oyinbo (*Pineapple*)	56	28.0	0.56	144	72.0	1.44	0.00	0.00	0.00
32	Akoko (*boundary leave*)	120	60.0	1.20	80	40.0	0.80	0.00	0.00	0.00
33	Gbure (water leaf)	60	30.0	0.60	140	70.0	1.40	0.00	0.00	0.00
34	Agbon (*Coconut*)	168	84.0	1.68	32	16.0	0.32	0.00	0.00	0.00
	TOTAL	2436	35.82	0.72	3652	56.06	1.12	552	8.12	0.16

Source: Field Survey, 2024

Table 6: Analysis of the level of availability of plant species after the commencement of dredging operation.

S/N	Items	High F	%	Mean Score	Low F	%	Mean Score
1	Eja Epiya (Spotted tilapia)	52	26.0	0.52	148	74.0	1.48
2	Eja epiya (Red belly tilapia)	40	20.0	0.42	160	80.0	1.60
3	Eja orombo (Frill fin goby)	52	26.0	0.52	148	74.0	1.48
4	Eja Obokun (Silver catfish)	92	46.0	0.92	108	54.0	1.08
5	Eja igbun (Lady fish)	40	20.0	0.04	160	80.0	1.60
6	Eja efolo (Bonga shad)	52	26.0	0.52	148	74.0	1.48
7	Eja ofun (Royal threadfin)	36	18.0	0.36	164	82.0	1.64
8	Kuta (Guinean barracuda)	36	18.0	0.36	164	82.0	1.64
9	Ede (Prawn)	76	38.0	0.76	124	62.0	1.24
10	Oya (Hedgehog)	36	18.0	0.36	164	82.0	1.64
11	Eja osan (knife fish, frank fish)	76	38.0	0.76	124	62.0	1.24
12	Ahonrihon (Alligator)	56	28.0	0.56	144	72.0	1.44
13	Akan (Crab)	108	54.0	1.08	92	46.0	0.92
14	Oni (Crocodile)	48	24.0	0.48	152	76.0	1.52
15	Eja aro (Catfish)	108	54.0	1.08	92	46.0	0.92
16	Okere (Squirrel)	48	24.0	0.48	152	76.0	1.52
17	Igbin (Snail)	100	50.0	1.00	100	50.0	1.00
18	Obo (Monkey)	72	36.0	0.72	128	64.0	1.28
19	Konko (Toad)	92	46.0	0.92	108	54.0	1.08
20	Opolo (Frog)	100	50.0	1.00	100	50.0	1.00
	TOTAL	1320	33.0	0.66	100	67.0	1.34

Source: Field Survey, 2024

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Table 7: Analysis of the effects of dredging on aquatic species.

S/N	Items	Agree F	%	Mean Score	Disagree F	%	Mean Score
1	Dredging changes the physicochemical components such as turbidity, dissolved oxygen, and alkalinity which affect the growth and survival of aquatic flora and fauna	192	96.0	1.92	8	4.00	0.08
2	Dredging leads to the loss of aquatic organisms' habitat through the removal of sediment materials which displace aquatic organisms	200	100	2.00	0	0.00	0.00
3	Return of excavated soil particles into water bodies altered the topography, acidification, and water contamination which resulted in fish kill	192	96.0	1.92	8	4.00	0.08
4	Noise from dredgers during dredging operations disturbs aquatic animal balance which makes them move away to a conducive environment	196	98.0	1.96	4	2.00	0.04
5	Physical and chemical modifications in the benthic zone of water bodies due to dredging operations cause loss of benthic organisms	196	96.0	1.96	4	4.00	0.16
6	Contamination of water with heavy metals such as lead, nickel, and mercury from dredging changes water quality which affects the growth and survival of aquatic flora and fauna	184	92.0	1.84	16	8.00	0.40
7	Excavated sand, clay, silt, and gravel cover some animals that live close to dredging sites which causes their death	160	80.0	1.60	40	20.0	0.36
8	Land clearing to give way for dredging activities cause loss of useful medicinal and economical plants and animals	164	82.0	1.64	36	18.0	0.08
9	Trapping of aquatic plants and animals in dredgers during dredging operations causes a reduction in the availability of aquatic flora and fauna	192	96.0	1.92	8	4.00	0.08
	TOTAL	1676	92.89	1.86	124	7.11	0.14

Source: Field Survey, 2024

Table 8: Analysis of the reason for embarking on dredging operation.

S/N	Items	Agree F	%	Mean Score	Disagree F	%	Mean Score
1	Dredging was carried out to increase water navigability	56	28.0	0.56	144	72.0	1.44
2	Dredging was carried out to create habour	64	32.0	0.64	136	68.0	1.36
3	Creation of a port was why dredging activities were carried out	40	20.0	0.40	160	80.0	1.60
4	Dredging was embarked upon to create new habitats for aquatic and terrestrial organisms	44	22.0	0.44	156	78.0	1.56
5	Dredging was carried out to create moveable channels and ensure ships and boats move goods from one place to another	48	24.0	0.48	152	76.0	1.52
6	Monetary gain from the sale of excavated materials such as sand and clay was the reason for carrying out dredging operations	200	100	2.00	0	0.00	0.00
	TOTAL	452	37.67	0.75	748	62.33	1.25

Source: Field Survey, 2024

Table 9: Analysis of the socio-economic effect of dredging on residents.

S/N	Items	Agree F	%	Mean Score	Disagree F	%	Mean Score
1	Dredging causes the loss of economical, medicinal, and research plants and animals due to the clearing of vegetation to pave the way for dredging activities	200	100	2.00	0	0.00	0.00
2	Dredging pollutes and causes changes in residents well water	192	96.0	1.92	8	4.00	0.08
3	Vibration from dredgers affects buildings located closer to dredging sites by weakening the building foundation	188	94.0	1.88	12	6.00	0.12
4	Noise from dredgers causes noise pollution to residents living closer to dredging sites	196	98.0	1.96	4	2.00	0.04
5	Reduction in the availability of aquatic and land species due to dredging contributes to farmers, wholesale, and retailers' low-income	192	96.0	1.92	8	4.00	0.08
6	Herbal traders spend more to source medicinal herbs since medicinal herb vegetations are lost to dredging	196	98.0	1.96	4	2.00	0.04
7	Abandoned dredging sites turned into dump sites by residents contribute to a filthy and polluted environment	96	48.0	0.96	104	52.00	1.04
8	Science researchers have access to limited naturally occurring species to work with due to the loss of useful species from dredging operations	192	96.0	1.92	8	4.00	0.08
	TOTAL	1452	90.75	1.81	148	9.25	0.19

Source: Field Survey, 2024

Table 10: *t* - test analysis on the difference between the availability of plant and animal species before and after the commencement of dredging.

Variables	N	X	SD	T	DF	Decision
Plant and animal species before the commencement of dredging	200	42.78	21.79	12.06	1.962	
Plant and animal species after the commencement of dredging	200	18.78	17.85			Significant

Source: Field Survey, 2024

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Table 11: Chi-square analysis of the relationship between loss of aquatic organisms and dredging.

Variable	Agree	Undecided	Disagree	Df	p-value	X^2	Decision
Relationship between loss of aquatic organisms and dredging	1513	62	225	16	26.296	1020.37	Significant

Source: Field Survey, 2024

of dredging. This is an insight for swift action from relevant stakeholders in the study area to address the issue of dredging going on in the study area.

Tables 3,4 established that both plant and animal species were found to be high before the commencement of dredging activity in the area, however, Tables 5,6 revealed that they became low after the commencement of dredging. A telling sign of the negative impact of dredging was deduced from a baseline study of the study area.

Table 7 affirmed that dredging duly contributes to the loss of photic, aphotic, and benthic aquatic organisms, displacement from their natural habitat, fish kill, and loss of flora. This finding conforms with the finding of Ohimain, et al., 2002 [9], that dredging causes damage to both flora and fauna.

Findings from Table 8 revealed that monetary gain from the sale of sand and other excavated materials was the main reason why dredging activity was embarked upon in the study area and not in line to create harbor or navigable waterways. This is contrary to the submission of Mnom and Chukwu, 2011, Adebimpe and Oladejo, 2012 and Podila, 2017, who opined that the objective of dredging is to make waterways easily navigable.

Table 8 shows that dredging contributes to the socio-economic imbalance. It contributes to the loss of medicinal, economic, and research plant and animal species, contaminates residents' underground well water, noise from dredgers constitutes noise pollution and disturbance, and abandoned dredging sites become dump sites which aid environmental pollution amongst others.

Table 10 (*t* - test analysis) showed that there is a significant difference between the availability of plant and animal species (high) before the commencement of dredging and after its commencement (low). In addition, Chi-square analysis (Table 11) revealed that the relationship between dredging and loss of aquatic organisms was significant. This indicates that dredging contributes significantly to the loss of large available aquatic organisms before dredging activity in the study area.

In a nutshell, it could be deduced from the finding that dredging was not done to create a harbor or make waterways navigable in the study area but rather for monetary gain from the sale of land and excavated materials. Dredging of water bodies in the study area is creating a long-lasting negative impact in the area without any stringent cushioning effort.

Other factors also contribute to the decrease in animal and plant species. These factors include agricultural practices, deforestation, industrialization, and urbanization amongst others. The environment is more impaired by present-day agricultural practices to boost yield. Particularly, livestock production contributes to carbon dioxide [14] and habitat loss caused by deforestation [15]. Pollution from pesticides and nutrients adversely impacts numerous terrestrial and aquatic organisms [16], collectively driving rapid biodiversity decline [17].

Conclusion

The study concludes that dredging has a significant impact on aquatic and terrestrial organisms in the Oto-Awori Local Council Development Area of Lagos State. The majority of the respondents chose monetary gains from dredging activity as the main reason for embarking on dredging in the study area. They affirmed both plant and animal species to be high and available before the commencement of dredging but became low after its commencement. It was established that dredging enhances the loss of medicinal and economical plant species, loss of aquatic organisms, and displacement from their natural homes when land has been cleared in preparation for dredging and if cushion measures are not put in place to regulate dredging in the study area, more damages to aquatic and terrestrial lives in the study area will continue to flourish.

Recommendation

Based on the findings of the study, the following recommendations were made

1. Pre and post-dredging environmental impact assessments should be carried out to better understand the extent of the impacts of dredging on living organisms and the environment
2. A report of the conducted environmental impact assessment should be communicated to all stakeholders such as royal fathers, management of higher institutions, executive chairman, and residents within the study area, to ensure effective implementation of mitigating measures
3. Fish ponds should be constructed to rear identified fish species lost to dredging operations and reintroduced into the river
4. Land reclamation should be embarked upon in order to cultivate plant species lost to dredging activities to prevent species extinction
5. Dredging operations within the study area should be strictly regulated, as the purpose for dredging must be clearly spelt out, to ensure it conforms to the approved objectives of dredging.

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