

Understanding Inland Water Transportation Dynamics in Port Harcourt

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Abstract: This study delves into the preferences, utilization patterns, and perceptions regarding inland water transportation among respondents in Port Harcourt. Utilizing field surveys with the aid of a questionnaire administered to 384 households of the study area, various aspects related to transportation choices, conveyance of goods and services, frequency of usage, reasons for trips, service ratings, and the interconnection between road and jetty infrastructure were examined. The findings highlighted that 60% of respondents favored inland water transportation, attributing it to its contribution to their income sources. In terms of conveying goods and services, 90% utilized outboard speed boats, while 10% relied on hand-paddled canoes. Furthermore, 60% of respondents frequently used these services, emphasizing their regular reliance. The study elucidated diverse reasons for trips, with 50% citing business purposes, 35% for social engagements, 10% for religious activities, and 5% for educational endeavors. Interestingly, respondents' perceptions varied significantly, with 30% rating the service as fair, while 20% deemed it bad and very bad, respectively, reflecting a range of experiences and viewpoints. Additionally, the research underscored the undeniable linkage between road transportation and jetties for inland water transportation, with 100% of respondents affirming the connection. This linkage highlights the integrative nature of transportation modes in Port Harcourt. These insights contribute to a comprehensive understanding of the dynamics surrounding inland water transportation in the region, shedding light on preferences, utilization behaviors, and infrastructure interdependencies. Such knowledge can inform policy frameworks and development initiatives aimed at optimizing and enhancing transportation networks in Port Harcourt.

Keywords: Inland water transportation, Transportation preferences, Conveyance of goods, Frequency of usage, Trip purposes, Service perceptions, Road-jetty linkage, Transportation infrastructure

I. Introduction

Traffic congestion is an enormous global phenomenon attributed from high population density, increase of motor cars and related infrastructure, and proliferation of rideshare and delivery services (Reed & Kidd, 2019; Afrin & Yodo, 2020). It affects urban areas and makes it difficult for vehicles to move freely, worsens environmental issues, and impedes economic growth (Banister, 2015; Shaheen et al., 2019). A similar issue facing Port Harcourt, a thriving economic hub in Nigeria, is persistent traffic congestion that interferes with everyday commutes, hinders business operations, and jeopardizes environmental sustainability (World Bank, 2021). Because driving is the primary means of transportation, traffic congestion has increased, exacerbating economic inefficiencies and reducing the standard of living for locals (Arnott, & Small, 1994).

According to Ozguven et al. (2022), Port Harcourt's ongoing traffic congestion is a complex issue resulting from population expansion, fast urbanization, and inadequate transportation infrastructure. Increased operating expenses for enterprises and decreased productivity as a result of longer travel times are two examples of the negative economic effects of this congestion (OECD, 2017). Furthermore, the environmental cost, which includes increased carbon emissions and air pollution, presents serious health hazards as well as ecological imbalances (Ishak & Farhan, 2020).

There is an immediate need to investigate alternate forms of transportation that might lessen the burden on Port Harcourt's congested road system due to the complexity and wide-ranging effects of this problem. Given this, inland water transportation stands out as a potentially useful but underutilized resource that, with the right application, might ease traffic and provide a long-term fix for the city's transportation problems.

Problem Statement

Port Harcourt, Nigeria, grapples with a pressing transportation dilemma: an overloaded road network strained by the burgeoning demands of a growing population and economic activities. Despite possessing a well-connected system of rivers and creeks, the utilization of inland water transportation (IWT) remains vastly underexploited, presenting a missed opportunity for a more

effective, environmentally friendly, and resilient transportation framework. The city's streets teem with heavy vehicular traffic and commuters, resulting in persistent congestion, prolonged travel durations, and diminished productivity. This congestion not only impedes mobility but also engenders air and noise pollution, detrimentally impacting both public health and the ecosystem. Despite its potential to alleviate strain on the road network, the utilization of IWT for both passenger and freight movement remains constrained.

Growing traffic congestion in Port Harcourt is a complex issue that affects the city's economic health, environmental sustainability, and public safety. It is mainly caused by the city's heavy reliance on road transportation. Significant financial expenditures are incurred, effective transportation is hampered, and serious environmental issues are brought up by this congestion. In order to address this urgent problem, a thoughtful investigation of other forms of transportation is required that can reduce the burden on the current road network and promote a more sustainable urban mobility environment.

Aim and Objectives of the Study

This research intends to give a complete examination of the role that inland water transportation can play in easing road congestion in Port Harcourt. The key objectives are tailored towards conducting an assessment of the present transportation environment with consideration to the alternate inland water transportation.

Scope of Study

The study focuses on several waterways present in Port Harcourt Metropolis that are navigable and helps transportation across the city. The study focuses on the following rivers;

Table 1.1 Creeks/Water Bodies and Closest Community

| S/N | Creeks/Water Bodies | Closest Community |
|-----|---------------------|--------------------------|
| 1 | Abutoru Creek | Marine Base |
| 2 | Dockyard Creek | Bundu |
| 3 | Victory Creek | Eagle Island |
| 4 | Ajugo river | Iwofe |
| 5 | Okubiakiri Creek | Borokiri |
| 6 | Nembe Waterside | Nembe |
| 7 | Abonnema Waterfront | Abonnema Wharf/ Shell IA |

Source: Field Survey 2023

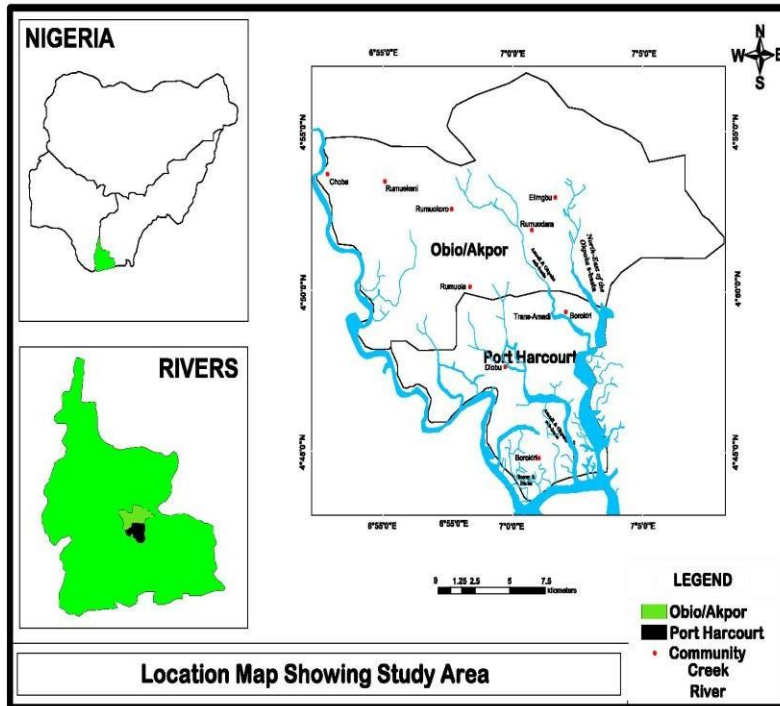
Significance of Study

Findings from this study would be of significant use to the government, users, policymakers, and operators, as the study will identify the prevalent obstacles preventing the growth of IWT in Port Harcourt. Also, it will assist policymakers in establishing proper policies that will support the rapid development of IWT, which would thus boost the social, economic, and industrial growth of the research region and the country at large. This study is also essential since its findings will contribute to the current literature for use by other researchers.

Study Area

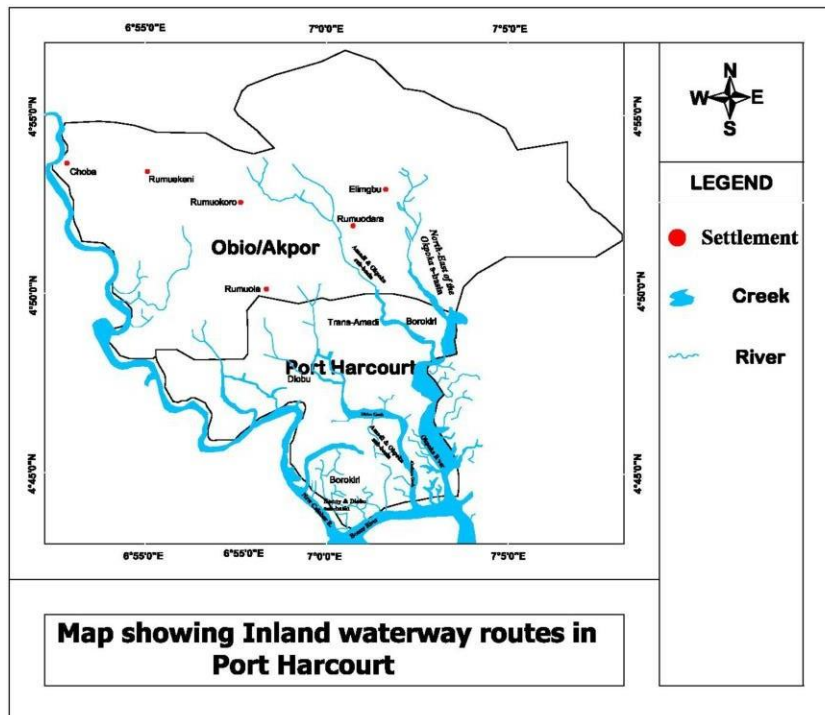
Port Harcourt is a city situated in Rivers State, Nigeria. It is positioned at 4.78 latitude and 7.01 longitude, and it is placed at a height of 16 meters above sea level. It lies along the Bonny River and is located in the Niger Delta. Port Harcourt is flanked to the north by Oduoha-Emuoha and Oyigbo, to the south by Okrika LGA, to the east by Okrika LGA, and to the west by Emohua LGA.

Fig 1.1: Location Map showing Study Area.



Source: Authors Digitization.

Fig 1.2: Map showing Inland Waterway Routes in the study area



Source: Authors Digitization.

II. Literature Review

Traffic Congestion and Urban Challenges

Traffic congestion is a key concern effecting economic productivity, environmental sustainability, and quality of life in urban environments (Banister, 2015; Shaheen et al., 2019). In Port Harcourt, Nigeria, rising urbanization and population expansion increase congestion concerns owing to limited transportation infrastructure (World Bank, 2021). This pressure on the road network affects traffic flow, impedes economic operations, and creates environmental issues (Arnott, & Small, 1994).

The pervasive reliance on road transportation amplifies congestion-related difficulties, hurting economic efficiency and environmental sustainability (Ozguven et al., 2022). Studies show congestion's unfavorable consequences on corporate expenses, travel delays, and increased carbon emissions (OECD, 2017). Hence, developing alternate transportation options becomes vital to ease road strain (Ishak & Farhan, 2020).

Inland Water Transportation: A Viable Alternative

Inland water transportation develops as a promising option, presenting potential solutions to relieve road congestion in metropolitan areas (UNCTAD, 2021). Utilizing inland waterways for transportation provides ecologically sustainable and economically effective possibilities (Mavropoulos et al., 2019). Optimizing this mode decreases congestion, cutting the carbon footprint and fuel usage (CIEH, 2018).

Studies suggest substantial potential for inland water transportation networks to complement road systems (Wang & Zeng, 2020). Properly constructed and linked networks have the ability to boost overall transportation efficiency by shifting traffic to water-based routes. Moreover, environmental advantages include reduced air pollution and lowered energy usage, underscoring inland water transportation's relevance (Nwilo & Badejo, 2016).

IWT takes the load off the roads: Imagine hundreds of big trucks passing your journey every hour. Now, envision those same products drifting silently along a river, leaving your roads clear and serene. Utilizing barges and ships for commercial transport greatly reduces the number of trucks on city streets, reducing congestion and improving air quality. Studies in Nigeria, for instance, demonstrate how transferring freight to waterways can dramatically relieve traffic pressures in megacities like Lagos (Punch Newspapers, 2016; InfoGuideNigeria.com, 2023).

While the advantages of waterway cargo transport are most visible in urban center locations, the benefits extend beyond city borders. Efficient movement of commodities along inland waterways connects ports and industrial hubs, improving logistics and potentially lowering congestion at congested ports (Punch Newspapers, 2016).

Inland water transport has a particular environmental edge (Green Glide, Not Gridlock). Compared to their land-bound competitors, barges and ships produce much fewer pollutants per ton-mile (The World Bank, 2021). This translates to cleaner air, especially in busy regions, and adds to our fight against climate change.

Osoja (2019) carried out a study named 'Complimentary Role of Water Transport Travel Along Ikorodu-Lagos Island Areas of Lagos Metropolis'. The research paper analyzes the complementing significance of water transport travel along the Ikorodu-Lagos Island areas of Lagos city. It evaluates the influence of water transport infrastructure on commuters' mobility and tries to determine if the improvement and management of inland water transport infrastructure has drawn commuters away from road travel in the research region. The study utilizes a sample size of 100 respondents and employs statistical sampling, questionnaire-based data collecting, and SPSS software for data analysis. The data indicate that the improvement and management of inland water transport infrastructure has somewhat drawn commuters away from road travel in the research area, with statistical support for the alternative hypothesis. The report also discusses the issues faced by existing private ferry transportation companies and the efforts of the Lagos state government in developing world-class terminals to increase water transport operations. The research however revealed that underdevelopment of the inland waterways mode of transport and the stunted growth of inland waterways in the study area can be attributed to lack of funding for the proper provision of infrastructure and appropriate maintenance of Lagos water ways, which plays a significance impact in attracting the commuters to the transportation system. Overall, the article gives useful insights on the advantages of inland waterways for commuters and the prospective implications for urban planning and infrastructure development in Lagos metropolis.

Inland Water Transportation (IWT) and Road Transportation are not separate entities in a city's infrastructure; they constitute a synergistic collaboration vital for efficient and sustainable urban transportation (Behrends et al., 2012). While IWT's promise to reduce traffic congestion and offer a cheaper, eco-friendly alternative is evident (Boyce, 2008; Rouse, 2017), its full usage rests on its smooth connection with the current road network (UNCTAD, 2020).

Access and Last-Mile Connectivity

Reaching the Waterways: Although IWT offers direct access to certain places, many households lack fast access to jetty sites. Road mobility plays a significant role in bridging this gap, by linking houses to the seaside embarkation ports (World Bank, 2020). This "first-mile" and "last-mile" connectivity is crucial for commuters to easily integrate IWT into their everyday commutes (Nunes et al., 2017).

Door-to-Door Convenience: While IWT thrives in point-to-point travel along waterways, it sometimes falls short in getting passengers directly to their ultimate destinations. Road transportation steps in here, offering feeder services that connect IWT jetties to communities and individual addresses (UN-Habitat, 2013). This assures door-to-door ease for commuters, making IWT a really realistic choice (Behrends et al., 2012).

Network Synergy and Cost-Effectiveness

Complementing the Road Grid: IWT doesn't intend to replace the current road network; rather, it acts as a complementing mode that may absorb traffic on specific routes, notably those across rivers (Boyce, 2008). This intentional integration decreases congestion on major highways, improving overall traffic flow and travel times for everyone (Rouse, 2017).

Cost-Effective goods Transport: For bulk goods, IWT offers considerable cost benefits compared to road transport. By linking industrial and commercial hubs via waterways, IWT decreases reliance on heavy vehicles on highways, conserving fuel, minimizing wear and tear, and potentially cutting transportation costs for enterprises (UNCTAD, 2018).

Interconnected City Sections

Expanding Reach and Accessibility: Just as roads link various portions of a city, IWT allows access to places previously unreachable by land (UN-Habitat, 2013). Marine communities, for instance, may be successfully incorporated into the urban fabric through IWT, generating economic activity, social connection, and equitable development prospects (Behrends et al., 2012).

Example: Abutoru Creek Network: Residence of Marine Base who desires to travel to Nembe, Iwofe, and Eagle Island etc. can transfer using the inland water transportation via Abutoru Creek to Dockyard Creek (Bundu), Victory Creek (Eagle Island), Okubiakiri Creek (Borokiri), Nembe Waterside (Nembe), Iwofe Waterside (Iwofe). Commuters may pick the most efficient and cost-effective route based on their origin and destination, making IWT a beneficial addition to the city's transportation scene (World Bank, 2020).

On a general perspective, IWT and Road Transportation are not rivals but partners in advancement. By recognizing their connection and supporting their integration, cities may establish a resilient and sustainable transportation ecosystem that benefits commuters, companies, and the environment alike (Nunes et al., 2017). This synergy would not only reduce traffic congestion and boost economic growth but also build a more equal and accessible city for all.

III. Methodology

This study employs a quantitative approach to comprehensively investigate the potential for IWT integration within Port Harcourt's transportation system. Taro Yamane formula was used to forecast the population for which questionnaire will be administered and the figure was achieved at 384 heads of households (See Table 4.1). This approach data collection was aided with questionnaire administration to heads of households. The study area encompass seven communities selected based on nearest neighbour assessment and questionnaire sampled and administered evenly.

Table 4.1: Questionnaire Sampled and Administered

| Study Communities | Number of Questionnaires Administered | Percentage Distribution (%) |
|-------------------|---------------------------------------|-----------------------------|
| Marine Base | 55 | 14.32 |
| Bundu | 55 | 14.32 |
| Eagle Island | 55 | 14.32 |

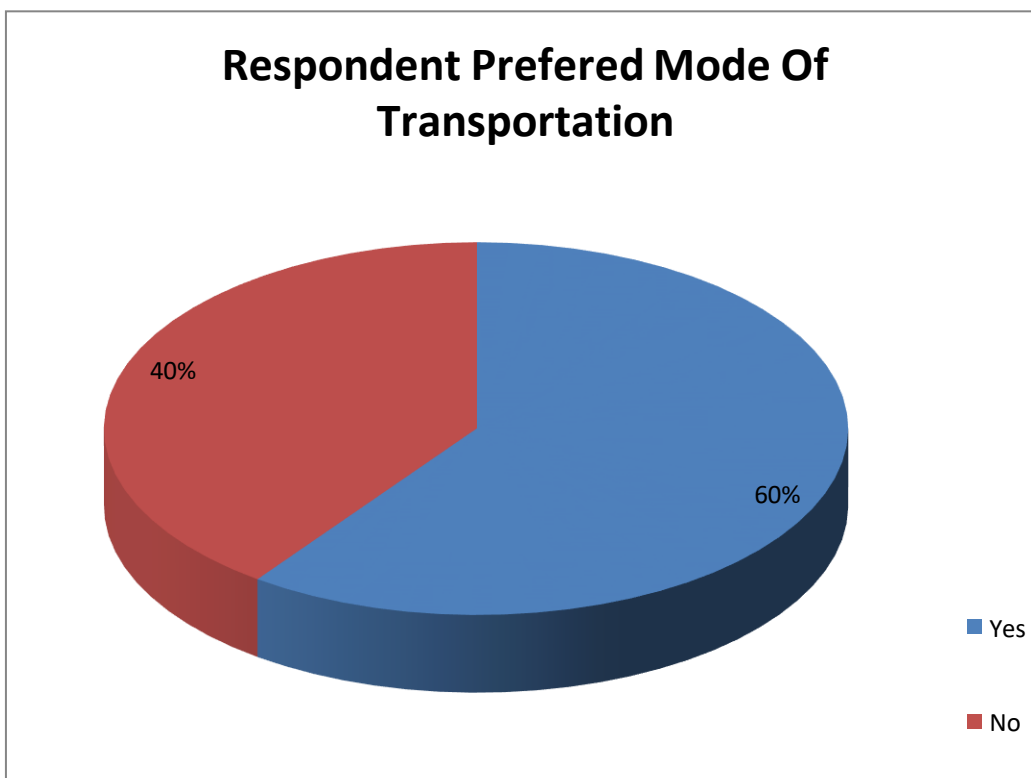
| | | |
|--------------------------|------------|------------|
| Iwofe | 55 | 14.32 |
| Borokiri | 55 | 14.32 |
| Nembe | 55 | 14.32 |
| Abonnema Wharf/ Shell IA | 54 | 14.06 |
| Total | 384 | 100 |

IV. Data Presentation

Respondents Preferred Mode of Transportation

The respondents preferred mode of transportation is shown in Fig 4.1. From the chart, 60% of the respondents prefer inland water transportation as their means of transportation and this is as a result of the fact that it contributes to their source of income while 20% of the respondent prefer other modes of transportation.

Fig 4.1: Respondents Preferred Mode of Transportation

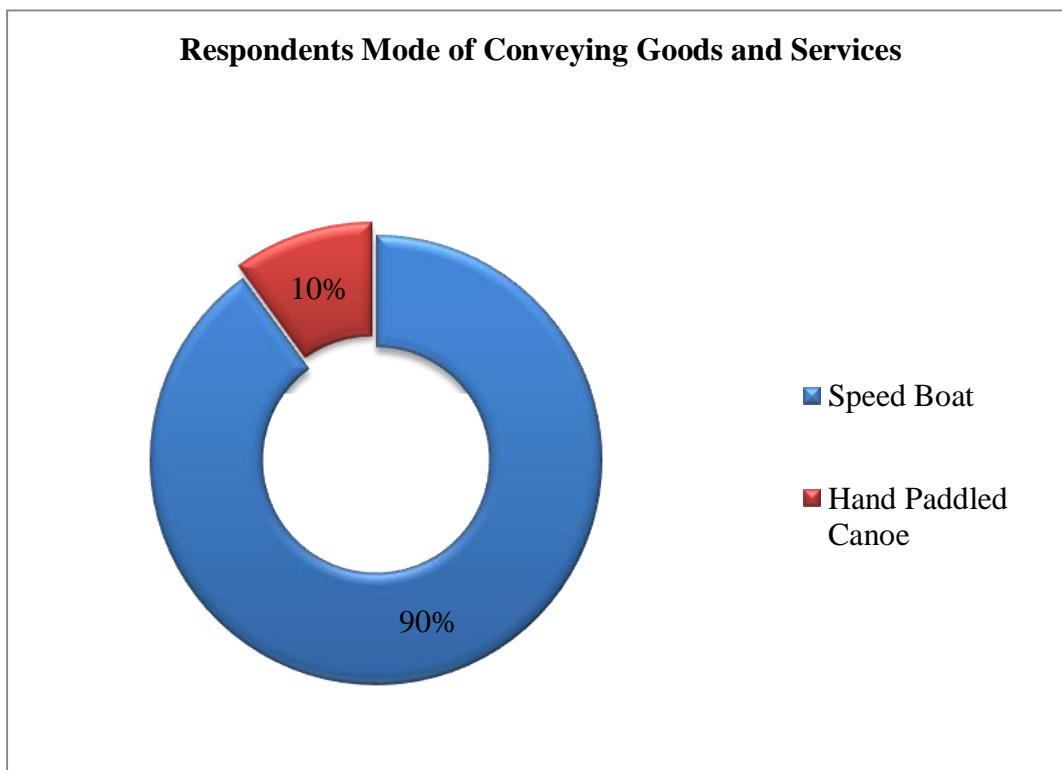


Source: Field Survey 2023.

Respondents Mode of Conveying Goods and Services

Fig 4.2 shows the preferred means of conveying goods and services by respondents. From the data, it is evident that 90% of the respondents use outboard speed boats to convey goods, people and services and 10% of respondents use hand-paddled canoe to convey goods, people and services.

Fig 4.2: Respondents Mode of Conveying Goods and Services



Source: Field Survey 2023.

Respondents Level of Usage

Table 4.2 shows the level of usage of respondents in the study area. It reveals that 60% of respondents use this service very often, 20% use it once a week and 20% use it once a month.

Table 4.2: Respondents Level of Usage

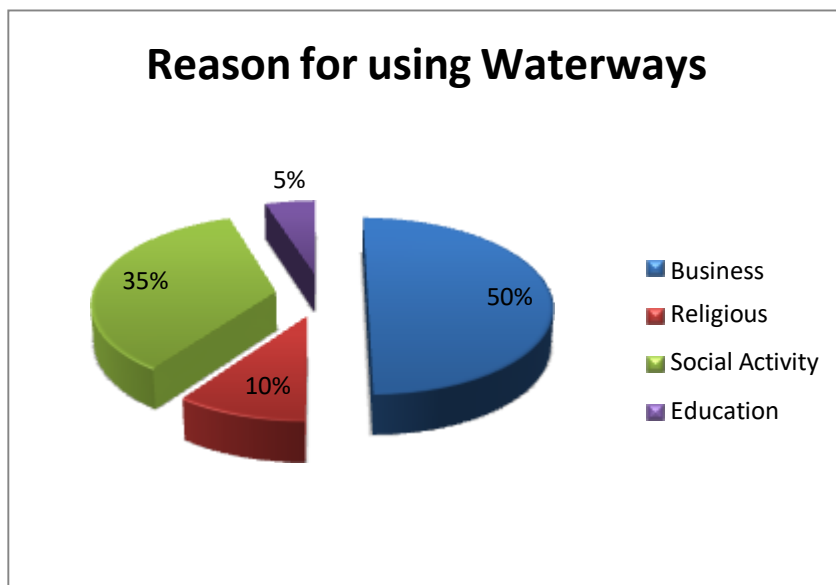
| S/N | Response | No. of Respondents | % |
|-----|--------------|--------------------|------------|
| 1 | Very often | 230 | 60 |
| 2 | Once a week | 77 | 20 |
| 3 | Once a month | 77 | 20 |
| | Total | 384 | 100 |

Source: Field Survey 2023.

Respondents Reason for Using this Service

Fig 4.3 shows the reason why respondents make trips and it was revealed that 50% of the respondents make their trips for business purposes, 35% of the respondents make trips to engage in various forms of social activity, while 10% of the respondents claim to make trips for religious and 5% of the respondents make trips for educational reasons.

Figure 4.3: Respondents Reason for Using this Service



Source: Field Survey 2023.

Respondents Rating on this Service

Table 4.3 reveals respondents rating on Inland Water Transportation in Port Harcourt. 10% of the respondents rated Inland Water Transportation in Port Harcourt, 15% rated it Good, 30% rated it Fair, 20% rates it Bad and 20% also rated it Very Bad.

Table 4.3: Respondents Rating on this Service

| S/N | Response | No. of Respondents | % |
|-----|--------------|--------------------|------------|
| 1 | Very good | 38 | 10 |
| 2 | Good | 58 | 15 |
| 3 | Fair | 115 | 30 |
| 4 | Bad | 77 | 20 |
| 5 | Very bad | 96 | 25 |
| | Total | 384 | 100 |

Source: Field Survey 2023.

Linkage between the Road and Jetties

Table 4.4 shows that there is a linkage between the Jetties for inland water transportation and road transportation. The respondents agreed 100% that the jetties are connected to the road transportation. This means that there is a linkage between the road transportation and inland water transportation.

Table 4.4: Linkage between the Road and Jetties

| S/N | Response | No. of Respondents | % |
|-----|----------|--------------------|-----|
| 1 | Yes | 384 | 100 |
| 2 | No | 0 | 0 |

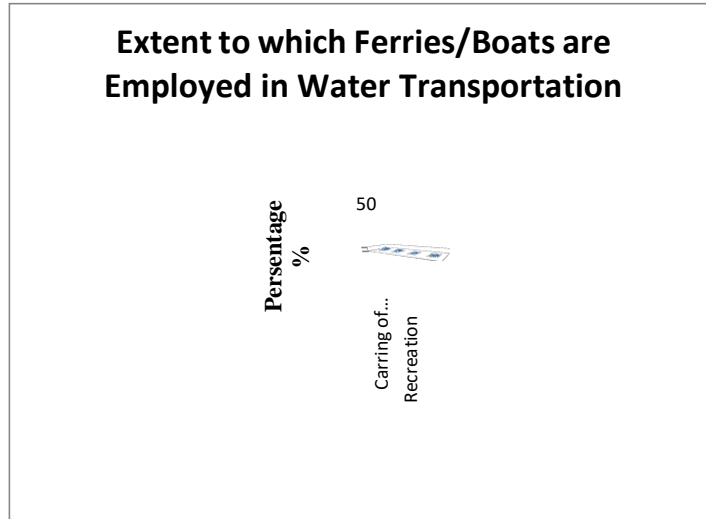
| | | | |
|--|--------------|------------|------------|
| | Total | 384 | 100 |
|--|--------------|------------|------------|

Source: Field Survey 2020.

Extent to which Ferries/Boats are employed in Water Transportation

Fig 4.4 shows the extent to which ferries and boats are employed in the study area. From the data above, it is evident that 40% of the ferries convey passengers, 30% convey goods, 15% for Recreational activities and 15% for transportation of industrial products.

Fig 4.4: Extent to which Ferries/Boats are employed in Water Transportation



Source: Field Survey 2020

V. Analysis of Key Findings

Preferred Mode of Transportation: A remarkable 60% of respondents favor IWT as their primary mode of transport, indicating a significant shift in preferences away from traditional road-based options. This preference is directly linked to income generation, highlighting IWT's role as a livelihood source for many.

Dominant Mode of Goods Movement: Outboard speedboats reign supreme in conveying goods and services (90%), showcasing IWT's efficiency and capacity for bulk cargo transportation.

Frequency of Use: IWT usage is not restricted to a niche group; 60% utilize it 'very often', underscoring its integration into the daily lives of a significant portion of the population.

Motivations for Using IWT: Business purposes (50%) emerge as the primary driver for IWT usage, followed by social activities (35%). This indicates a multifaceted role for IWT, catering to both economic and social needs.

User Perceptions: IWT receives mixed reviews, with 10% rating it 'very good' and 25% deeming it 'very bad'. This suggests room for improvement in infrastructure, safety, and service quality to foster greater user satisfaction.

Linkage with Road Network: The 100% agreement on connectedness between jetties and roads affirms IWT's potential for seamless integration within the existing transportation network.

Diverse Functions of Ferries/Boats: Beyond passenger transport (40%), ferries and boats serve a range of functions, including goods transport (30%), recreational activities (15%), and industrial product movement (15%). This versatility expands IWT's reach and impact across various sectors.

VI. Discussion and Implications

This study's findings paint a nuanced picture of IWT's potential in Port Harcourt. The strong preference, frequent usage, and diverse functions highlight its undeniable value in addressing traffic congestion, enhancing economic activity, and facilitating social interaction. However, the mixed user perceptions and room for improvement in service quality necessitate strategic interventions.

Infrastructure Development: Upgrading jetties, expanding routes, and ensuring regular maintenance are crucial to enhance efficiency and safety.

Regulation and Enforcement: Implementing robust safety standards, regulating operations, and addressing informal practices are vital to fostering trust and confidence in IWT.

Public Awareness Campaigns: Educating the public about IWT's benefits and addressing safety concerns can encourage wider adoption and improve user experience.

Integrated Transportation Planning: Recognizing IWT's complementary role to road transportation and fostering seamless intermodal connections is essential for optimizing the city's transportation system.

VII. Conclusion

In conclusion, the escalating traffic congestion in Port Harcourt necessitates immediate action to explore alternative transportation modes. Inland water transportation stands out as a viable solution with the potential to mitigate congestion, reduce environmental impact, and enhance overall transportation efficiency (Wang & Zeng, 2020). However, this potential can only be realized through concerted efforts in infrastructure development, regulatory improvements, and public engagement. Addressing challenges and implementing strategic measures will pave the way for a more integrated and sustainable transportation network, alleviating congestion and fostering a more livable and prosperous urban environment in Port Harcourt.

From this study, IWT has presented a promising avenue for sustainable and efficient urban mobility in Port Harcourt. By addressing the identified challenges and capitalizing on its strengths, IWT will play a pivotal role in improving accessibility, livelihoods, and overall quality of life in the city. Meanwhile, further research into specific user segments, economic impact assessments, and cost-benefit analyses can further strengthen the case for IWT integration and guide effective policy interventions.

VIII. Recommendation

Given the potential of inland water transportation in alleviating traffic congestion, it is imperative for policymakers and stakeholders in Port Harcourt to consider strategic investments and initiatives.

First, substantial investment in inland waterway infrastructure, including terminals, docking facilities, and navigational aids, is necessary (UNCTAD, 2021). This development will enhance the efficiency and attractiveness of water transport options, diverting a significant portion of freight and passenger traffic from the congested road network (Mavropoulos et al., 2019).

Second, regulatory frameworks should prioritize safety measures and stringent enforcement to mitigate concerns related to security and illegal activities (Li et al., 2021). Moreover, public awareness campaigns highlighting the benefits of inland water transportation and encouraging its use could facilitate its integration into the city's transport ecosystem (Nwilo & Badejo, 2016).

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