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Original Article

Infrastructure Challenges for Innovative Floating Bank Service Implementation in Outer Island Areas

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Abstract *- This study focuses on the evaluation of innovative floating banking infrastructure for archipelagic regions, particularly the 3T-area (Frontmost, Outermost, Least Developed) in South Halmahera by Bahtera Seva III ship, owned by Bank Republik Indonesia (BRI). The study has three primary objectives: (1) to assess the physical conditions of the ports serviced by Bahtera Seva III; (2) to evaluate user satisfaction and perceived service quality; and (3) to analyze the influence of existing port infrastructure on the inclusivity and effectiveness of the floating banking services. Despite the innovative nature of the service, its operational effectiveness is constrained by inadequate port infrastructure in several locations. Employing a quantitative survey method, data were collected from 225 respondents across five serviced islands through structured questionnaires and field observations. The findings indicate a statistically significant negative impact of poor port infrastructure on the perceived service quality of the floating bank. These results highlight the critical role of infrastructure readiness in supporting effective public service delivery and advancing financial inclusion in Indonesia's remote and underserved regions.*

Keywords *- Port infrastructure, Floating bank, Financial inclusivity, Service quality, South halmahera.*

1. Introduction

Indonesia's national vision of equitable development across all regions requires the state to ensure access (inclusivity) to basic services for every citizen, including those in remote, border, and outer islands (also known as 3T Terdepan, Terluar, dan Tertinggal – Frontmost, Outermost, and Least Developed Regions) as mandated by Government Regulation Number 78 of 2014 concerning Acceleration of Development of Underdeveloped Regions. One of the regions facing structural service delivery challenges is South Halmahera, a regency in North Maluku Province characterized by its vast maritime territory comprising over 60 inhabited islands [1]. The population's heavy dependence on maritime transport is exacerbated by the underdevelopment of transport infrastructure, particularly port facilities. Despite the presence of 68 active sea routes connecting islands, the distribution of transport services remains uneven, with several southern subdistricts experiencing delays of more than two weeks in ship arrivals [2]. This reflects a persistent spatial exclusion in logistical and financial access. In parallel, the economic growth in the region, particularly through extractive and processing industries, has not been matched by proportional improvements in the transport and logistics sector, as evidenced by a decline in the share of transport in the regional gross domestic product between 2017 and 2021 [3], [4, 5].

In response to these logistical and financial access issues, Bank Rakyat Indonesia (BRI), a state-owned enterprise, introduced the Teras Kapal or floating bank service Bahtera Seva III in 2017. This vessel operates as a mobile financial service unit providing banking, administrative (Samsat), and health services across six major islands weekly. The vessel departs from Bacan every Monday and returns on Friday, completing a circuit that includes Kayoa, Mandioli, and other underserved islands.

Based on the mandate of Statute No. 4 Year 2022, service represents an important intervention to boost financial inclusion. However, its effectiveness is constrained by the inadequate condition of port infrastructure at its stopping points [6]. Users often report difficulty boarding due to a lack of docking structures, long queuing times due to inadequate passenger terminals, and general discomfort from limited waiting areas or shelter, ultimately reducing satisfaction and discouraging consistent use. The physical environment, therefore, becomes a bottleneck that undermines the inclusivity goal of the floating banking program [7].

From a regulatory standpoint, the development of reliable and safe maritime infrastructure is governed by Statute No. 66 Year 2024 on Pelayaran and international conventions such as UNCLOS, 1982 and SOLAS 1974 by IMO, 1974. These laws require that sea transport services be designed with minimum standards of safety, reliability, and universal accessibility, especially in archipelagic states. Furthermore, under Statute No. 25 Year 2009 on Public Service Delivery, the state is obliged to ensure that all citizens can access key public services, including financial services, regardless of geographic location. This means that the provision of port infrastructure cannot be treated as a matter of optional investment, but rather as a normative necessity to uphold constitutional and legal responsibilities. Unfortunately, the gap between these regulatory ideals and field realities indicates that the current infrastructure planning does not yet integrate the operational needs of floating services or the lived conditions of users in peripheral zones. Moreover, our preliminary query analysis specifically targeted port infrastructure and service quality in South Halmahera and did not match any results. Therefore, it highlights the locus gap of this study.

To assess service performance, shifting from a binary view of service availability toward a multidimensional analysis of service quality is important. The SERVQUAL model developed by Parasuraman et al. (1988) provides a structured framework to evaluate perceived service quality through five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. In the context of floating banking services, tangibility includes the condition and accessibility of ports and physical infrastructure [11]. Reliability refers to the regularity of vessel operations and service consistency. Responsiveness is assessed by the promptness of staff and adaptability to user needs. Assurance captures the professionalism and technical competence of service providers, while empathy refers to the degree to which services are customized and sensitive to local users, including vulnerable groups such as the elderly and disabled. The model is suitable for identifying gaps between expected and experienced service quality in resource-constrained environments [12].

Beyond the assessment of individual service events, the long-term effectiveness of floating banking programs must be evaluated through the lens of Total Quality Management (TQM). TQM emphasizes continuous improvement, cross-functional collaboration, and user-centered service design [13]. When applied to infrastructure-supported services like the Bahtera Seva III Ship, TQM requires systematic feedback loops between users, service operators, and infrastructure providers to align operational design with user needs. Empirical studies show that applying TQM principles in transportation and financial services leads to increased efficiency, cost reduction, and user satisfaction [14]. In the case of South Halmahera, BRI's service model demonstrates partial application of these principles but is constrained by the lack of control over the physical environments where the service is delivered, particularly the landing points managed by local governments.

Inclusive port infrastructure is not only a technical or logistical matter, but also a socio-political instrument for economic justice. The Asian Development Bank (2012) and UNOPS (2023) define inclusive infrastructure as infrastructure that is accessible, affordable, high-quality, and responsive to the needs of all user groups. In port infrastructure, inclusivity indicators include availability of universal design features such as ramps and shaded waiting areas, reasonable costs of use, and reliable utilities like electricity and clean water. Many of these criteria are unmet in South Halmahera, leading to physical and economic inaccessibility. The resulting exclusion particularly affects small traders, women, the elderly, and informal workers, who rely on these services for financial transactions and accessing state administrative and health functions brought by the vessel.

This study aims to examine the relationship between the availability and condition of port infrastructure and the quality of floating banking services delivered by BRI Bahtera Seva III. The study addresses several key questions: 1) What is the physical condition of the ports where Bahtera Seva III docks? 2) How do these conditions affect user satisfaction and perceived service quality? 3) To what extent does poor infrastructure limit the inclusivity and effectiveness of financial services in the region?

Providing high-quality service necessitates adequate supporting conditions and infrastructure. In the case of the Bahtera Seva III service in Halmahera, the port's condition is a fundamental factor influencing the overall effectiveness of service delivery. However, existing port facilities are currently inadequate and do not meet the operational standards required for Bahtera Seva III to dock safely and efficiently while serving local communities. This infrastructural gap presents a critical challenge that hinders the continuity and quality of services. Despite its significance, systematic and evidence-based assessments of port infrastructure remain limited. Such assessments are essential for informing decision-making processes among port authorities, local governments, and financial institutions like BRI, particularly in preparation for the national budgeting and infrastructure development agenda.

2. Literature Review

The development of port infrastructure is widely acknowledged as a key driver of economic growth and improved connectivity, particularly in archipelagic regions. Munim & Schramm (2018) state that port infrastructure and logistics performance significantly mediate economic

development through enhanced seaborne trade. Similarly, Li & Sun (2023) emphasize that strategic traffic and port infrastructure investment play a critical role in accelerating regional economic transformation. These perspectives are crucial for understanding how inadequate infrastructure, especially in remote and outermost regions, limits both physical and economic access to essential services.

In the context of financial services, the role of infrastructure becomes even more significant in promoting inclusion. The presence of floating banks like Bahtera Seva III offers a temporary solution, but long-term financial inclusion relies on robust port and transport infrastructure. These challenges are further explored by [NO_PRINTED_FORM] [18], who find that access to financial services is deeply intertwined with local development and infrastructure quality.

The SERVQUAL model is the primary framework for evaluating service quality in transport and banking sectors. Originally developed by Parasuraman, Zeithaml, and Berry (1988), the model has been adapted in maritime contexts [19], indicating its flexibility and relevance. Subsequent works [20] support the application of SERVQUAL for capturing multidimensional user experiences and aligning service delivery with expectations, particularly in remote and physically constrained regions.

Total Quality Management (TQM) is another widely referenced framework in service improvement, particularly in public infrastructure delivery. Gharakhani et al. (2013) and Lamdjad & AlFalahi (2024) highlight how TQM principles can be adapted for port development, enhancing sustainability, user satisfaction, and long-term reliability. Jum'a & Mansour (2023) show that TQM practices significantly influence user trust and operational excellence in the banking sector. These principles also align with the inclusive development goals outlined by the Asian Development Bank (2012).

In terms of smart port development, the work of [23] highlights the transformation of traditional port infrastructure into integrated service hubs. These "smart ports" offer a vision for integrated logistics, digital services, and community connectivity, an ideal fit for floating banking platforms aiming to serve marginalized communities. Sergiy et al. (2024) also argue for the integration of smart port concepts into urban planning to foster efficient, user-centered maritime access.

Indonesia's unique challenges in port governance and coastal development are thoroughly addressed by Jansen et al. (2018) and Nusantara et al. (2023). Their studies illustrate how local politics, governance fragmentation, and logistical limitations hinder inclusive port development in peripheral regions. Such fragmentation often exacerbates inequalities in financial access, especially in regions like Halmahera Selatan, where maritime transport is the primary mobility mode. Social inclusion, especially for vulnerable groups, remains central to both port and banking service evaluation. Studies by Nautwima and Nautwima & Romeo Asa (2022), Sari (2017), and Suhu et al. (2023) consistently stress that service design must address the needs of women, the elderly, and disabled users. The success of initiatives like Bahtera Seva III ultimately depends on how infrastructure supports the participation of these groups, promoting not just access but empowerment through financial services.

3. Methodology

This study employs a quantitative research design to examine the influence of port infrastructure availability on the quality of services provided by the floating banking unit, BRI Bahtera Seva III, operating in the coastal and island communities of South Halmahera Regency. The research aims to determine how infrastructure readiness contributes to financial service delivery by assessing user satisfaction across dimensions of accessibility, affordability, and service experience. The selection of a quantitative framework is appropriate given the measurable nature of both independent and dependent variables, which include observable infrastructure features and user-perceived service quality indicators based on the SERVQUAL and TQM model.

3.1. Sampling

To determine the study sample, the total population of BRI Bahtera Seva III registered users is estimated at 6,000 according to the national census of 2022. A sample size of 296 respondents was involved, with a 76% response rate (n = 225), which satisfied the Slovin formula at a 7% margin of error. A non-probability accidental sampling method was employed, allowing the researcher to collect data from users present at port locations during service operation. Fieldwork was conducted by trained enumerators using a standardized instrument with both open and closed questions.

All instruments were subjected to an exempt ethics checking process by the thesis committee of the first author and were allowed to carry out the research by both Bank Republic Indonesia, as the owner of Bahtera Seva III and the port managements. Before the survey, all served customers were asked about their willingness to participate in the study.

Several conditions were emphasized, such as data disclosure statement, purpose of study, and freedom from conflict of interest by both the service provider (BRI - Bahtera Seva III) and the port management. In the data collection process, we ensure to control biases, such as hasty behavior, carelessness during the filling process, and periodically ask them to fill it slowly as they experience. Consent was collected verbally as we showed the permit to do the research.

A survey was taken in the Bahtera Seva III waiting room to ensure all participants were actual service users with direct and recent experience with floating banking services. This approach was chosen to guarantee that all respondents were active service users with direct and recent experience with floating banking services. Conducting the survey on-site also allowed enumerators to clarify questions, monitor the completion process, and minimize non-response bias.

Figure 1 Waiting room in Bahtera Seva III.

3.2. Data Collection

The research was conducted during the operational service hours of BRI Bahtera Seva III, which follows a weekly route. Data collection was done in 5 locations, which are:

1. Guruapin or Kayoa Port (0.009863, 127.411504)
2. Madopolo Port (-1.222751, 127.652625)
3. Saketa Port (-0.359052, 127.844947)
4. Pasi Palele Port (-0.738981, 128.131423)
5. Bajo Port (-0.620181, 127.395270)

Primary data were collected directly from the field through structured surveys and observation. The primary data comprises two sources: first, direct observations on the physical state of port infrastructure at each docking point; and second, structured questionnaires measuring users' experiences and satisfaction with the floating bank service. The surveys capture variables such as ease of access to the docking area, frequency of ship visits, transaction affordability, inclusion of vulnerable groups, and overall service satisfaction. Secondary data include geospatial and administrative records of port infrastructure development from the past ten years, collected from regional planning and port authority sources.

3.3. Instruments

The research instrument consists of two core tools: an observation checklist and a structured questionnaire. The observation checklist, developed based on PP No. 61/2009 on Port Facility Standards, covers ten basic and auxiliary port infrastructure categories, including docks, waiting terminals, storage yards, clean water, lighting, public toilets, and accessibility for disabled users.

Table 1. Observation instrument development guidelines

Variable	Indicator	Rationale for Variable Selection
Accessibility of Financial Services	Distance/travel time to the ship location	To measure how easily people can access financial services geographically.
	Frequency of ship visits	Represents the consistency of service availability at the user's location.
Affordability of Services	Financial transaction costs	To assess the extent to which service fees are affordable for all segments of society.
	Service usage constraints due to cost	To identify potential economic barriers to accessing ship-based financial services.
Utilization of Financial Services	Types of services used	Reflects the needs and habits of the community regarding the use of financial services.
Openness/Social Inclusivity	Services for vulnerable groups	To evaluate the availability of services for women, the elderly, and people with disabilities.
Overall Satisfaction	General satisfaction with services	Illustrates the public's perception of the overall quality of financial services provided.

Meanwhile, the survey questionnaire evaluates five aspects of service accessibility and user satisfaction: distance and travel time to reach the ship, transaction cost perceptions, service frequency, inclusivity for vulnerable groups, and overall satisfaction. Items were validated through expert review and piloting prior to deployment. Lastly, the SERVQUAL-based survey instrument was also developed, as shown in Table 3.

Table 2. Interview instruction sheet development guidelines

Variable	Indicator	Rationale for Variable Selection
Access to Ship-Based Services	Ease of reaching the ship location	Captures the public's direct perception of geographical access to the service location.
	Travel time to the ship location	Describes the level of physical accessibility to financial service points.
Cost Affordability	Perceived cost of services	Assesses public perception of the affordability of administrative or transaction fees.
	Experience of cost-related obstacles	Explores user experiences that may be hindered due to financial burdens.

Variable	Indicator	Rationale for Variable Selection
Service Utilization	Most frequently used financial service	Identifies the priority services that are most beneficial to coastal communities.
Social Inclusivity	Services for vulnerable groups (women, the elderly, persons with disabilities)	Assesses how open and fair the services are for all segments of society.
Overall Satisfaction	Level of satisfaction with ship services	Serves as a key indicator of the overall success of inclusive service delivery.

Table 3. Interview instruction sheet development guidelines

SERVQUAL Dimension	Indicator	Explanation of Indicator
Tangibles	Cleanliness of physical facilities	Reflects the cleanliness of service areas, seating, and ship facilities, including restrooms and other amenities.
	Comfort of facilities	Refers to the physical quality of amenities such as seating, waiting areas, and the completeness of supporting comfort features.
	Suitability of facilities to user needs	Evaluates whether the available facilities meet the primary needs of the ship's users.
Reliability	Punctuality of the service schedule	Measures how often the ship departs or arrives according to the promised schedule.
	Consistency of service quality	Assesses whether the quality of service remains consistent over time.
	Reliability in fulfilling user needs	Refers to the ship's and crew's ability to deliver services as expected without disruptions or issues.
Responsiveness	Promptness in handling user requests	Measures of how quickly staff respond to user needs, complaints, or requests for assistance.
	Accuracy of information and services	Assesses the clarity and accuracy of information provided to users, including schedules and service procedures.
	Ease of access to staff	Refers to the availability and approachability of staff when users need help or assistance.
Assurance	User safety while using the service	Evaluates how safe users feel, both physically (onboard safety) and in terms of personal or data security.
	Staff professionalism	Describes the competence, attitude, and knowledge of staff in delivering trustworthy and capable service.
	User confidence in service quality	Measures how confident users are that the service meets expectations and promised standards.
Empathy	Staff attention to individual user needs	Assesses the extent to which staff provide personalized attention or tailor services to specific user needs.
	Staff friendliness and courtesy	Evaluates the interaction between staff and users, including friendliness, politeness, and respect.
	Staff concerns in addressing user difficulties	Describes staff efforts to understand and assist with any problems or obstacles faced by users during service use.

3.4. Data Analysis

Measures of central tendency or descriptive analysis (mean, median, and mode) were calculated for each item in the questionnaire. These included indicators related to accessibility, affordability, service utilization, social inclusivity, overall satisfaction, and the five SERVQUAL dimensions: tangibles, reliability, responsiveness, assurance, and empathy. Furthermore, construct validity was examined using factor analysis with oblimin rotation to identify whether the items grouped well under their intended variables, while reliability testing was performed using Cronbach's alpha to assess the internal consistency of each variable or dimension.

4. Results and Discussion

Surveys were conducted online through the Google Form platform. A total of 300 online surveys were distributed to consumers served by Teras Kapal BRI who had previously been given an explanation (consent) or approval to become respondents in this study. A total of 265 consumers agreed to fill out the online survey sheet. Checks were then carried out on the collected data to see the responses that were intentionally left blank by the respondents. There were 40 responses with several response item values that were intentionally left blank and excluded from the final data processing. As final data, a total of 225 responses were collected into research data, along with the sociodemographic data of respondents.

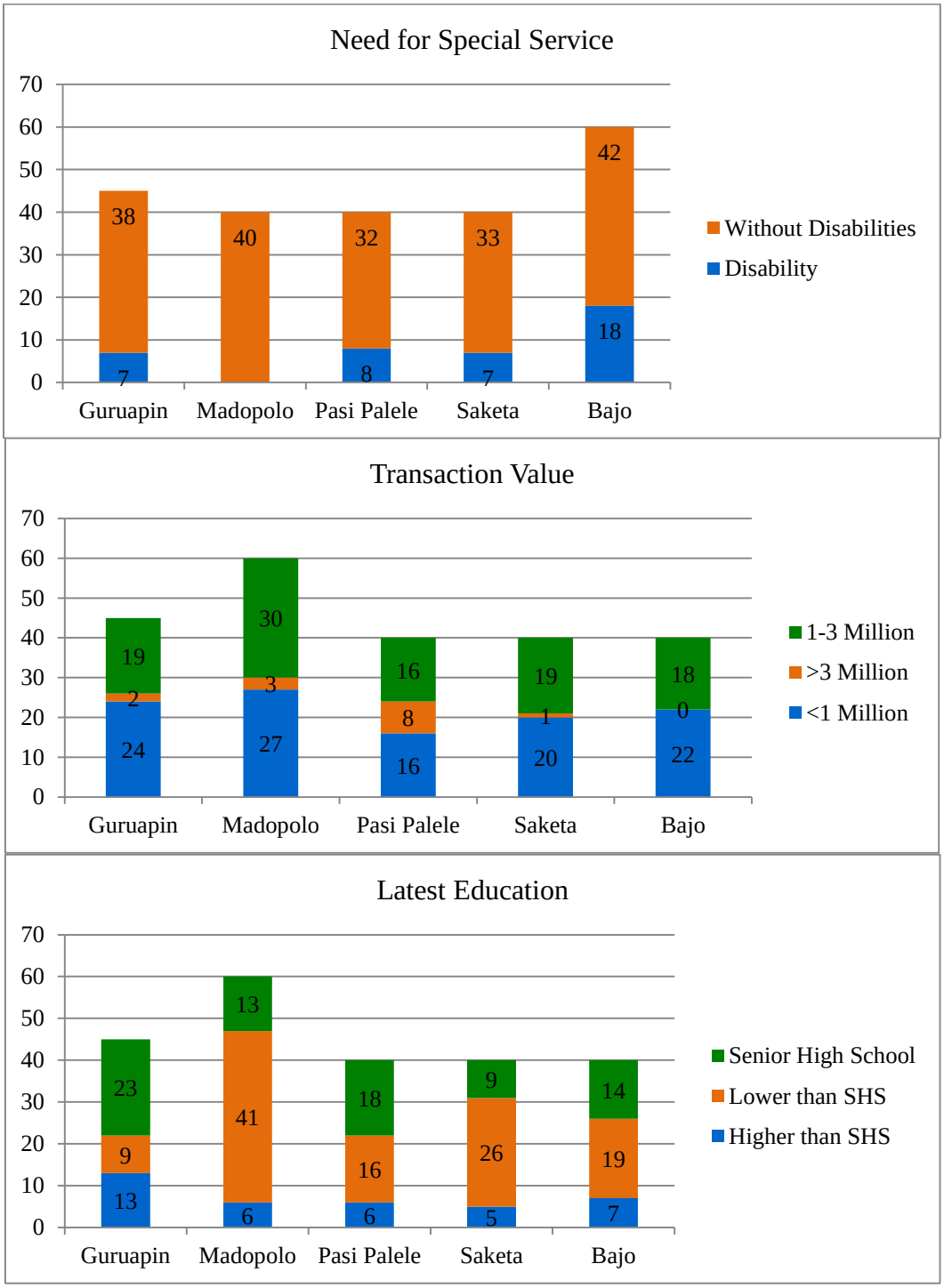

Fig. 1 Respondent's sociodemographic characteristics

The respondents from Guruapin represent a diverse demographic group, as noted by their educational background, economic participation, and ability status. Out of 31 individuals surveyed, the average age was approximately 38.6 years, with respondents ranging from early adulthood to elderly populations. Most respondents (26 individuals) reported having no disabilities, while 5 individuals identified as persons with disabilities, indicating a need for an inclusive public service infrastructure in the area. In terms of educational background, the largest segment (15 respondents) had completed senior high school, making it the dominant education level among the population. This was followed by 9 respondents who had attained education beyond high school, while 7 respondents had lower than high school education.

In addition, economic activity as reflected in transaction value revealed a concentration in the lower income brackets. The majority of respondents (18 out of 31) reported average transaction values of less than 1 million rupiah, indicating a low-to-moderate level of banking activity and purchasing power. Meanwhile, 12 individuals reported monthly transactions between 1 and 3 million rupiah, and only 1 respondent exceeded 3 million rupiah, suggesting that higher-value transactions were rare among this population.

4.1. Physical Condition of Port Infrastructure at BRI Bahtera Seva III Docking Points

The fieldwork was conducted across all port locations served by the BRI Bahtera Seva III floating bank, including Guruapin Port, Madopolo Port, Saketa Port, Pasi Palele Port, and Bajo Port. As a floating public service innovation, Bahtera Seva III is not limited to banking operations but also collaborates with local police and health authorities to provide essential administrative services (such as issuing SKCK – Police Clearance Certificate PCC and driving licenses) and basic healthcare services. Each port serves as a temporary service point for approximately 12 hours, after which the vessel navigates to the next island, requiring another 12 hours for travel. From an operational perspective, the availability of docking infrastructure is critical. Although there is no strict specification on the type of dock required (whether pier, wharf, or jetty), at a minimum, it must support safe and efficient access for users boarding the vessel. Moreover, as the ship functions as a mobile public service unit, the dock infrastructure must be capable of accommodating user queues, providing shelter, and enabling basic accessibility, especially in regions prone to tidal fluctuations and heavy rainfall.

As seen in Figure 2, not all ports meet the standard infrastructure components set forth in national regulations, such as the Ministry of Transportation Regulation No. 50/2021. However, several core and supporting facilities are essential to Bahtera Seva III operations. The minimum required includes a proper docking site and anchorage. Supporting infrastructure includes access roads or transport connectivity, telecommunications, clean water supply, public toilets, parking areas, and additional amenities for users. Based on satellite image analysis, which was used to assess the structural typology of each dock, the variations are apparent across locations. For instance, Guruapin Port on Kayoa Island features a wooden pier-type dock extending from the shoreline, allowing for easy access due to adequate sea depth. Madapolo Port also adopts a pier design, but its dock combines a concrete pathway with wooden outer sections, suggesting partial modernization.

In contrast, Saketa Port employs a jetty model with an L-shaped concrete platform to accommodate larger vessels, indicative of more robust engineering. Meanwhile, Pasi Palele Port features a modified jetty without a perpendicular structure, designed primarily for cargo ships requiring deeper waters, which may not align optimally with the service needs of Bahtera Seva III. Bajo Port's short pier structure makes it easier for local people to access the BRI Bahtera Seva III Terrace Ship service.

Service quality at each location is further influenced by the availability of waiting areas for users. Initial field observations reveal a common issue across all ports: the absence of permanent shelters or waiting rooms, forcing users to wait in exposed environments. This is exacerbated by the average walking distance from the main port gate to the docking site, often exceeding 30 meters, except for Bajo Port. This distance presents difficulties, especially for elderly users or those with mobility constraints. In terms of supporting facilities, Saketa and Madopolo ports lack nearby public toilets, and in most locations, access to places of worship such as prayer rooms (musholla) is also distant, often at similar or greater distances than the entry gate to the dock. Considering the predominantly Muslim population in South Halmahera, such facilities should be prioritized in future planning.

Additional observations on dock infrastructure show notable deterioration in several locations, particularly Madapolo Port. The wooden dock at Madapolo was found to be structurally incomplete or missing parts, with multiple points showing severe damage. These physical infrastructure deficiencies affect operational efficiency and safety and diminish the dignity and reliability of public services delivered through the floating bank program. Hence, these findings highlight an urgent need for targeted infrastructure development at the service points of Bahtera Seva III to ensure that service delivery objectives, especially related to financial inclusion and public access, can be achieved sustainably and equitably across the region.

Indeed, two main issues highlighted on port physical infrastructure, which are the docking pier structure (fragile wooden dock) or very far docking points from the terminal or

parking lot, lack of supporting facilities such as shelters or waiting rooms, nearby public toilets, and access to places of worship. These deficiencies contradict national policies such as Ministry of Transportation Regulation No. 50/2021 and Statute No. 66/2024, which mandate structural integrity and accessibility for all maritime service points. Furthermore, the absence of inclusive amenities directly impacts vulnerable groups, including the elderly, persons with disabilities, and religiously observant individuals, thereby violating the principles of equitable access outlined in Government Regulation No. 78/2014 and Statute No. 25/2009. As recent studies [NO_PRINTED_FORM] [28] highlighted, inclusive infrastructure must go beyond functionality to address dignity, comfort, and social sensitivity, which are currently lacking in many docking points served by BRI Bahtera Seva III. From a TQM perspective, the success of the floating banking service depends not only on the service provider's (BRI) performance but also on the alignment of supporting systems, such as infrastructure management by local authorities. Continuous improvement in service delivery requires integrated planning and feedback mechanisms across sectors [29, 30].

Fig. 2 Study locations: (a) Guruapin/Kayoa, (b) Madopolo, (c) Saketa, (d) Pasi Palele, and (e) Bajo Port.

4.2. Financial Inclusion Levels in Docked Districts

The level of financial inclusion in areas served by the Bahtera Seva III Ship is influenced by a combination of geographical factors, availability of port infrastructure, frequency of service, and community involvement with financial products. Meanwhile, savings, withdrawals, and payment services recorded the highest frequency of use. Based on the survey, the majority of service users stated easy access to the ship's service location (mean = 8.938), with an average travel time that was also considered reasonable (mean = 8.507). However, disparities in access were still found, such as in Koititi Village, which had to travel ±10 km to Saketa Port or Tanjung Obit, Prapakanda, Batutaga, Toin, and Sawang Akar villages, which are more than 3 Km of a straight line to Bajo Port (all in the same Obib Island). Then, in areas such as Pasi Palele and Mandioli, community interaction with financial services tended to be lower. Factors such as limited transportation modes, inadequate port infrastructure, and dependence on inconsistent ship service schedules were the main obstacles. Several villages, such as Tawa and Awis, which are ±7.3 km and ±2.6 km from the port, respectively, still experience challenges due to difficult terrain and the lack of public transportation.

Indirect cost constraints are also a barrier for low-income households. Although the boat service does not charge a direct fee, respondents stated that there were additional burdens in the form of transportation costs, waiting time, and potential loss of daily income. The mean value for the perception of affordability of service costs was 7.778, but a small portion of the community still experienced cost constraints. On the other hand, the limited cash capacity on the boat also caused some users to be unable to complete transactions in one visit.

Good port infrastructure matters far more than just keeping a ferry-size service like Bahtera Seva III running smoothly. It affects the Bahtera Seva III in opening doors to financial inclusion and sparking local economic growth, especially in Indonesia’s most remote and underserved 3T regions (tertinggal, terdepan, terluar—lagging, frontier, and outermost areas). For people living on small islands, where jobs and markets are hard to reach and everyday transactions can be costly, simply getting to a place where they can access banking services can be a major challenge. Ports are often the lifeline that makes this possible. When ports are poorly maintained or unsafe, it is not just an inconvenience, but also

cuts people off from essential financial tools [31]. Small traders, fishermen, market vendors, and others who live hand-to-mouth depend on being able to save money, get small loans, or send payments quickly. That is why we need to see ports not just as places where boats come and go, but as gateways to opportunity. With smart planning and coordinated investment, ports can become community hubs for many services [32].

4.3. User Satisfaction and Experience

The results of the descriptive analysis indicate that public satisfaction with the financial services provided by Teras Kapal BRI falls within the high category, with an average mean score exceeding 6. This suggests that users generally perceive the floating banking service as effective and responsive to their needs. The highest average value was recorded in the politeness of BRI staff (mean = 9.964), reflecting strong alignment between user expectations and the actual service experience. These findings align with the principles of the SERVQUAL model, which include one aspect of the five key dimensions, such as empathy. High scores in assurance and empathy, evidenced by professional staff behavior and attention to individual needs, contributed significantly to users' satisfaction.

From a regulatory standpoint, the current operational model partially fulfils the mandates of Statute No. 25 of 2009 on Public Service Delivery, which requires that all citizens have equal access to essential services regardless of geographic location. However, the absence of permanent waiting areas, clean water supply, or accessible toilet facilities at several ports contradicts the provisions of Ministry of Transportation Regulation No. 50/2021, which outlines the minimum infrastructure standards for maritime service points. Additionally, Statute No. 66 of 2024 on Maritime Transport reinforces the need for safe, reliable, and universally accessible maritime infrastructure, a standard that remains unmet in several docking locations visited by Bahtera Seva III.

User satisfaction with floating banking services (Teras Kapal BRI Bahtera Seva III) serves as a critical indicator of the success of financial inclusion programs in Indonesia’s archipelago regions. Given the limited reach of formal financial institutions in remote and outermost islands (3T regions), the presence of mobile banking services plays a pivotal role in bridging access gaps, as mentioned by [NO_PRINTED_FORM] [33]. These findings suggest that the floating service model is not merely a transitional solution but can serve as a permanent structure within the financial service ecosystem in archipelagic regions. The high level of satisfaction among users indicates the model's potential for adaptation to other geographically similar areas. In terms of service system engineering, these results can inform the development of adaptive service protocols tailored to specific locations and demographic segments. Future research could build on this framework to evaluate the effectiveness of digital banking integration with ship-based physical presence, thereby enhancing hybrid service delivery models.

In the coming years, the financial services sector will increasingly rely on hybrid models, combining digital platforms and direct interventions like floating ships to reach marginalized or remote communities across Indonesia’s archipelago. Ships like Bahtera Seva III have the potential to become national prototypes for floating banks in other island nations. Moreover, integration of public services may cooperatively improve the local economy. Those will shape the development towards inclusivity [34].

The study also focuses on evaluating the user community's experience of the port infrastructure that serves as a transit point for the BRI Bahtera Seva III floating banking service (Teras Kapal). This evaluation is crucial in understanding how the physical quality and accessibility of ports contribute to the convenience, safety, and effectiveness of utilizing maritime-based financial services. The assessment was conducted using several indicators, including the availability and condition of supporting facilities, user satisfaction with port services, perceived cleanliness, and the influence of port infrastructure on overall service quality. Survey results indicate that users generally perceive the availability of basic port facilities such as toilets, waiting areas, and lighting as satisfactory, with a mean score of 5.773. However, respondents expressed strong expectations for improvement, as reflected in the high modal value of 6.000 for the question regarding desired facility enhancements. These findings suggest that while some deem current conditions adequate, there remains a clear demand for better infrastructure development to meet user needs.

In terms of supporting facilities such as prayer rooms (musholla) and food vendors, respondents reported a relatively positive experience (mean = 5.827), though this aspect still shows room for improvement. A significant portion of respondents highlighted the importance of these amenities, particularly in a predominantly Muslim region where access to religious facilities plays a critical role in daily life. This aligns with the tangibility dimension of the SERVQUAL model, which emphasizes the physical environment and supporting facilities as essential contributors to perceived service quality [35, 36]. Port infrastructure affects whether to increase or reduce costs and enhance the systemic efficiency of any operations within a port [18, 37]. When ships can dock, unload, and depart more quickly due to efficient infrastructure, especially for Bahtera Seva III, a private-oriented asset.

Respondents also acknowledged the influence of port infrastructure on their overall satisfaction with Teras Kapal services, with a mean score of 6.187 for the indicator: "Does

the condition of port facilities affect your satisfaction with Bahtera Seva services?". Similarly, the indicator assessing the impact of port facilities on service quality scored 5.947, reinforcing the conclusion that infrastructure readiness significantly shapes user perception of service delivery.

Moreover, the survey revealed that port cleanliness (mean = 5.604) and waste management practices (mean = 5.827) were rated as moderately sufficient, but a notable number of respondents indicated concerns over environmental pollution (mode = 6.000). Some also noted that waste had a noticeable impact on their activities or those of the surrounding communities, suggesting that environmental sustainability should be integrated into future infrastructure planning. These findings reflect the broader discourse on inclusive and sustainable infrastructure, as outlined in [NO_PRINTED_FORM] [16], which defines inclusive infrastructure as one that is accessible, environmentally responsible, and responsive to diverse user needs. User experience with port infrastructure serves as a direct reflection of the quality of the maritime public transportation system and has a major impact on the effectiveness of sea-based social service programs like Teras Kapal BRI. This study expands the scientific discourse on the relationship between port infrastructure and public service delivery, especially in the context of small islands and remote archipelagic regions [38, 39].

These findings imply that investment in ports should not only consider the logistics aspect of goods transportation but also emphasize the socio-economic dimension, particularly related to public service connectivity. In other words, ports should evolve into social service nodes, rather than merely functioning as loading and unloading points. In the future, they need to transform into integrated service hubs in coastal areas, where commercial, administrative, health, and financial functions coexist harmoniously.

4.4. Future Impacts

Given the critical role of port infrastructure in facilitating effective service delivery and promoting financial inclusion in archipelagic regions, this study highlights several actionable implications for policymakers.

1. Infrastructure investment strategies in 3T areas must go beyond large-scale port developments and include constructing and maintaining small-to-medium docking facilities that meet minimum safety and accessibility standards.
2. An integrated policy approach should be adopted under a unified framework for inclusive regional development.
3. Collaboration between state-owned enterprises such as BRI and local governments is essential to align floating banking schedules with port readiness and community needs.
4. We recommended that regulatory agencies implement a performance-based monitoring system to assess the effectiveness of floating services in underserved areas, using metrics such as service uptake, user satisfaction, and frequency of disruptions due to poor port access.

The findings of this study offer substantial implications for national policy and financial service innovation. By integrating port development with social service planning, especially for 3T regions, Indonesia can develop a more inclusive maritime infrastructure framework. The Bahtera Seva III model, if replicated and supported by adequate infrastructure, could serve as a national prototype for hybrid service delivery. This model can also catalyze the transformation of coastal ports into multifunctional public service hubs, promoting economic exchange and administrative and health service access in remote areas. Future research should explore the integration of digital banking with ship-based services and the long-term impact of such models on economic empowerment and social equity.

5. Conclusion

This study highlights the relationship between port infrastructure quality and the effectiveness of floating banking services, particularly in remote archipelagic regions such as South Halmahera. The research revealed that the BRI Bahtera Seva III floating bank has successfully enhanced financial inclusion and user satisfaction in underserved areas. However, its impact is substantially constrained by inadequate port infrastructure. Key factors such as ease of access, docking safety, availability of supporting facilities, and service consistency were found to influence user perceptions and engagement. The results highlight the need for integrated infrastructure and service planning that considers local geographical challenges and user needs.

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