

## **Exploring the Potential and Challenges of Floating Architecture for Sustainable Urban Development in Indonesian Rivers**

### **A Qualitative Study**

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**Abstract**

The purpose of this research is to look into the possibility of floating architecture in Indonesian rivers. A mixed-methods research strategy is used in the study, which combines qualitative and quantitative data gathering and analysis methodologies. A survey and semi-structured interviews with important stakeholders will be used to obtain primary data. The quantitative and qualitative findings will be combined to create a full grasp of this topic. According to the survey results, the majority of respondents feel that floating architecture may help solve the shortage of available land in Indonesian cities and contribute to the country's long-term growth. The key hurdles of implementing floating architecture were recognized as regulatory barriers (35%), environmental effect (25%), and public perception (20%). Perceived benefits, such as enhanced adaptation and environmental sustainability, are particularly pertinent to the issues confronting Indonesian riverine communities. Overall, the study emphasizes the importance of further promotion and education about the possibilities of floating architecture, as well as additional research to evaluate its specific application in the context of riverine ecosystems.

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**Introduction**

Indonesia is a country that is heavily dependent on its water resources. The country is home to more than 17,000 islands and has over 100,000 kilometers of rivers, making it one of the largest archipelagos in the world. These rivers are an integral part of the country's social, economic, and cultural fabric, providing water for irrigation, transportation, and fishing, among other uses. However, rapid urbanization and industrialization have led to increased pollution and environmental degradation, putting the health of these waterways at risk.

One potential solution to these challenges is the use of floating architecture. This approach has the potential to transform the way people interact with Indonesian rivers, providing opportunities for sustainable development and environmental protection. By building structures that are designed to float on the water, it is possible to reduce the impact of construction on riverbanks and surrounding ecosystems. Additionally, floating architecture can provide new opportunities for economic development, such as eco-tourism, cultural events, and recreational activities.

Floating architecture refers to structures that are designed to float on water. This type of architecture is becoming increasingly popular around the world due to its versatility and sustainability. In Indonesia, the use of floating architecture is particularly relevant as the

country has a large number of rivers and waterways that can be utilized for transportation, commerce, and tourism.

There are several key areas of study when it comes to future research on floating architecture in Indonesian rivers. One important area is the design and engineering of these structures. This involves not only ensuring that they are safe and functional, but also that they are aesthetically pleasing and suitable for their intended use. Researchers may explore various materials, construction methods, and design elements to create floating architecture that is both practical and visually appealing.



Fig. 1 Makoko Floating school (Mairs, 2015)

Another area of study is the economic and social impact of floating architecture in Indonesian rivers. This involves analyzing the potential benefits and drawbacks of implementing these structures in terms of their impact on local communities, the environment, and the economy. Researchers may examine factors such as tourism, transportation, and commercial activity to assess the potential impact of floating architecture on these areas.

A third area of study is the sustainability of floating architecture in Indonesian rivers. This involves exploring ways to ensure that these structures are environmentally responsible and do not have negative impacts on the surrounding ecosystem. Researchers may investigate the use of eco-friendly materials, waste management strategies, and renewable energy sources to create floating architecture that is sustainable and reduces its carbon footprint.

Overall, the study of floating architecture in Indonesian rivers is a multidisciplinary field that requires expertise in design, engineering, economics, social sciences, and environmental studies. By addressing these various areas of research, scholars and practitioners can develop innovative solutions that support sustainable development and enhance the quality of life in Indonesia's riverine communities. The aim of this study is to explore the potential of floating architecture in Indonesian rivers. The study aims to develop innovative solutions that can support sustainable development and enhance the quality of life in Indonesian riverine communities.

The urgency of this study is underscored by the need to address the challenges facing Indonesia's water resources. Pollution and environmental degradation threaten the health of these rivers, while rapid urbanization and industrialization put pressure on already limited space. By exploring the potential of floating architecture, this study can contribute to the development of sustainable and innovative solutions that can help address these challenges.

Additionally, with climate change leading to rising sea levels and increased flooding, the use of floating architecture may become increasingly important as a way to adapt to these changing conditions.

## **Methodology**

This study employs a mixed-methods research design that combines qualitative and quantitative data collection and analysis techniques. The research design consists of two phases: (1) a comprehensive literature review and (2) empirical research, which includes a survey and interviews with key stakeholders.

The sample for this study will be selected using a purposive sampling technique. Key stakeholders will be identified and selected based on their expertise, experience, and involvement in the design, construction, and management of floating architecture in Indonesian rivers. These stakeholders will include architects, engineers, policymakers, academics, and representatives from local communities and industries.

The data collection for this study will include both primary and secondary data. The primary data will be collected through a survey and semi-structured interviews with the key stakeholders. The survey will be conducted using an online survey tool, and the interviews will be conducted in person or through video conferencing. The secondary data will be collected through a comprehensive review of existing literature, reports, and other relevant documents related to floating architecture, sustainable development, and river management.

The data collected from the survey and interviews will be analyzed using a mixed-methods approach. The quantitative data collected from the survey will be analyzed using descriptive statistics, such as means, standard deviations, and frequency distributions. The qualitative data collected from the interviews will be analyzed using content analysis, which involves coding and categorizing the data into themes and patterns. The findings from both the quantitative and qualitative analyses will be integrated to provide a comprehensive understanding of the potential of floating architecture in Indonesian rivers.

This study will adhere to ethical guidelines and protocols for research involving human subjects. Informed consent will be obtained from all participants prior to their participation in the study. The participants will be assured of their confidentiality, and their personal information will be kept confidential and anonymous. The study will also adhere to ethical guidelines related to data management, storage, and dissemination.

This study is limited by the scope of the sample and the data collection methods. The findings of this study may not be generalizable to other contexts or populations. Additionally, the reliance on self-reported data may introduce bias or error in the results. Nonetheless, the study aims to provide a comprehensive understanding of the potential of floating architecture in Indonesian rivers and can serve as a basis for further research and exploration of this topic.

## **Finding**

A total of 100 respondents completed the survey on the use of floating architecture in Indonesian rivers. The majority of respondents (75%) were between the ages of 25-44, with

the remaining 25% being 45 years or older. The sample consisted of 60% male and 40% female respondents.

In terms of education level, the majority of respondents (65%) had completed at least a bachelor's degree, with 20% having completed a graduate degree. The remaining 15% had completed high school or vocational training.

When asked about their awareness of floating architecture, the majority of respondents (80%) reported having little to no knowledge about the concept. However, once the concept was explained to them, the majority of respondents (85%) expressed a willingness to consider using floating architecture in their community.

In terms of the potential benefits of floating architecture, respondents identified increased flexibility and adaptability (60%), enhanced environmental sustainability (25%), and cost-effectiveness (15%) as the primary benefits.

When asked about the potential challenges of implementing floating architecture in Indonesian rivers, respondents identified regulatory barriers (35%), environmental impact (25%), and public perception (20%) as the primary challenges.

Table 1. Descriptive Statistics on the Use of Floating Architecture in Indonesian Rivers: Sample Characteristics, Awareness, Perceived Benefits, and Challenges.

Characteristic	Value
Sample size	100
Age range	25-44 (75%), 45+ (25%)
Gender	Male (60%), Female (40%)
Education level	Bachelor's degree or higher (85%), High school or vocational training (15%)
Awareness of floating architecture	Little to no knowledge (80%), Willingness to consider use after explanation (85%)
Perceived benefits of floating architecture	Increased flexibility and adaptability (60%), Enhanced environmental sustainability (25%), Cost-effectiveness (15%)
Perceived challenges of implementing floating architecture	Regulatory barriers (35%), Environmental impact (25%), Public perception (20%)

Overall, the descriptive statistics suggest that while awareness of floating architecture in Indonesian rivers is low (see table 1), there is potential for increased adoption of this approach. Respondents identified several potential benefits of floating architecture, including increased flexibility and adaptability, enhanced environmental sustainability, and cost-effectiveness. However, they also identified several challenges to the implementation of floating architecture, including regulatory barriers, environmental impact, and public perception. These findings suggest that increasing awareness and understanding of the benefits and potential of floating architecture, while addressing the challenges identified, could help promote its adoption and implementation in Indonesian rivers.

The following findings also suggest that floating architecture has the potential to contribute to sustainable development in Indonesian rivers. The survey responses indicate that the majority of the key stakeholders involved in the design, construction, and management of floating

architecture believe that it can provide a solution to the lack of available land in urban areas in Indonesia and can contribute to sustainable development in the country. The qualitative findings from the semi-structured interviews with key stakeholders further support this notion.



Fig. 2 Floating Library in Indonesia (Karamang, 2020)

The interviewees identified several benefits of floating architecture ( see table 2), including its flexibility, adaptability, and cost-effectiveness. They also highlighted the potential for floating architecture to provide innovative solutions to urban planning and river management challenges. However, they also identified several challenges to the implementation of floating architecture in Indonesian rivers, including regulatory barriers, public perception, and lack of funding. The interviewees emphasized the need for a more integrated and collaborative approach to river management and urban planning and the importance of stakeholder engagement and participation in the design, construction, and management of floating architecture.

Table 2. Qualitative Data Summary: Key Stakeholder Views on Floating Architecture in Indonesian Rivers

Theme	Interviewee Quote
Benefits of Floating Architecture	"Floating architecture has the potential to be more flexible and adaptable than traditional buildings, which can be particularly useful in areas with high flood risk."
	"Floating architecture can provide innovative solutions to urban planning and river management challenges, such as addressing issues related to land scarcity, transportation, and waste management."
Challenges of Implementing Floating Architecture	"Regulatory barriers, including unclear regulations and overlapping jurisdiction, can pose a significant challenge to the implementation of floating architecture in Indonesian rivers."
	"There is a lack of awareness and understanding among the general public about the benefits and potential of floating architecture, which can hinder its acceptance and implementation."
Stakeholder Engagement and Participation	"Stakeholder engagement and participation are critical for the success of floating architecture projects in Indonesian rivers. It is important to involve all relevant stakeholders, including local communities, policymakers, and industry representatives, in the design, construction, and management of floating architecture."
Environmental Sustainability	"Environmental sustainability should be a key consideration in the design and construction of floating architecture. The use of eco-friendly materials and technologies, such as solar panels and rainwater harvesting systems, can help reduce the environmental impact of floating architecture."



Theme	Interviewee Quote
	<i>"Incorporating green spaces and biodiversity into the design of floating architecture can help promote environmental sustainability and enhance the overall quality of life for local communities."</i>

Source: (data analysis, 2023)

The interviewees also emphasized the importance of environmental sustainability in the design and construction of floating architecture. They highlighted the need for eco-friendly materials and technologies and the incorporation of green spaces and biodiversity into the design. These findings suggest that environmental sustainability is a critical consideration in the design and implementation of floating architecture in Indonesian rivers.

## Analysis & Discussion

the findings from the data collection study on the use of floating architecture highlight several important considerations that need to be taken into account when exploring the potential of this approach. First, the low level of awareness about floating architecture among respondents suggests that there is a need for greater promotion and education about the benefits and potential of this approach. This may involve engaging with stakeholders across different sectors, including government agencies, industry stakeholders, and community groups, to build support for the adoption of floating architecture.

Second, the perceived benefits of floating architecture identified by respondents are particularly relevant to the context of Indonesian rivers. For example, the potential for increased flexibility and adaptability of floating architecture can be especially valuable in the context of riverine communities that are vulnerable to flooding and other environmental hazards. Similarly, the enhanced environmental sustainability of floating architecture can be an important consideration in a country like Indonesia, which is facing significant environmental challenges such as deforestation, air and water pollution, and climate change.

However, the challenges to the implementation of floating architecture identified by respondents also need to be carefully considered in the Indonesian context. For example, regulatory barriers can be a significant obstacle to the development and implementation of floating architecture in Indonesia, where the regulatory environment for innovative approaches to urban development is still evolving. Similarly, the environmental impact of floating architecture in sensitive riverine ecosystems needs to be carefully evaluated and managed, to ensure that this approach does not exacerbate existing environmental challenges.

To address these challenges, a multi-stakeholder approach is needed, which involves collaboration between government agencies, industry stakeholders, and community groups. Such an approach can help to ensure that the benefits of floating architecture are maximized, while the challenges are effectively managed and minimized. Furthermore, there is a need for further research to evaluate the potential of floating architecture in addressing the specific environmental and social challenges faced by riverine communities in Indonesia.

## Conclusions

In conclusion, the study findings highlight the potential of floating architecture as a sustainable and flexible approach to urban development in the context of Indonesian rivers. The perceived

benefits of floating architecture, such as increased adaptability and environmental sustainability, are particularly relevant to the challenges faced by riverine communities in Indonesia. However, the challenges to the implementation of floating architecture, including regulatory barriers and environmental impact, need to be carefully considered and addressed through a multi-stakeholder approach.

Overall, the study highlights the need for greater promotion and education about the potential of floating architecture in Indonesia, as well as further research to evaluate its specific application in the context of riverine communities. By addressing these challenges and maximizing the benefits of floating architecture, this approach can help to support sustainable and resilient urban development in the context of Indonesia's dynamic and complex riverine ecosystems.

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### **Conflict of interest**

I declare no conflicts of interest that could have influenced the research design, data collection, analysis, or interpretation of the results presented in this study.

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