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Architectural Visualization Approach Using Google SketchUp and Lumion on the Development of Maritime Tourism

Haedar Akib ^{a,*}, Ismail ^a, Edi Suhardi Rahman ^b, Ahmad Wahidiyat Haedar ^b, Sirajuddin Saleh ^a,
Muhammad Rizal ^a

^a Faculty of Social Science and Law, Universitas Negeri Makassar, Makassar, South Sulawesi, 90224, Indonesia

^b Faculty of Engineering, Universitas Negeri Makassar, Makassar, South Sulawesi, 90224, Indonesia

Corresponding author: *haedarakib@unm.ac.id

Abstract— This study aims to portray the strategy and design of marine tourism development through a data visualization approach using Google SketchUp and Lumion. The type of research conducted is Research and Development (R&D), employing the ADDIE approach (Analysis, Design, Development, Implementation, and Evaluation). The findings of this study reveal that the miniature design of Pulau Sembilan on Larea-rea Island incorporates local cultural themes in the construction of Rulan (Nine House), with a visualization of the roof following the design of the traditional Karampuang house. Additionally, the researcher presents designs concerning the jetties of Larea-rea Island and the product facility designs. Ultimately, contributes to development of Rulan (Nine House) and the efficient land utilization contributes to the region's income enhancement in the tourism sector of Larea-rea Island. It is recommended that future research on marine tourism development should involve a more comprehensive analytical framework that considers social, economic, and environmental aspects. This will help in understanding the overall impacts of marine tourism development. It is also important to investigate the ecological impacts of tourism and come up with effective mitigation strategies to prevent harm to the marine environment. Another interesting research area is to integrate the perspectives of local communities and their participation in the planning and implementation of tourism development. This will ensure the sustainability of such projects and gain community acceptance.

Keywords— Marine tourism; architectural visualization; Google SketchUp; Lumion.

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I. INTRODUCTION

Maritime tourism has long been recognized as a sector with significant potential in driving the economic development of a region [1]–[6]. The potential is manifested in the form of opportunities to increase regional income, create job opportunities for local communities, as well as improve infrastructure and public services [7], [8]. Besides the economic benefits, maritime tourism also plays a crucial role in promoting the natural and cultural wealth of a region to tourists, facilitating cultural exchange, and enhancing environmental awareness [9], [10].

However, alongside the existing opportunities, the development of maritime tourism often faces serious challenges. One of these challenges is inadequate and less holistic planning. Effective planning is crucial to ensure that tourism development maintains a balance between economic, social, and environmental aspects [3]–[6][11], [12].

Moreover, conflicts frequently arise between tourism development objectives and environmental conservation and sustainability efforts. Careless management can harm vulnerable maritime and coastal ecosystems, ultimately negatively impacting the very tourism attractions.

Another challenge encountered in maritime tourism development is the difficulty in communicating design concepts to various stakeholders, including local governments, local communities, investors, and groups [8], [13]–[15]. Clear and effective visualization of design concepts is vital to assist all parties in comprehending the tourism project's vision, identifying potential impacts, and experiencing the benefits from its development [16]–[18]. Therefore, the success of maritime tourism development relies not solely on the quality of the physical infrastructure constructed, but also on the ability to visualize design concepts clearly and convincingly to stakeholders. This is why the architectural visualization approach using technologies like Google

SketchUp and Lumion is highly relevant in tackling these challenges and achieving sustainable maritime tourism development goals [19]–[21].

In addressing these challenges, the architectural visualization approach using technologies like Google SketchUp and Lumion has garnered significant attention in supporting maritime tourism planning and development. These technologies enable planners and architects to create realistic visual representations of design concepts, including island development, buildings, facilities, and the tourism environment [22], [23]. However, despite the potential of these technologies in overcoming communication barriers and enhancing decision-making, in-depth research that explores the application of this architectural visualization approach in the context of maritime tourism development remains limited.

Hence, the primary objective of this study is to investigate how the architectural visualization approach using Google SketchUp and Lumion can be effectively applied in maritime tourism development. This study will identify the best strategies and approaches for utilizing these technologies to design and visualize island development and tourism facilities

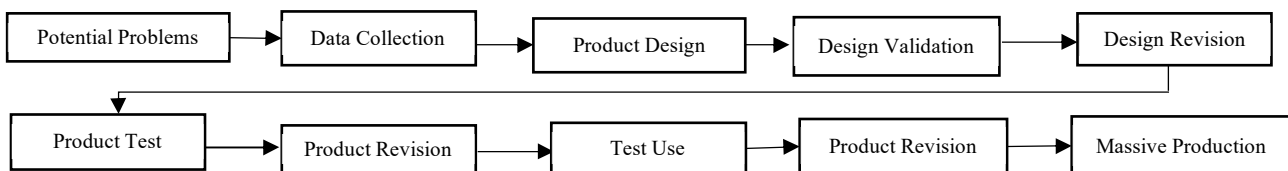


Fig. 1 Steps of Using the R&D Method

Socio-technical architecture is produced through a process as introduced by Kelly and Duerk [27], involving fact-finding, theme determination, goal setting, design display requirements, and concept creation. Fact-finding is accumulated based on observed phenomena in South Sulawesi and various regions in Indonesia where architectural designs are planned and constructed to showcase the existence of the community on Larea-rea Island, living, socializing, and interacting within its socio-cultural environment.

B. Method

The type of research employed to create the architectural design in the miniature design of Pulau Sembilan on Larea-rea Island is socio-technical architecture, which has been developed by various researchers. The research approach utilizes Research and Development [27] through the implementation of the ADDIE approach (Analysis, Design, Development, Implementation, Evaluation). In the context of architectural destination development, the design is based on the 5A tourism framework - attraction, accommodation, accessibility, amenities, ancillaries (Aliah et al., 2019; Alim, 2017; Bare et al., 2020; Haedar, 2018) of the Sembilan Islands centered around Larea-rea Island. The area is divided into two zones: ecotourism and conservation zones. Observation, interviews, and documentation techniques are used in field research to gather data, information, and knowledge (tacit, explicit, cultural) about the miniature design of Pulau Sembilan on Larea-rea Island. In the development of architectural visualization, a 3D map design flowchart is employed (Figure 2).

plans, as well as their impact on communication efficiency and stakeholder participation [19], [20], [22]. Thus, this research is expected to provide valuable insights for tourism practitioners, urban planners, and local governments in maximizing the potential of maritime tourism development through the architectural visualization approach.

II. MATERIALS AND METHOD

A. Materials

The type of research used in this study is the Research and Development (R&D) method, which is a research method used to create a product and test the effectiveness of a produced product [24]–[26]. The research and development steps in the design phase are as follows: 1) identifying potential issues, 2) data collection, 3) product design, 4) product testing, 4) product revision, 5) usage testing, 6) product revision, 7) mass production. For clearer understanding, please refer to Figure 1. Additionally, the researcher conducted visualization analysis regarding the concept of Socio-Technical Architecture.

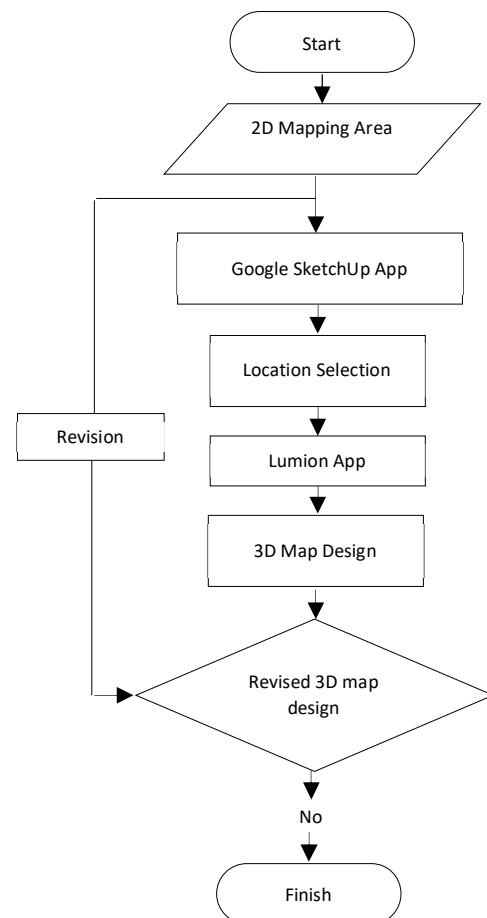


Fig. 2 Flowchart of 3D Map Creation

III. RESULT AND DISCUSSION

A. Designing Tourist Attractions

Larea-rea Island, also known as the Nine Islands in Sinjai Regency, is recognized for its potential as a tourist destination. To maximize the tourism potential at this location, the researcher conducted architectural visualization designs to attract the interest of tourists to visit. The researcher created several designs to enhance the experience of tourists enjoying the captivating scenery. The architectural visualization designs for land utilization include: 1) Karampuang traditional house design, 2) Larea-rea island pavilion design, 3) designs for public facility products such as: a) place of worship, b) toilets, 4) other designs such as: a) Garden, b) Lobby, c) Larea-rea island Dock and Diving Club, d) Welcome view of Larea-rea island, and e) Larea-rea island souvenir shop, 5) Mangrove plant miniature as natural conservation, 6) Larea-rea island site plan.

1) *Traditional Karampuang House Design on Larea-rea Island:* The architectural concept has deep roots in ontological perspectives of life, reflecting how we understand and interact with the universe in a "universal" manner. This viewpoint involves a profound understanding of the relationship between humans, nature, and existence. In this context, society developed a life philosophy known as "Sulapa Appa," which fundamentally aims to achieve self-perfection and harmony with the universe.

The philosophy of "Sulapa Appa" depicts a holistic view of life, where all aspects of human existence are interconnected and influence one another. The fundamental principle of this philosophy is that true perfection in human life can only be attained when all its aspects – physical, mental, emotional, and spiritual – are in balance and harmony. Within this perspective, the form and meaning of the "Quadrilateral" become significant symbols, representing these four aspects that must be attended to and nurtured to achieve perfection.

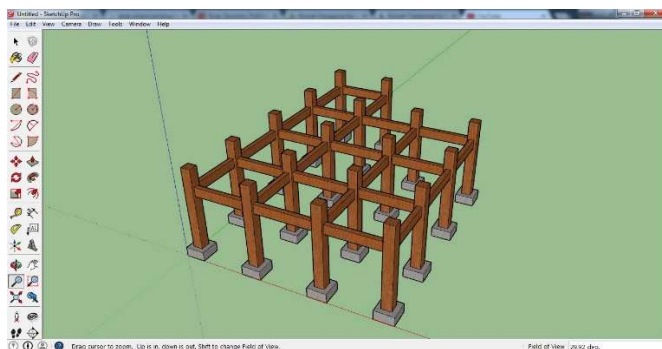


Fig. 3 Foundation and Frame Construction of a House Embracing the Philosophy of Sulapa Appa

Figure 3 presents this concept that can be applied in architecture as a visual and physical manifestation of this ontological worldview. In building and environmental design, the philosophy of "Sulapa Appa" can guide the process of creating spaces that respect the balance and relationships between humans, nature, and other dimensions of life. Architectural designs that incorporate these philosophical principles may result in spaces that promote human well-

being, create alignment with nature, and reflect profound spiritual values.

Furthermore, the exterior design is characterized by the motif of the Karampuang traditional house, marked by wooden panel walls. Drawing inspiration from the Karampuang traditional house, the exterior design introduces a rich traditional ambiance into the design. A prominent feature is the use of wooden panel walls, visually reminiscent of the Karampuang traditional house, imparting a strong identity to the building. Additionally, amenities such as ceiling fans, double beds, bathrooms, and back terraces are provided.

In the process of constructing the house's roof, the researcher integrates the concept of the Karampuang traditional house roof, characterized by a triangular prism shape and a roof ridge known as "timpa laja." Furthermore, the researcher creates a lodging facility named "Rulan" (House of Nine). Rulan consists of 10 houses, symbolizing the 10 islands. It is referred to as "Nine" because the tenth island is "not considered" as it emerges and submerges due to tidal changes (based on an interview on May 26, 2018). Hence, the name "Rulan" (House of Nine) is given to this lodging.

The researcher innovatively designs the lodging by incorporating local cultures of Sinjai Regency. This is evident in the architectural design of the Rulan roof, adopting the prism shape and using the roof ridge called "Timpa Laja" (Sinjai Traditional House) made from "seppu" wood (spinach) (Figure 4). The building structure and construction adopt local traditions such as Palanggalliri, serving as the house's legs, Alliri', assumed to be pillars or columns, and Pattoddo', functioning as connectors between pillars and supporting Alliri'.



Fig. 4 RULAN (House of Nine/Rumah Sembilan) on Larea-rea Island

2) *Larea-rea Island Pavilion Design:* The researcher designed a pavilion as one of the iconic tourist attractions of Larea-rea Island. This can be seen from the field conditions with the result of the Larea-rea Island pavilion design. The pavilion is intended for tourists who wish to enjoy the beauty of the sea with its expanse of white sand. It is also designed to face the West, allowing tourists to indulge in the beauty of the sunset (Figure 5).



Fig. 5 Larea-rea Island Pavilion

The researchers have taken significant steps in designing the pavilion that will serve as a prominent icon of the tourist attraction on Larea-rea Island. In this design, various aspects have been considered to ensure that the pavilion not only serves as a visual attraction but also provides a valuable experience for tourists. The design outcome of the Larea-rea Island pavilion portrays a blend of aesthetics and functionality. By taking the field conditions into account, the pavilion is meticulously designed to blend seamlessly with its surroundings and harmoniously integrate with the natural landscape. This design reflects the forms of the sea and the coastline while utilizing environmentally friendly materials to minimize any negative impact on the local ecosystem.

3) *Design of Public Facility Product Designs:* The stage of designing public facility products in this research involves a holistic approach to create spaces that are comfortable, functional, and meet the needs of both the local community and tourists. This aligns with the existing potential issues on Larea-rea Island. In the initial product design stage, which

was conducted prior to fieldwork, the researcher developed preliminary prototype designs to initiate the design proposal for Pulau Sembilan. Three facilities to be designed are a place of worship and toilets (Figure 6). Each of these facilities needs to be designed while considering cleanliness, accessibility, and user comfort aspects.



Fig. 6 Architectural Visualization Design of Public Facility

4) *Other Facility Designs:* The design of other facilities encompasses facilities that support tourism destination activities, such as: a) Garden, b) Lobby, c) Larea-rea Island Dock and Diving Club, d) Larea-rea Island Welcome View, and e) Larea-rea Island Souvenir Shop.



Fig. 7 Other Facility Designs

- Main Garden. The initial product design features a garden theme that beautifies Larea-rea Island. With the addition of a monument bearing the word "Sembilan," it signifies that Larea-rea Island is located in the Pulau Sembilan subdistrict.
- Larea-rea Island Dock. This dock serves as the place for boats to dock when arriving at Larea-rea Island. Alongside the dock, the researcher establishes a Diving Club, providing diving equipment for tourists interested in exploring the underwater beauty of Larea-rea Island.
- Welcome View. A monument bearing the word "Sembilan" serves as a welcome view for visitors arriving via the Larea-rea Island Dock. The term "Sembilan" is used to signify that Larea-rea Island is located in the Pulau Sembilan subdistrict.
- Souvenir Shop. The researcher revises the existing lodging on Larea-rea Island to become Rulan,

emphasizing local cultural education for both the visiting local community and tourists of the island. Additionally, a Souvenir Shop facility is created for purchasing unique souvenirs representative of Sinjai Regency.

- Main Lobby as the central activity hub on Pulau Sembilan. The Main Lobby serves as the center point for tourists visiting Pulau Sembilan. It provides information about the island's attractions, accommodations, restaurants/dining options, and various facilities available on Pulau Sembilan. The photograph captures the seaside view of the Main Lobby, the garden, and the "Sembilan" monument.
- Larea-rea Island Dock. This dock serves as the place for boats to dock when arriving at Larea-rea Island. Alongside the dock, the researcher establishes a Diving Club, providing diving equipment for tourists interested in exploring the underwater beauty of Larea-rea Island.

5) Site Plan of Larea-rea Island

In this stage, a major revision was carried out due to the differences between the actual size of the island and the size

that was initially designed. Additionally, there was a Site Plan that had been conceptualized but was still in the form of a basic sketch. For a clearer understanding, please refer to Figure 8.

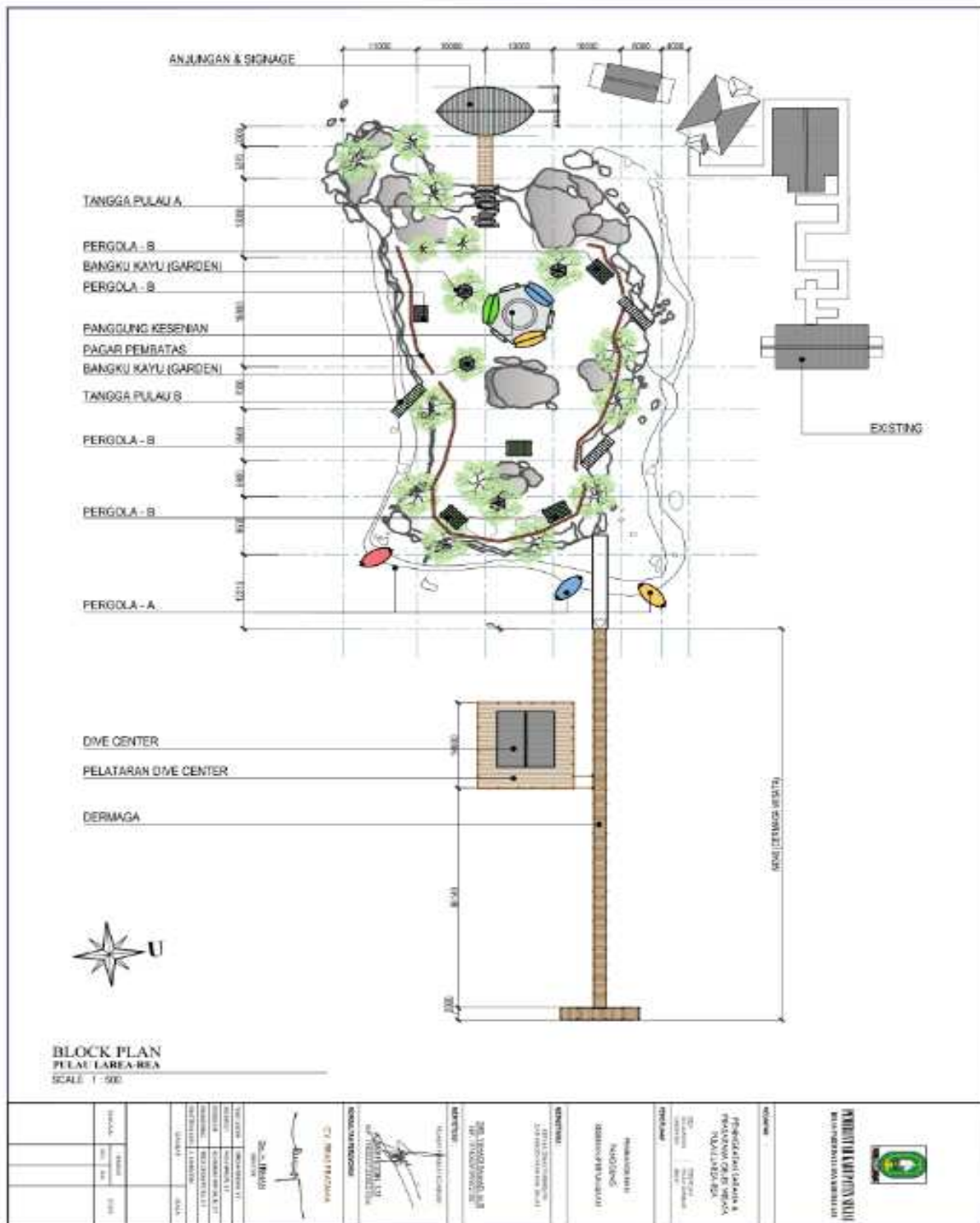


Fig. 8 Site Plan Layout of Larea-larea Island

6) Miniature Mangrove Plantation

Larea-rea Island, as a natural laboratory for the development of marine biota ecosystems, faces a serious threat in the form of coastal erosion that can damage the coastal environment and endanger the sustainability of the

maritime ecosystem. In an effort to address this issue, an innovative initiative has been designed by creating a miniature Mangrove plant setup aimed at reducing and preventing coastal erosion. The design of the miniature Mangrove plants aims to utilize Mangrove vegetation to

maintain coastal stability and stimulate the growth of the coastal ecosystem.



Fig. 9 Miniature Mangrove Plantation for Nature Conservation

Firstly, in the development of the miniature Mangrove plant design, strategic placement along the coastline of Larea-rea Island needs to be considered. Mangrove plants possess strong and intricate root systems that can hold soil and sediment in place. By utilizing this design, miniature Mangrove plants can be positioned in vulnerable areas prone to erosion, forming a natural barrier that slows down the rate of coastal erosion. Moreover, these miniatures can also serve as aesthetic elements that enhance the coastal scenery and attract tourists, thereby promoting awareness about the importance of coastal ecosystem preservation.

Secondly, the development of miniature Mangrove plants can also leverage cutting-edge technology like 3D printing to create precise replicas of Mangrove roots. This allows for the creation of simulated roots that are effective in reducing erosion. Additionally, using environmentally friendly materials for these miniatures can support the concept of nature conservation on Larea-rea Island. In the long run, these miniature Mangrove plants will contribute to research on coastal ecosystem adaptation and development, strengthening Larea-rea Island's role as a natural laboratory for marine ecosystem studies.

Thirdly, collaboration among ecologists, engineers, and the local community is crucial for the successful development and implementation of the miniature Mangrove plant design. In the implementation process, involving the local community in caring for and maintaining the miniatures can help raise awareness about the importance of coastal conservation. Furthermore, educational efforts and outreach about the benefits of Mangrove ecosystems and the positive impact of this design can foster a deeper understanding and strong commitment to preserving the coastal environment of Larea-rea Island.

B. Discussion

The discussion in this study highlights the importance of architectural visualization approaches in the development of marine tourism through the use of tools such as Google SketchUp and Lumion. In this context, architectural visualization plays a significant role in conveying the concept of tourism development to stakeholders and the community in a clearer and more convincing manner. By utilizing these tools, tourism development plans can be presented in a more realistic and impressive manner, allowing stakeholders to better understand the project's potential and its impact on the environment and local culture.

The application of this approach also enables researchers to investigate the extent to which the miniature design of Pulau Sembilan on Larea-rea Island can incorporate local cultural aspects in the construction of Rulan (Rumah Sembilan), as reflected in the visualization of roofs that follow the design pattern of Karampuang traditional houses. This underscores the importance of responding to cultural contexts in tourism project development, which can enhance tourist appeal and create a unique identity for the destination. Furthermore, the implementation of visualization technology allows researchers to meticulously design facilities such as docks and tourist products that align with the proposed tourism development concept.

The results of this study directly support previous findings that highlight the crucial role of architectural visualization approaches in informing and engaging communities in the process of sustainable tourism development planning [28]–[31]. Therefore, the use of tools such as Google SketchUp and Lumion is not only a technical means but also serves as a powerful communication tool to connect tourism planning with complex cultural, social, and environmental aspects [22].

Limitations of this study include its focus on the architectural visualization approach in marine tourism development using Google SketchUp and Lumion. This study does not encompass other aspects that might also influence tourism development, such as broader economic, social, and environmental factors. Additionally, the study did not deeply analyze the ecological impacts of the proposed marine tourism development, including potential damage to the marine environment and its impact on marine ecosystems.

For future research, it is recommended to involve a more holistic analytical framework, including social, economic, and environmental aspects, to understand the more comprehensive impacts of marine tourism development. Further investigation into the ecological impacts and mitigation strategies is also an interesting research area to ensure that tourism development does not harm the valuable marine environment. Additionally, integrating the perspectives of local communities and their participation in the planning and implementation of tourism development could be a focus of further research to ensure the sustainability and community acceptance of such projects.

IV. CONCLUSION

Through the findings of this study, it is revealed that the approach of designing the miniature of Pulau Sembilan on Larea-rea Island encompasses deeper dimensions by integrating elements of local culture in the development of Rulan (Rumah Sembilan), as portrayed through the visualization of the roof that follows the design pattern of the traditional Karampuang house. Not only that, but the researchers also present designs related to the development of the pier on Larea-rea Island and product facility designs. The entirety of this study reaffirms that the innovation in the development of Rulan (Rumah Sembilan) and the efficient use of land make a significant contribution to enhancing revenue in the tourism sector of Larea-rea Island. By applying local cultural elements and careful design strategies, this study provides a strong foundation for sustainable tourism development that not only yields economic benefits but also preserves the local cultural identity on Larea-rea Island.

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