



Enhancing Safety and Security: Facilities for Wheelchair Users in Marine Tourism Area

Sunardi^{1,2*}, Ali Muntaha^{1,3}, Daduk Setyohadi^{1,3}, Andik Isdianto^{4,5}

¹ Department of Fishery and Marine Resources Utilization, Universitas Brawijaya, Malang 65145, Indonesia

² MASELA Marine Tourism Research Group, Universitas Brawijaya, Malang 65145, Indonesia

³ Im-Fisher Research Group, Universitas Brawijaya, Malang 65145, Indonesia

⁴ Coastal Resilience and Climate Change Adaptation, Universitas Brawijaya, Malang 65145, Indonesia

⁵ Doctoral Program of Environment Studies, Graduate School, Universitas Brawijaya, Malang 65145, Indonesia

Corresponding Author Email: sunardi@ub.ac.id

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ABSTRACT

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Keywords:

Labuan Bajo Indonesia, SWOT analysis, wheelchair-accessible outdoor tourism, redesign of the Pinisi boat for wheelchair users, accessible facilities or services at attractions, comprehensive and up-to-date wheelchair-accessible information, universal design of wheelchair accessibility and disability rights, wheelchair-accessible transportation and accommodation

The Indonesian tourist resort of Labuan Bajo is recognized for marine and island features. Accessibility issues may cause disappointment for those using wheelchairs. This study proposes wheelchair-accessible outdoor tourism at Padar Island, Pink Beach, and the Komodo Conservation Forest to address these issues. The Pinisi boat cruise was evaluated for one day to understand accessibility issues and potential for passengers with impairments. Travel access problems for those using wheelchairs were addressed through surveys and literature. Surveys were conducted with 15 participants from diverse backgrounds and over 30 scholarly articles were reviewed to gather insights on the topic. Data from both approaches was examined using descriptive statistics, content analysis, and SWOT analysis. It was found that the Pinisi boat needs redesigning to accommodate wheelchair access on board. An additional portable crane was used to assist travel from the boat to the ground and back. Accommodations for wheelchair trailriders were needed to cross the wilderness of Komodo Island, ascend the mountains of Padar Island, and enjoy Pink Beach. The study recommended more accessible transportation and accommodation, ramps, paths, or trails at attractions, accessible facilities or services at attractions, a website or app with comprehensive and up-to-date information on wheelchair-accessible Labuan Bajo, and brochures, maps, or guides with relevant and reliable information. The proposed solutions could enhance accessibility, quality, safety, and satisfaction for those using wheelchairs in Labuan Bajo, while supporting universal design and disability rights.

1. INTRODUCTION

Marine and island tourism is a rapidly growing industry that offers visitors unique and attractive experiences in natural settings, human interaction, and scenic views [1]. However, not everyone can enjoy these experiences equally, especially wheelchair users who face various accessibility challenges and barriers in their travels. With the rapid development of marine tourism, most of which is for economic purposes, it is important to take into account aspects of sustainable and inclusive development areas. This requires the government's role to regulate it, ensuring that the industry is developed in a sustainable and inclusive manner [2]. With more than 17,000 islands and a diverse marine ecosystem, Indonesia is one of the world's largest archipelagic countries. The ocean has a significant impact on many aspects of life on these islands, which are connected by a chain of islands. It possesses a large number of potential sites for marine and island tourism, including Bali, Lombok, Raja Ampat, Wakatobi, and Labuan Bajo, among others. A little hamlet known as Labuan Bajo can be found on the westernmost point of Flores Island in East Nusa Tenggara Province. This area is recognised as a UNESCO World Heritage Site and is the natural habitat of the

endangered Komodo dragon (*Varanus komodoensis*) Labuan Bajo, which is located in Indonesia, is a one-of-a-kind tourist destination that is home to a number of attractions that cannot be found in any other country. Some of these attractions include: the Komodo National Park, which is the habitat for Komodo and has been protected from the time of Dutch colonial rule until now [3]; the Manggarai culture, which uses traditional fighting dance ("*Caci Dance*") as a means of giving gratitude to God Almighty [4]; the Wae Rebo village with the conical houses ("*Mbaru Niang*") on top of the hill [5]; the Pink Beach, which is one of the seven pink beaches in the world [6]; the Batu Cermin Cave, which is a natural cave that reflects the sunlight through the cave hole [7]; and the Manta Point, which is a diving site with manta rays [8]. Labuan Bajo offers tourists a lot of nature, culture, history, and adventure. Each year, millions of domestic and foreign tourists are attracted to these attractions, elevating Labuan Bajo to the status of a top priority tourist destination in Indonesia. It is anticipated that up to 1.5 million visitors will visit annually [9].

However, not every traveller will be able to enjoy these sights to the same degree. Wheelchair users will encounter a number of obstacles and problems throughout their travels in Labuan Bajo, particularly while getting to the islands by boat.

Their movement and ability to participate in tourism activities are restricted because there are not enough accessible facilities, infrastructure, or services [10]. This situation contravenes the principles of universal design, which aim to create products and environments that are useful to all people without the need for adaptation or specialized design. The principles of universal design strive to create products and situations that are usable by all people. People with disabilities are afforded greater social participation, protection of their human rights, and access to equal opportunities thanks to universal design [11, 12].

Many people find that participating in tourism fulfils a need for personal growth while also providing them with opportunities for pleasure. Nevertheless, not everyone has equal access to the opportunities presented by tourism, particularly people with disabilities. The World Health Organisation estimates that there are around 1 billion individuals living with some form of disability across the globe, the vast majority of whom are located in less developed nations [13]. Accessibility and tourism have a history that stretches back to 1980, when the World Tourism Organisation identified tourism as a fundamental right for human development and suggested that member countries integrate accessibility as an essential part of tourism development [14]. This is the beginning of the connection between accessibility and tourism. There is a considerable lack of access for people with disabilities to participate in recreational activities outside [15]. The tourism industry as a whole can gain a competitive edge by recognising the significance of making tourist locations accessible to people with impairments [16]. In his book *Planning Inclusive Yachts*, which is the product of research on the building of boats for wheelchair users, Ferrari [13] describes many aspects of yacht design for wheelchair users. These features include accessibility, manoeuvrability, and stability. Piardi et al. [17] use a design that is accessible to all on a small boat. This design includes instructions, essential components, and potential opportunities. In the United States of America, regulations established by the Passenger Vessel Access Advisory Committee [18] govern the implementation of access design for disabled individuals at ports serving passenger boats. Several recent studies have contributed to the understanding of accessible tourism for individuals with disabilities. Buhalis and Michopoulou [19] reviewed the evolution from disability and tourism to accessible tourism, discussing future challenges and opportunities. Darcy and Buhalis in 2019 explored the concept of accessible tourism and its implications, providing best practices and recommendations [20]. Shen et al. [21] in 2018 investigated the impact of customer value co-creation behavior on the brand equity of online travel enterprises. McKercher et al. [22] examined the perception of people with disabilities towards the effectiveness of travel agents. Lastly, Tutuncu [23] in 2017 examined the effects of accessibility, disability types, and forms of assistive devices on the hotel satisfaction of people with physical disabilities.

As a result, the purpose of this research is to investigate accessibility problems and provide potential solutions for wheelchair users who wish to travel in and around Labuan Bajo, particularly for outdoor tourism on Padar Island, Pink Beach, and within the Komodo Conservation Forest. These areas were picked because they each offer a distinctive landscape and a variety of pursuits that are common among vacationers. In addition to that goal, the study intends to make a contribution to the formulation of universal design principles

for marine and island tourism throughout Indonesia and the rest of the world.

The research aims to investigate the accessibility issues and propose solutions for wheelchair users who want to enjoy marine and island tourism in Labuan Bajo, Indonesia. The research focuses on three main sites: Padar Island, Pink Beach, and Komodo Island, which offer different landscapes and activities for tourists. The research findings and recommendations can be generalized to other similar tourist destinations that have natural, cultural, and historical attractions, as well as transportation, accommodation, and information challenges for wheelchair users. The research can also contribute to the development of universal design and disability rights in the tourism industry.

2. METHODOLOGY

The research utilized a mixed-methodologies strategy, which included both survey methods and an assessment of the relevant previous literature. Observation, in-person interviews, and written questionnaires made up the survey's data collection methods. All the people who joined the survey and interview were asked to agree to take part in the study. They were told what the study wanted to do, how it would do it, what could happen, and what they would get from it. They were also told they could stop any time they wanted without any problem. They were given a paper that had the rules of their participation, and were asked to sign it before the data collection started. The privacy and confidentiality of the people were kept by using fake names, codes, and encryption to hide their personal information and data. No one outside the research team was told who they were, where they lived, or any other information that could identify them. The data were also put in a safe server that only the research team could access. During the observation, which took place on August 15, 2022, participants boarded a Pinishi boat in Labuan Bajo and traveled to Padar Island, Pink Beach, and Komodo Island over the course of one day. A journal and a video camera were used to capture our experiences on this trip. Interviews were conducted with a variety of individuals, including local inhabitants, boat crew members, tour guides, park rangers, and other tourists, to elicit their perspectives on accessibility difficulties and potential solutions. The questionnaire was sent out via the internet to fifteen wheelchair users who were either already in Labuan Bajo or had future plans to go there. In the survey, respondents were asked about their travel preferences, expectations, levels of satisfaction, obstacles experienced, suggestions for improvement, and whether or not they were willing to pay for accessible services. This approach was influenced by the work of Devile and Kastenholtz [14], who carried out a survey of wheelchair users in Portugal that was quite similar to the one we used.

For the purpose of the literature review, relevant sources were sought from academic journals, books, publications, websites, blogs, and other online and social media platforms. The materials were chosen because of the significance that they hold in relation to the issues of accessibility, universal design, marine and island tourism, disability rights, and the Indonesian context. The purpose of the literature review was to supply the study with theoretical background information, comparative analysis, and examples of best practices. The review of the relevant literature made use of a number of important sources, including information regarding the

organisation of all-inclusive yachts. According to Piardi [24], who applied a design for all approach on a small boat; who reported on the access design for people with disabilities at passenger boat ports in the USA; and Kastenholz et al. [16], who examined the importance of access for people with disabilities in tourist destinations, access is very important for people with disabilities in tourist destinations.

Descriptive statistics, content analysis, and SWOT analysis were utilised in the examination of the data gathered through the two different approaches [25].

- **Descriptive statistics:** This method was used to summarize the demographic characteristics, travel behaviors, and overall satisfaction levels of the wheelchair users who participated in the online survey. The frequencies, percentages, means, and standard deviations of the variables were calculated and presented in tables and charts.
- **Content analysis:** This method was used to analyze the qualitative data from the observation, interview, and literature review. The themes, patterns, and categories that emerged from the data were identified and coded accordingly. The different sources of data were also compared and contrasted and the similarities and differences were looked for.
- **SWOT analysis:** This method was used to evaluate the current situation and the proposed solutions for wheelchair users to travel in Labuan Bajo. The strengths, weaknesses, opportunities, and threats of the current situation and the proposed solutions were compared and presented in a matrix. The implications and recommendations based on the SWOT analysis were also discussed.

3. RESULT

The results and discussion are presented in four sections: (1) accessibility issues, (2) proposed solutions, (3) SWOT analysis, and (4) universal design principles.

3.1 Accessibility issues

Wheelchair users who are vacationing in Labuan Bajo will encounter accessibility challenges in the following four areas: (1) transportation; (2) accommodations; (3) attractions; and (4) information.

3.1.1 Transportation

Wheelchair users' mobility and accessibility are significantly impacted by a number of factors, one of which is transportation. Land vehicles and boats are the primary means of conveyance in Labuan Bajo's transportation system. The tour may be completed in one day and requires both land transit at the port and boat travel between the islands, as shown in Figure 1. Automobiles and motorcycles are examples of land vehicles. Pinishi boats, speedboats, and yachts are all different types of boats.

The findings of the observation and interview indicate that wheelchair users will have a positive experience travelling through the primary port of Labuan Bajo. As can be seen in Figure 2, it is equipped with wheelchair-accessible ramps, elevators, restrooms, parking spaces, and ticket counters.

However, wheelchair users were unable to participate in the one-day excursion because the Pinishi boat that was employed

was inaccessible (Figure 3). Due to the huge number of boats that dock at the port, not all Pinishi boats are able to anchor near the edge of the port. Because of this, they require the assistance of smaller boats in order to transfer people to the larger vessels (Figure 4). Nearly every large Pinishi boat has a smaller boat attached to the stern by means of a connecting rope, and this allows the smaller boat to be towed behind the larger boat (Figure 5). The principal entrance point for the speed boat to enter the Pinishi boat is through the diving area at the stern of the boat, which has a height that is relatively low in relation to the water level (Figure 4).



Figure 1. One-day trip in Labuan Bajo



Figure 2. Wheelchair users accessibility at main port

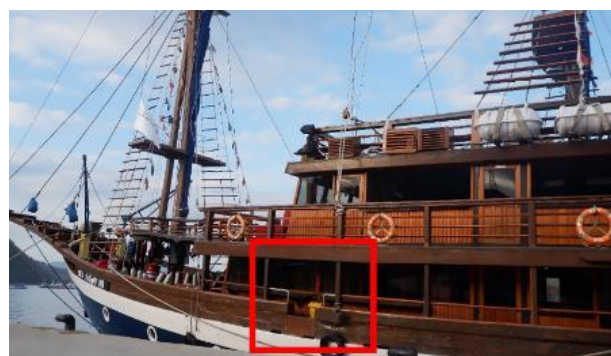


Figure 3. Entrance from side into Pinishi boat



Figure 4. Entrance to Pinishi with small boat



Figure 5. Small boat to transfer tourists

It had a number of issues, including the following:

- The boat did not have a ramp or a lift for wheelchair users to board or depart the vessel. It was necessary for the crew of the boat to manually transport the wheelchair user, which was both hazardous and uncomfortable for everyone involved (Figure 3 and Figure 6).
- The wheelchair could not be stored on the boat because there was not enough room or a safe place to put it.
- The boat did not have a wheelchair-accessible restroom or space for those who use wheelchairs. The head was located in the aft portion of the boat and had a door that was somewhat tiny (Figure 6).
- Wheelchair users have no access to any of the safety devices or emergency procedures that were offered on the boat. Wheelchair users did not have access to any life jackets, fire extinguishers, first aid kits, or evacuation plans that were designed for their specific needs.

The results of the poll showed that wheelchair users who had been to Labuan Bajo before or were planning a trip there found that transportation was one of the most challenging aspects of the city. One hundred percent of those who participated in the survey stated that it was difficult for them to locate accessible modes of transportation in Labuan Bajo. More than 85 percent of those who took the survey expressed displeasure with both the level of quality and the level of safety provided by the transportation services in Labuan Bajo.

3.1.2 Accommodation

The availability of accommodations is yet another significant component that plays a role in determining the level

of convenience and access afforded to wheelchair users. In Labuan Bajo, visitors have their choice of a variety of lodging establishments, including hotels, resorts, guesthouses, homestays, and Phinisi boats, among others. The Phinisi boats provide the accommodations for the overnight stay in Labuan Bajo that are part of the one-day excursion. The findings of the observation and interview indicated that there were a limited number of lodging options in Labuan Bajo that were suitable for wheelchair users. The majority of them may be found in either the central business district or in the area close to the primary port. They were equipped with wheelchair-accessible ramps, elevators, toilets, mattresses, and other pieces of furniture, as well as other fundamental amenities. However, they did have a few drawbacks, such as the following:

- Both the number and the kind of available lodgings were severely restricted. There were only a handful of hotels and resorts that offered rooms or services that were accessible to people using wheelchairs. There were no accommodations, including guesthouses, homestays, or the Phinisi boat, that were accessible to people using wheelchairs.
- The available lodging options were not only pricey but also frequently completely booked. Prices at hotels and resorts in Labuan Bajo that were more expensive than the city's average were increased in order to accommodate wheelchair users by providing accessible rooms and other amenities. They too had a high demand but a short supply, particularly during the busiest times of the year.

The many possibilities for lodging were neither professionally managed nor properly maintained. Some of the hotels and resorts that offered accessible rooms or amenities for wheelchair users were somewhat dated, had poor housekeeping, or were in disrepair.

According to the results of the poll, wheelchair users who had visited or were planning to visit Labuan Bajo experienced yet another significant barrier in the form of accommodations. More than 75 percent of those who participated in the survey mentioned that they had difficulty locating accessible lodging alternatives in Labuan Bajo. More than 65 percent of those who participated in the survey expressed displeasure with both the price and the quality of the accommodations that were offered in Labuan Bajo.

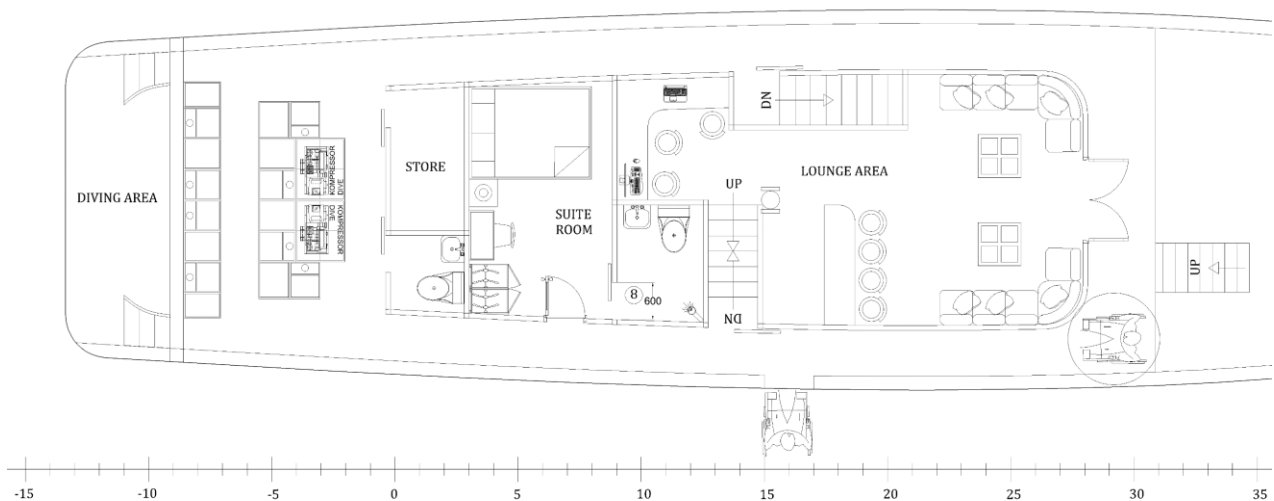


Figure 6. No accessibility for wheelchair on main deck layout

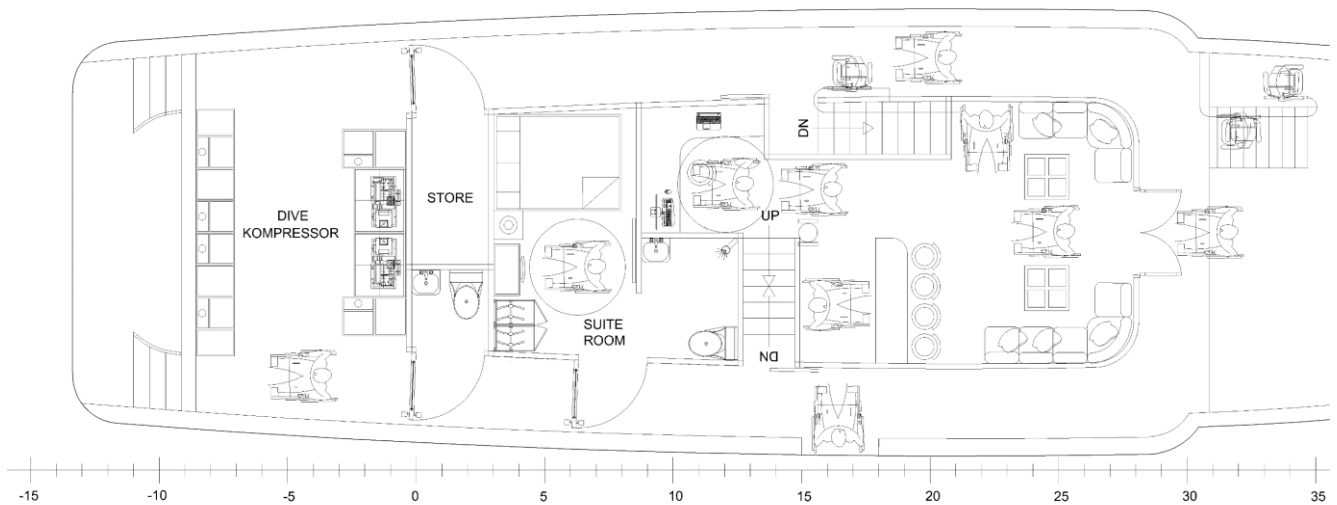


Figure 7. The redesign layout of Pinishi boat on the main deck

3.1.3 Attractions

Labuan Bajo is primarily visited by tourists because of its many interesting attractions. They comprise natural, cultural, and historical attractions that demonstrate the splendour and variety of Labuan Bajo's landscapes and inhabitants. Padar Island, Pink Beach, and Komodo Island are among the most frequented tourist destinations in this region.

Based on what was observed and heard in the interview, it became clear that none of these attractions were suitable for wheelchair users. They faced a number of challenges, including the following:

- Wheelchair users were unable to access any of the attractions since none of them had ramps, walkways, or trails that were accessible to them. The terrain could be described as rocky, sandy, uneven, or steep.
- Wheelchair users were unable to reach any of the attractions because none of them had any facilities or services that were accessible to them. There were no accessible restrooms, changing rooms, benches, or shelters, nor were there any guides who could provide assistance.
- The attractions did not have any precautions in place for wheelchair users' safety or any contingency preparations in case of an emergency.
- Wheelchair users were not provided with any signs, warnings, alarms, or rescue teams that were specifically prepared for them.

According to the results of the study, visiting Labuan Bajo with a wheelchair is most challenging and disappointing when it comes to seeing the city's attractions. More than ninety percent of those who participated in the survey stated that they were unable to access or fully appreciate the city of Labuan Bajo's many attractions. More than eighty percent of those who took the survey expressed displeasure with both the level of quality and the level of safety provided by Labuan Bajo's attractions.

3.2 Proposed solutions

The findings from the observation, interview, and questionnaire, as well as the findings from the literature review, served as the basis for the recommended solutions for wheelchair users to navigate Labuan Bajo. They can be broken down into the following four categories: (1) transportation; (2) accommodation; (3) attractions; and (4) information.

3.2.1 Transportation

Wheelchair users in Labuan Bajo have access to a variety of transportation options; nevertheless, the accessibility, quality, and safety of these options should be improved. The proposed solutions for mobility attempt to accomplish this goal. They are as follows:

- Modifying the layout of the Pinishi boat so that passengers using wheelchairs can board the vessel. It is possible to develop access for people with disabilities by modifying the deck of the existing ship (Figure 6) of the Pinishi boat such that it is accessible to people with disabilities, as shown in Figure 7. Wheelchair users ought to be able to board and depart the vessel using either a ramp or a lift. On the deck of the vessel, there should be sufficient room in addition to a safe location to access it. Additionally, the boat must be outfitted with safety gear and emergency procedures that are suitable for wheelchair users.
- Adding supplemental facilities in the form of portable cranes so that wheelchair users can be transferred from the boat to the ground and vice versa. Wheelchair users should be able to be lifted and lowered by the crane in a secure and comfortable manner. Additionally, the crane ought to be simple in both operation and upkeep.
- Increasing the quantity of accessible transportation alternatives in Labuan Bajo as well as the range of those options. Wheelchair users should have greater access to a wider variety of vehicles, including automobiles, buses, bicycles, speed boats, yachts, and ferries. Additionally, there should be an increase in the number of routes and times that are accessible to wheelchair users.
- Bringing down the cost of accessible transportation options in Labuan Bajo while simultaneously increasing the number of options that are available. Wheelchair users who employ accessible transportation choices ought to be eligible for subsidies in the form of discounts, vouchers, or price reductions. Additionally, there ought to be a greater supply of accessible transportation options and a lower demand for them, particularly during peak seasons.
- Improving the operation of accessible transportation choices in Labuan Bajo, as well as their maintenance and management, accessible modes of transportation ought to be subjected to routine maintenance, including inspections, repairs, and upgrades. A higher level of service should also be provided, which includes processes for checking in and

out that are quick and pleasant, staff members who are kind and helpful, and sufficient amenities.

3.2.2 Accommodation

Wheelchair users in Labuan Bajo have access to a variety of lodging options, but not all of them are of a high enough standard or are within their price range. The proposed solutions for accommodation try to address these issues. They are as follows:

- Increasing the quantity of accessible lodging alternatives in Labuan Bajo as well as the variety of those options. It would be beneficial for there to be a greater number of hotels, resorts, guesthouses, homestays, hostels, and camping grounds that are equipped with rooms or facilities that are accessible for wheelchair users. There should also be a greater number of locations that provide accessible housing options, such as those in close proximity to the points of interest or further away from the heart of the town.
- Lowering the cost of accessible lodging options in Labuan Bajo while simultaneously expanding the number of those that are available. Wheelchair users who make use of accessible lodging choices ought to be eligible for financial assistance in the form of vouchers, discounts, or subsidies. Additionally, there ought to be a greater supply of accessible lodging options and a lower demand for those options, particularly during high seasons.
- Efforts will be made to improve the upkeep and management of accessible lodging choices in Labuan Bajo. Inspections, repairs, and improvements are to be performed on a routine basis on the various accessible accommodation alternatives. In addition to that, the quality of the service should be improved, it should be easy to check in and check out, the staff should be kind and helpful, and the amenities should be sufficient.

3.2.3 Attractions

Wheelchair users in Labuan Bajo will benefit from the accessibility, quality, and safety improvements that would result from the implementation of the recommended solutions for the city's attractions. They are as follows:

- Adding more wheelchair trailrider facilities so that people who use wheelchairs can reach the attractions on Padar Island, Pink Beach, and Komodo Island and still have a good time there. Figure 7, Figure 8, and Figure 9 illustrate the trailrider, which is a specially built wheelchair that can be pushed or dragged by one or more aides over rugged terrain. Figure 7 illustrates the trailrider. Figure 8, and Figure 9 show the trailrider in action. It is expected of the trailrider that they will be able to traverse the wooded area on Komodo Island, walk along the sandy beach at Pink Beach, and ascend the hills on Padar Island.
- Constructing wheelchair-accessible ramps, walkways, and trails at the attractions located on Padar Island, Pink Beach, and Komodo Island. It is important that the ramps, paths, or trails be uniform, smooth, flat, or have a gradual slope.
- Making all of the attractions on Padar Island, Pink Beach, and Komodo Island accessible to those who use wheelchairs, including providing accessible facilities and services. It is imperative that there be accessible restrooms, locker rooms, changing areas, benches, and shelters, as well as tour guides.
- It is important for the tourist destinations on Padar Island, Pink Beach, and Komodo Island to have safety precautions and emergency action plans in place for wheelchair users. Wheelchair users ought to have access to prepared rescue

teams, as well as warning signs, alarms, and other safety measures.

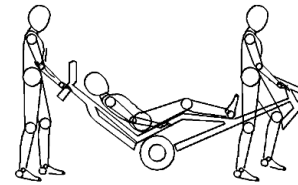


Figure 8. Trail rider wheelchair

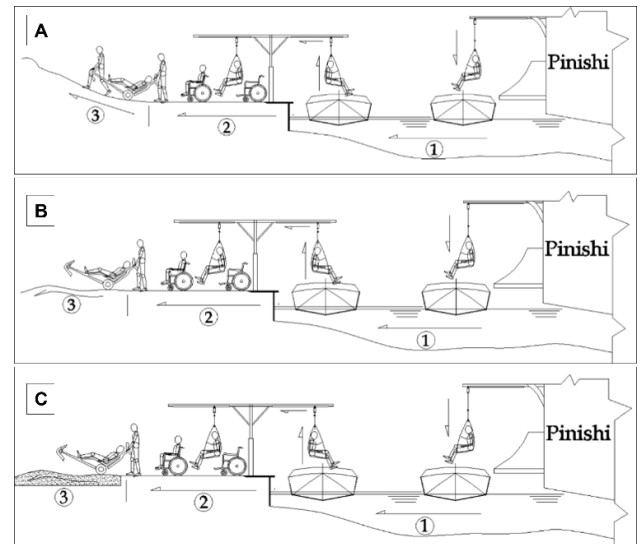


Figure 9. Solution idea accessibility of wheelchair user: (A) Padar Island; (B) Komodo Island; and (C) Pink Beach

The "Golem project" [26] was established by the University of Brescia, and it was responsible for the design and construction of the trail wheelchair prototype. The design and modeling phase with the device's dynamic characteristics and suspension system has reached its conclusion at this point. Testing of the prototype is currently under place, which will be followed by validation and testing of the new solution in the field with users [27].

3.2.4 Information

The informational solutions that have been suggested for Labuan Bajo residents who use wheelchairs have the goals of increasing the information's accessibility, precision, and utility in their daily lives. to name a few:

- Developing a mobile application or website that, in a thorough and up-to-date manner, provides information regarding the accessibility of Labuan Bajo for people who use wheelchairs. Wheelchair users should be able to access information on the website or app that details accessible modes of transportation, lodging options, points of interest, and other services. Additionally, evaluations, ratings, and feedback from other wheelchair users who have travelled to Labuan Bajo should be included on the website or in the mobile application.
- Distributing pamphlets, maps, or guides that include information that is pertinent and dependable regarding the accessibility of Labuan Bajo for people who use wheelchairs. It is important that the pamphlets, maps, or guides be offered in a variety of languages and media, such as print, digital, audio, or visual. It is also important to

disseminate brochures, maps, or guides in a variety of locations, including airports, ports, hotels, resorts, attractions, and information centers for tourists.

- Providing training to personnel, crew, guides, rangers, or residents so that they can provide accurate and helpful information to wheelchair users regarding the accessibility of Labuan Bajo. Wheelchair users should have their requirements and preferences taken into consideration by the personnel, crew, guides, and rangers, as well as locals. They should also have the ability to communicate clearly and politely with individuals who use wheelchairs.

3.3 SWOT analysis

Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is a method that examines the positives and negatives of a situation or a potential solution. The results of a SWOT analysis of the suggested solutions for wheelchair users to get around in Labuan Bajo are shown in Table 1.

Table 1. SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Improve the accessibility, quality, safety, and satisfaction of wheelchair users in Labuan Bajo ▪ Promote universal design principles and disability rights in Labuan Bajo ▪ Increase the number and diversity of tourists and tourism activities in Labuan Bajo 	<ul style="list-style-type: none"> ▪ Require high costs, resources, time, and expertise to implement ▪ Face technical, environmental, social, or cultural challenges or barriers ▪ Depend on the cooperation and coordination of various stakeholders and sectors
Opportunities	Threats
<ul style="list-style-type: none"> ▪ Enhance the image and reputation of Labuan Bajo as an accessible and inclusive tourist destination ▪ Boost the economy and development of Labuan Bajo and its surrounding areas ▪ Inspire other tourist destinations in Indonesia and beyond to adopt universal design principles and improve accessibility for wheelchair users 	<ul style="list-style-type: none"> ▪ Compete with other tourist destinations that offer similar or better accessibility for wheelchair users ▪ Damage the environment and ecology of Labuan Bajo and its surrounding areas ▪ Encounter legal, political, or ethical issues or conflicts

3.4 Universal design principles

According to Ibem et al. [28], the ideas of universal design are becoming increasingly popular and are being implemented in a variety of design professions. Some of these fields include architecture, product design, web design, and education. These principles of universal design served as the foundation for the solutions that were offered to make it possible for wheelchair users to move around in Labuan Bajo. They have the goal of making Labuan Bajo more accessible, useable, and pleasurable for tourists who use wheelchairs, in addition to tourists who have a variety of other abilities. The following are some instances of these potential solutions:

- Equitable use: providing ramps, lifts, and accessible toilets at ships, hotels, restaurants, shops, and tourist attractions.
- Flexibility in use: offering different modes of transportation, such as wheelchair-friendly buses, boats, taxis, or bikes.
- Simple and intuitive use: using clear and consistent signage, maps, and information systems to guide visitors.

- Perceptible information: providing audio guides, tactile models, or braille labels at museums and cultural sites.
- Tolerance for error: installing handrails, guardrails, or safety nets along pathways or bridges.
- Low physical effort: reducing the distance or slope between destinations or attractions.
- Size and space for approach and use: ensuring enough space for wheelchair maneuvering and turning at entrances, exits, corridors, or seating areas.

One of the critical problems that calls for increased focus in the travel and tourism business is the accessibility of tourist destinations for people with disabilities. There are a lot of tourist attractions that are difficult to access for disabled people, particularly wheelchair users. These include places that are associated with nature and islands. This not only leads to prejudice and social marginalization but also restricts the opportunities and experiences available to disabled people in the tourism industry [29]. Therefore, research and development are needed to improve the accessibility and inclusiveness of tourist destinations for the disabled, using the principles of universal design. Universal design is a design approach that aims to create products, environments, programs, and services that can be used by everyone without requiring adaptation or special. Some studies have been conducted to analyze and evaluate the accessibility of tourist destinations for disabled people in various countries, such as China [30, 31]; and provide feasible solutions to improve accessibility, such as redesigning boats [30], providing portable crane facilities [31], and providing trailrider wheelchair facilities. These studies can provide insight and inspiration for your research on universal design for marine and island tourism in Labuan Bajo, Indonesia.

Universal design is a concept that aims to create accessible and usable solutions for all people. However, applying universal design in developing countries is challenging due to: lack of awareness and knowledge about the needs and preferences of wheelchair users [32]; lack of resources and infrastructure to support the development and maintenance of assistive devices, such as wheelchairs [33]; lack of accessibility and inclusivity in the built environment; and lack of social acceptance and empowerment of people with disabilities [34, 35]. To overcome these challenges, some possible strategies are: promoting a human-centered and participatory design approach [33]; developing appropriate and affordable assistive technology [33]; improving the accessibility and inclusivity of the built environment; and enhancing the social acceptance and empowerment of people with disabilities [34, 35].

Universal design is a concept that aims to create products and environments that are usable by all people, regardless of their abilities, age, gender, culture, or preferences. It can improve the accessibility, quality, safety, and satisfaction of tourism experiences for people with disabilities and others. However, implementing universal design in developing countries, such as Labuan Bajo or Indonesia, can face various challenges, such as:

- The lack of awareness and knowledge about the needs and preferences of people with disabilities among the tourism stakeholders.
- The lack of skills and resources to apply universal design principles and practices in the tourism industry.
- The lack of standards and regulations to guide and enforce the implementation of universal design in the tourism sector.

- The lack of incentives and participation to encourage and involve the tourism stakeholders in the development and improvement of universal design in the tourism industry.

These challenges can be addressed by adopting a holistic and participatory approach to universal design, which considers the social, economic, environmental, and cultural aspects of tourism development, and involves the active and meaningful engagement of all the tourism stakeholders, especially the people with disabilities, in the process of planning, designing, implementing, and evaluating universal design in the tourism industry.

This study has proposed some solutions for improving the accessibility and inclusiveness of tourism products and services for wheelchair users in Labuan Bajo, Indonesia. However, further research is needed to test and evaluate the feasibility, effectiveness, efficiency, and sustainability of these solutions in the real context. Future work can also explore how these solutions can be adapted and applied to other tourist destinations that have similar or different characteristics, such as geography, climate, culture, and infrastructure. Moreover, future work can investigate how to enhance the participation and empowerment of people with disabilities and other stakeholders in the planning, design, implementation, and evaluation of accessible tourism products and services. Additionally, future work can examine how to improve the awareness and education of the tourism industry and society regarding the needs and rights of people with disabilities and the benefits of universal design. Furthermore, future work can develop and enforce the policy and regulation of the tourism sector to support and promote the accessibility and inclusiveness of tourist destinations for people with disabilities and others.

4. CONCLUSIONS

The primary port of Labuan Bajo is accessible for wheelchair users, but the islands' tourist spots are not. This research proposes practical and innovative solutions to enhance safety and security for wheelchair users in the marine tourism area of Labuan Bajo, Indonesia. These solutions include redesigning the Pinishi boat for wheelchair access, providing portable cranes and trailrider facilities, constructing ramps, walkways, and trails at attractions, developing a mobile app, website, brochures, maps, and guides with comprehensive and up-to-date information about Labuan Bajo's wheelchair accessibility, and adhering to the principles of universal design and disability rights. Further elaboration and implementation of these solutions are necessary, such as acquiring and operating assistive devices and technologies, evaluating and monitoring the effectiveness and sustainability of accessible tourism products and services, and cooperating and coordinating with various stakeholders and sectors. The SWOT analysis indicates that the proposed solutions can make Labuan Bajo more accessible, safe, and satisfying for all. However, these solutions also present challenges, such as high costs, technical difficulties, environmental impacts, and social or cultural barriers. Therefore, consideration of legal, political, and ethical issues is needed, as well as the involvement and empowerment of the local community and all tourists. The proposed solutions adhere to the principles of universal design, aiming to create products, environments, programs, and services usable by everyone without requiring adaptation or

special design. These solutions provide equal and flexible access to transportation, accommodation, attractions, and information in Labuan Bajo. They also simplify the use of these services, reduce physical effort and the risk of error, and ensure enough size and space for all to approach and use the facilities and amenities in Labuan Bajo. This project suggests some solutions to make Labuan Bajo more accessible and inclusive for all tourists. However, more work is needed to improve these solutions, such as conducting more studies with all stakeholders to test the feasibility, effectiveness, and impact of the solutions, applying standards, guidelines, and regulations for universal design and disability rights in marine and island tourism in Indonesia and beyond, and using and combining other innovative technologies, such as virtual reality, artificial intelligence, or smart devices, to improve the accessibility and experience of all tourists in Labuan Bajo.

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