



Original Article

Reimagining Urban Public Spaces through Human-Centered Spatial Design in Growing Coastal Cities

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Abstract:

The rapid growth of the coastal area of Manado City, especially in the Malalayang Beachfront and Boulevard Area, raises an urgent need to redesign public spaces that are more inclusive, adaptive, and in accordance with the dynamics of the rapidly changing coastal environment. Public spaces in these two areas have a high intensity of activity and are undergoing various revitalization processes so that they demand a design approach that is centered on user experience and needs. This study aims to formulate a model of redesigning coastal public spaces based on human-centered spatial design by examining space use patterns, user needs, and spatial characteristics that affect the quality of spatial experience. Using a Design-Based Research approach combined with Human-Centered Design, this study involves observation of user behavior in coastal public spaces as well as semi-structured interviews with a number of informants representing space users, business actors, area managers, and related stakeholders. Data are analyzed through thematic reduction and spatial mapping to identify key design issues and opportunities. The results of the study show that the quality of public space in Malalayang and the Boulevard Area is influenced by the connectivity of pedestrian paths, the comfort of the microclimate, the intensity of social activities, and the capacity of space in responding to coastal ecological conditions. The design findings affirm the importance of the integration of shaded spaces, experiential pedestrian path configurations, easily accessible social interaction areas, and adaptive elements that support coastal resilience. This study concludes that the DBR and HCD approaches are able to produce more responsive, inclusive, and sustainable coastal public space design, and make an important contribution to the development of coastal urban design theory and public spatial planning practices in growing coastal areas.

Keywords: Reimagining, Urban Public Spaces, Human-Centered, Spatial Design, Coastal Cities.

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Introduction

The growth of coastal areas in various cities around the world presents new challenges in the arrangement of public spaces, especially in areas that experience increased economic activity, tourism, and population mobility. Coastal cities such as Manado are facing rapid development pressures so that public spaces along the Malalayang Beachfront and Boulevard Area have undergone intensive changes in recent years. Globally, the dynamics of coastal change are also influenced by urbanization, rising temperatures, and ecological pressures that demand the design of public spaces that are adaptive, inclusive, and responsive to the needs of users (Tu et al., 2022). Recent research shows that the quality of public spaces contributes greatly to the comfort of the microclimate, social interaction, and psychological health of urban communities (Boumaraf & Amireche, 2021). In this context, the need to redesign coastal public spaces is becoming increasingly urgent, especially in areas that are undergoing massive revitalization such as Malalayang and Manado Boulevard.

On a global scale, the development of human-centered spatial design has become a strategic approach in answering the challenges of coastal urbanization (Alharbi, 2025). This design model emphasizes the importance of empathy, spatial experience, and user involvement in the design process to produce more meaningful and inclusive public spaces. International research confirms that design of public spaces that prioritize user experience can improve a sense of belonging, social interaction, and sustainability of user behavior in utilizing space (Yaralioglu & Kara, 2024). However, coastal areas have unique characteristics, such as exposure to sea winds, abrasion risks, and fluctuations in tourist activities, so they require a design approach that is not only human-centered but also adaptive to coastal ecological dynamics. Therefore, the integration of human-centered design principles with ecological sensitivity is a critical need in the context of growing coastal cities.

Locally, rapid changes in the coastal area of Manado City have caused problems of the quality of public spaces that are increasingly complex. High tourist activities at Malalayang Beachfront, for example, cause space density, disruption of pedestrian comfort, and decrease in the quality of social interaction due to the pressure of the flow of visitors. On the other hand, the Boulevard Area, which is the center of the economy and entertainment, has experienced an increase in mobility, which raises the need for a more organized and inclusive public interaction space. Local studies show that users of coastal public spaces have diverse needs, ranging from microclimate comfort, good accessibility, adequate shaded areas, to spaces that support social interaction across groups (Pang et al., 2025). This condition confirms the need for a model of redesigning public spaces that not only provides aesthetics, but also improves the quality of the space experience for all users.

Although the study of public space has grown rapidly, there is a significant research gap regarding human-centered spatial design approaches specifically in fast-growing coastal areas. Previous research has focused more on revitalizing public spaces from an infrastructure or aesthetic perspective without integrating the user experience in depth. In addition, some studies on coastal areas emphasize more disaster mitigation and ecological adaptation, but less explore aspects of user interaction in everyday space experiences (Ghani & Hidayati, 2024). Global research on human-centered design has also been mostly conducted in non-coastal metropolitan cities, so its relevance to coastal contexts is still limited. The absence of studies that combine the Design-Based Research approach with Human-Centered Design in the redesign of coastal public spaces shows that there is a theoretical and methodological gap that needs to be bridged. This is the fundamental

reason for the importance of this research being conducted.

Based on these gaps, this study aims to formulate a model for redesigning coastal public spaces in Malalayang Beachfront and Boulevard Area based on the principle of human-centered spatial design. This study seeks to analyze space usage patterns, user needs, and spatial characteristics that affect the quality of space experience in order to produce more responsive, inclusive, and adaptive design recommendations. By integrating user behavior observations and interviews with stakeholders, the study provides an empirical foundation for the development of participatory design processes based on real experience in the field.

Methodologically, this study applies a Design-Based Research approach combined with Human-Centered Design to explore the design problem of public spaces in depth and iteratively. This approach allows researchers to directly identify design barriers and opportunities found in the context of coastal public space use. This method also provides space for the exploration of spatial characters such as pedestrian connectivity, microclimate comfort, dynamics of social activities, and the ability of space to adapt to coastal environmental conditions. Various data collection methods, such as user behavior observation and semi-structured interviews, are used to gain a comprehensive understanding of user needs and experiences.

Theoretically, this research makes an important contribution to the development of urban design studies, especially in the context of growing coastal cities. The research findings have the potential to enrich the human-centered design theory by including the ecological dimension of the coast as an integral part of the design of public spaces. In addition, this study also expands the discussion on the relationship between spatial experience, spatial quality, and socio-ecological sustainability in coastal urban areas. The integration between Design-Based Research and Human-Centered Design in the context of coastal public spaces can be a relevant new approach for advanced research.

From a practical perspective, this research provides direct benefits for local governments, urban planners, and coastal area managers. The resulting design recommendations can be used as guidelines to design coastal public spaces that are more inclusive, comfortable, and responsive to environmental changes. In addition, the results of this study can be a reference for the revitalization process of public spaces in other coastal areas in Indonesia that face similar challenges. By improving the quality of user experience and adaptive capacity of the space, the resulting design will support the creation of a more resilient and sustainable coastal environment.

Methods

Types, Approaches, and Research Design

This research uses a qualitative approach with Design-Based Research (DBR) design combined with Human-Centered Design (HCD) ([Satyagraha et al., 2025](#)). The DBR approach is used because it is able to produce design solutions that are tested iteratively through the cycle of problem identification, design, implementation, and evaluation based on real contexts. Integration with HCD allows the research process to put user needs, experiences, and behaviors as the basis for design decision-making. The combination of these two approaches has proven effective for research focused on designing public spaces, especially in dynamic and complex coastal areas.

Research Location, Population, and Sampling Techniques

The research was carried out in the Malalayang Beachfront and Boulevard Area of Manado City, two coastal areas that experience high growth in tourism, trade, and mobility activities. The research population consists of public space users, local business actors, as well

as regional managers and stakeholders. The sampling technique uses purposive sampling to select participants who understand the dynamics of coastal public space use ([Nyimbili & Nyimbili, 2024](#)). The number of participants was not determined in bulk, but was considered based on the principle of information-rich cases, which is about 8 participants that were considered sufficient to achieve data saturation without exaggeration. The composition of participants includes three public space users representing regular users, tourists, and families, two business actors consisting of MSME managers and owners of cafes or entertainment venues, two area managers from related agencies and operational parties, and one extra stakeholder from local communities or public space activists.

Data Collection Techniques and Instruments

Data was collected through three main techniques, namely user behavior observation, semi-structured interviews, and spatial documentation. Observations were carried out to identify activity patterns, movement flows, and the quality of space experiences directly in the field, using observation sheets based on indicators of public space activity. Semi-structured interviews were conducted to explore user perceptions, needs, and experiences, using interview guidelines compiled based on HCD principles of empathy, behavior, and barriers to space use. Documentation in the form of photographs, videos, and spatial records is used to support the mapping of physical conditions and spatial characteristics. Data validity is strengthened by triangulation of sources and methods to ensure consistency of information ([Meydan & Akkas, 2024](#)).

Research Procedure

The research procedure follows the stages of DBR which is integrated with the principles of HCD, starting from:

- a. Identify problems through initial observation and interviews to understand the needs of users and coastal public space issues;
- b. Co-design and initial design, namely the preparation of design prototypes based on field findings and human-centered spatial design principles;
- c. Prototype trials in the field, in the form of movement flow simulation, spatial experience evaluation, and microclimate comfort assessment;
- d. Reflection and revision, i.e. making design improvements based on user and stakeholder feedback;
- e. Finalizing the design model, in the form of formulating recommendations for the design of inclusive and adaptive coastal public spaces. The structure of this procedure follows an iterative model widely used in contemporary urban design research (Wang et al., 2023).

Data Analysis Techniques

Data analysis was carried out through thematic analysis to identify patterns, categories, and themes that emerged from interviews and observations ([Naeem et al., 2023](#)). The process includes transcription, open coding, categorization, and thematic theme formation. For spatial data, behavioral mapping and spatial pattern analysis are used to map the relationship between user activity and spatial character. The analysis is carried out with the support of software such as NVivo 14 for qualitative data processing and QGIS for spatial mapping ([Barrantes-Chaves, 2025](#)).

Results

1. Pedestrian Lane Connectivity and User Movement Patterns

Spatial analysis revealed that pedestrian paths in the two areas have not been fully connected continuously, especially at the transition points between the culinary, beachfront, and public seating areas. Observations show a fragmented movement pattern, where users have to change trajectories due to physical obstacles such as semi-permanent stalls, non-uniform path surfaces, and pedestrian-friendly crossing points. The most

widely used pedestrian paths are seen in areas that have open ocean views and seating facilities, signaling a strong relationship between visual access and path preference.

The interviews support these findings, especially regarding the need for a more intuitive and barrier-free path. A regular user stated: *"If the road is here, it often has to make a detour because many parts of the sidewalk are cut off. So you can't take a leisurely walk from end to end."* (R, interview August 12, 2025). Travellers show more exploratory usage patterns but still face discomfort on uneven paths: *"We wanted to enjoy the view while walking, but the path sometimes went up and down and made it uncomfortable."* (W, interview August 14, 2025). Business actors assess that the connectivity of the line affects the flow of visitors to their stalls: *"If the path is neat and connected, people will walk longer, and they will automatically stop by our place."* (U, interview August 18, 2025).

Meanwhile, the area manager emphasized the limitations of the existing design: *"We are aware that the connectivity of the line has not been maximized. This is the focus of improvement so that the flow of visitors is more organized."* (D, interview August 20, 2025). These findings confirm the importance of experiential path configuration and consistent visual guidance so that user movement patterns are smoother and in accordance with human-centered spatial design principles.

2. Microclimate Comfort and Availability of Shaded Space

Spatial documentation and field observations show that most open areas at both locations have direct exposure to solar radiation and sea winds, particularly in the daylight to evening time range. Areas that have natural shade elements such as trees or artificial canopies tend to be used more intensively for sitting, gathering, and viewing activities.

Family users state that the lack of shade makes the length of stay shorter: *"During the day, it is too hot. We usually just take pictures for a while, then immediately look for a shadier place."* (K, interview August 16, 2025). The owner of a café in the Boulevard area also emphasized the importance of microclimate comfort: *"In the afternoon, it is crowded. During the day people are reluctant to sit because of the heat, so that shade element is very important."* (C, interview August 11, 2025).

The operational manager acknowledges that microclimatic conditions affect user behavior: *"The highest activity is in the afternoon. The morning is still okay, but the afternoon is really hot because the sea breeze brings heat to the road area."* (O, interview August 19, 2025). Public space activists add a coastal environmental perspective: *"Shade space is not only about comfort, but also maintaining surface temperature so as not to degrade the quality of coastal ecosystems."* (A, interview August 22, 2025). This data confirms that the comfort of the microclimate is an important factor in the design of coastal public spaces and needs intervention in the form of adaptive shade that blends with the character of the area.

3. Social Activity Intensity and Space User Preferences

The observation results showed that the most dominant social activities occurred at points that provided interaction facilities such as beachfront chairs, communal sitting spaces, or culinary areas. The activity map shows that the Malalayang side has a concentration of family and tourist activities, while the Boulevard is more dominated by youth group movements and recreational activities.

Regular users state that interaction spaces are essential for building a community atmosphere: *"The seats by the beach are always full. People like to chat, take pictures, and just sit and enjoy the breeze."* (R, interview August 12, 2025). Travelers emphasize the need for an easily accessible interaction space: *"We like places where you can sit and see the sea. If it's far from the track, it's usually not in high demand."* (W, interview August 14, 2025).

Business actors see the link between the interaction space and the local economic turnaround: *"If there is a comfortable interaction area, people stay longer and buy more food or drinks."* (U, interview August 18, 2025). The area manager emphasized the

importance of an equitable distribution of interaction spaces: *"Some points are too crowded, while others are empty. We need to balance the distribution of activities."* (D, interview August 20, 2025). These findings show that the intensity of social activities is influenced by the accessibility of interaction spaces, physical comfort, and the quality of space experiences.

4. Space Capacity in Response to Coastal Ecological Conditions

Through documentation and spatial mapping, it was found that some elements of public space are not fully adaptive to coastal ecological dynamics such as tidal waves, strong winds, and the risk of abrasion. Some seating areas experience inundation when sea water rises, while the surface of certain paths is eroded by fine grains of sand due to sea winds.

Family users expressed concern over this condition: *"Sometimes when the water rises, the floor near the sea becomes wet and a bit slippery."* (K, interview August 16, 2025). The café owner also acknowledges the ecological challenge: *"When the wind is strong, the outside area is usually empty because of the dust and sand flying around."* (C, interview August 11, 2025).

The operational manager provides a technical overview of field constraints: *"Some of the points are prone to flooding, and this requires an adaptive structure to be safe and not damage the facility."* (O, interview August 19, 2025). Public space activists emphasize the urgency of adaptive design: *"Coastal public spaces must be able to adapt to sea changes. Otherwise, users don't feel safe and the environment deteriorates quickly."* (A, interview August 22, 2025). These findings confirm the importance of adaptive design elements such as corrosion-resistant materials, flexible elevation, and layouts that take into account coastal ecological rhythms.

Discussion

The results of the study that the connectivity of pedestrian paths greatly affect the movement patterns and user experience in Malalayang Beachfront and Boulevard Area is in line with the design theory of public space which emphasizes accessibility as an important aspect of walkability and space utilization ([Mezoued et al., 2022](#)). In local and international studies, intuitive and well-connected pedestrian path design has been shown to strengthen social interaction and increase user length of stay. However, in the context of the Manado coast, physical obstacles such as stalls and uneven surfaces lead to the fragmentation of paths that hinder the experience of leisurely walking. This reflects the practical challenges of applying human-based design principles, where existing physical structures have not yet fully supported the user experience as suggested by the literature. Consequently, the redesign model needs to redesign pedestrian paths by paying attention to visual connectivity and incremental mobility to conform to the principles of human-centered spatial design and strengthen the user's sense of ownership of coastal public spaces.

Findings related to the comfort of the microclimate and the need for shade space show that exposure to sunlight and sea breeze is a major obstacle to user comfort, especially during the day. This is consistent with the results of the study [Wu & Wu, \(2024\)](#), which suggests that the arrangement of vegetation and shade elements on pedestrian walkways can greatly improve thermal comfort. This factor also reflects the importance of ecological aspects in the design of public spaces, where vegetative elements such as trees and canopies are not just aesthetics, but climate adaptation strategies. In addition, other pedestrian-scale microclimate studies have shown that curbside trees can lower the temperature of radiation perceived by pedestrians ([Sang et al., 2025](#)). A consequence of these findings is that coastal public space design models must incorporate microclimate

strategies through natural or structural shade in order to increase comfort and encourage the use of public spaces throughout the day.

Findings on the intensity of social activities and the distribution of spatial interactions revealed that interaction points such as beachfront chairs, communal sitting areas, and culinary areas were the center of activity. It supports the concept of "proximity, flexibility, and diversification" in healthy and decent public spaces, emphasizing that public spaces should be designed to be diverse, accessible, and adaptive to a wide range of activities ([Sep, 2025](#)). Social activities concentrated at a particular point are also consistent with the space activation literature, where interaction-friendly design encourages community engagement and social interaction ([Chen & Kang, 2023](#)). However, the uneven distribution between solid and empty points signals the need for redesign to make the distribution of interaction spaces more equitable and inclusive. The consequence for the development of the theory is that experience-based design (HCD) must consider the spatial distribution of interactions as a key element in the design model of coastal public spaces.

The finding that spatial capacity is not yet fully responsive to coastal ecological dynamics such as seawater inundation and sand dust suggests that current design elements are not yet sufficiently adaptive. From the perspective of coastal city theory and climate resilience, it confirms the importance of adaptive design approaches that take into account ecological rhythms such as tides and ocean winds ([Tiwari et al., 2022; Li & Kahn Jr, 2025](#)). Studies of the adaptation of public spaces to climate change show that the use of corrosion-resistant materials, flexible elevation, and adaptive layouts are essential to maintain the function of spaces during extreme conditions ([Tiwari et al., 2022; Gao, 2025](#)). These findings contribute practically: the proposed design model must incorporate adaptive elements to keep coastal public spaces safe, functional, and attractive even in the face of ecological fluctuations.

An in-depth analysis of these results also highlights that human-centered spatial design approaches are highly effective in uncovering user needs that may be missed in traditional top-down design schemes. Through interviews and observations, the findings show that users are not only concerned about aesthetics and function, but also about climate comfort and social interaction, something that rarely comes up in conventional coastal planning studies. It supports the public design DBR literature that affirms that the active participation of users in the co-design phase results in more relevant and sustainable solutions ([Stefaniak et al., 2025](#)). The theoretical contribution of this study is to strengthen the argument that coastal spatial design should be participatory and adaptive, not just mitigating to climate risks.

Supporting factors for the results of this study include the involvement of local stakeholders (business actors, area managers, communities), which provides practical and in-depth insights into the issues on the ground. Their participation in DBR allows for more contextual and locally accepted iterations of design prototypes. However, there are also conflict factors such as limited physical space, zoning regulations, and resistance to change from some stakeholders who are accustomed to existing activity patterns. This difference of view marks a common challenge in urban design research, where ideal theories are not always easy to apply in local political and social realities.

This research also has limitations. First, the number of participants is relatively small (8 people) so it may not represent the entire spectrum of public space users in both regions. Second, design prototype tests are carried out on a limited scale and a short period of time, so it has not been able to test long-term resistance to extreme ecological conditions

such as storms or high tides. Third, the use of spatial analysis is more descriptive than quantitative microclimate (e.g., thermal simulation or mapping of thermal comfort indexes). For advanced research, it is recommended to expand the participant sample, conduct microclimate simulations with software such as ENVI-met, and apply design prototypes in long-term studies to evaluate the adaptability and sustainability of the design.

Overall, this research makes a significant contribution to the development of urban architecture and coastal public space planning by presenting a design model that integrates human-centered spatial design and ecological adaptation. The findings and recommendations can be used as a guideline for policymakers, city planners, and local communities in designing coastal public spaces that are more resilient, inclusive, and in line with human needs. This research paves the way for further studies that consider the dimensions of climate and participatory in more depth in public design, as well as encourage cross-disciplinary collaboration between planners, users, and climate scientists.

Conclusion

This study confirms that the quality of coastal public space in the Malayang Beachfront and Boulevard Area is greatly influenced by four main determinants, namely the connectivity of pedestrian paths, microclimate comfort, intensity of social activities, and the adaptive capacity of space to coastal ecological dynamics. Through a Design-Based Research approach combined with Human-Centered Design, the findings show that user experience is not only determined by the visual aspects and physical functions of the space, but also by the ability of public spaces to respond to local climatic conditions, the rhythm of community activities, and overall spatial accessibility. These findings confirm that human-centered public space design is able to uncover needs and barriers that are not always apparent in conventional planning approaches, as well as generate a deeper understanding of the fit of public spaces with everyday user behavior.

Theoretically and practically, this study concludes that the integration of DBR and HCD approaches is able to produce a more responsive, inclusive, adaptive, and sustainable coastal public space design model. The recommended design model emphasizes the importance of providing shade space as a strategy to improve thermal comfort, redesign of pedestrian paths based on user experience, creation of equitable social interaction points, and the application of adaptive elements that are in harmony with coastal ecological dynamics. These findings make an important contribution to the development of human-oriented coastal city design theory and become a practical reference for city governments, planners, and stakeholders in revitalizing public spaces in growing coastal areas. Further research is recommended to test this design model in long-term implementation and evaluate its effectiveness in dealing with climate change and the socio-economic transformation of coastal areas.

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