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Mapping Social Behavior of Suku Laut Communities in Traditional Coastal Settlements Landscape Element on Mainland Batam

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Abstract

Sustainable future development is expected to support the creation of human welfare throughout the world, including traditional tribes and minorities. This research examines the phenomenon of a traditional tribe, namely the Sea Tribe or Suku Laut, which represents maritime communities on the mainland of Batam, Riau Islands, Indonesia, which requires special attention during industrial development and modernization which has an impact on the sustainability of Suku Laut traditional coastal settlements. This research utilizes participant observation methods to analyze the social behavior map of the Suku Laut community. This study found that community behavior maps influence spatial formation and settlement patterns. In conclusion, social behavior mapping provides benefits for the government in planning and managing traditional coastal settlements on the Batam mainland for future development in accordance with the social behavior and local wisdom of the Suku Laut community.

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1. Introduction

Sustainable Development Goals (SDGs) were established by the United Nations General Assembly in 2015 and are intended to be achieved by 2030 as a development framework for achieving a sustainable future to ensure human welfare, economic prosperity, and environmental protection (Pradhan et al., 2000). It is anticipated that the development can contribute to the welfare of human life in social development. This is especially those traditional ethnic minorities who are rarely considered and stigmatized because of their ethnicity. Welfare and prosperity are intended for all human beings in the world. They are not only measured by physical development growth without paying attention to the human side of humans as living individuals who feel the impact of change. Humans are both part of and in the center of the environment. Human behavior toward the environment primarily results from the desire to interact with the environment and control it to benefit life (Berkowitz, 2004; Effendi et al., 2017; Rapoport, 1983). The

identification of the behavior or attributes of the community by adopting behavior mapping to trace the behavioral pattern.

Behavior mapping is elucidated as a diagram of an area where humans carry out various activities to obtain information or identify individual and group movement patterns and behavior in an environment (Haryadi & Setiawan, 1995; Ratodi, 2017). Moreover, behavior mapping will help to access behavioral activities through physical activities in social communities. This research is exploratory, where this research seeks to understand the mapping of social behavior in traditional coastal settlements, with a focus on settlement landscape elements. This research is important because there are rarely studies that look holistically at the interactions between traditional coastal communities and the physical environment in which they live. This understanding provides better insight into how patterns of social behavior are formed and maintained in unique cultural contexts and natural environments.

In terms of geography, Indonesia is an archipelago, with two-thirds of its land area covered by water. According to the Juanda Declaration, Indonesia is an archipelagic state dotted with islands as its main territory (Effendi et al., 2017). There are approximately 9,261 coastal villages or traditional coastal settlements in Indonesia, which comprise 67,439 villages (Trisniawati, 2015). The history of coastal settlements in Batam stems from the native inhabitants of the Riau Islands, known as the Suku Laut, whose lives depend on the sea and who live as traditional fishermen. In the past, the Suku Laut community lived as nomads on canoes or *sampan berkajang* (seen Figure 1) and wandered the sea by forming clans; they only visited the land to stop by for water (Lenhart, 1997; Rahmat et al., 2021).

Figure 1. Suku Laut community in Riau Islands, source: Indonesian Ministry of Maritime Affairs & Fisheries, 2019

In the 1990s, the life culture of Suku Laut changed, and they settled on the coast, forming a coastal settlement due to the Batam development program (Yulia, 2016). Today, Suku Laut has settled in a coastal settlement known as Kampung Tua. This is an indigenous coastal settlement where houses are built on stilts above sea level with a linear pattern following the coastline. The houses are positioned to face the sea, with the sea as the front yard. In Batam, traditional coastal settlements contain historical, cultural, and religious values that should be preserved because they were home to the original inhabitants. Furthermore, Suku Laut represents a traditional coastal settlement of Malay wooden houses built on stilts (see Figure 2), representing Batam cultural heritage (Ancung & Sutisna, 2021).

Figure 2. Traditional coastal settlement in Batam

This research raises a case study on a traditional tribe in Batam, namely the Suku Laut, settled in Tiangwangkang traditional coastal settlement on mainland Batam, well known as the original inhabitants of Batam Island, and the locals mainly work as fishermen (Kusnadi et al., 2009). Suku Laut perceived their living lifestyle and livelihood depended on the sea for their daily routines. A Suku Laut is widely recognized as a symbol of the maritime community, with an ancient tradition of using the sea to form culture. In their nomadic life, the Suku Laut live in canoes with canopies called *sampan berkajang*, which function as homes. The choice of focus on the Suku Laut community on Batam Mainland was considered because of their uniqueness in the context of coastal settlements. The Suku Laut has a lifestyle that is closely related to the landscape elements of their settlement and local wisdom in utilizing natural resources. Understanding social dynamics and their interactions with the physical environment can provide valuable insight into how culture and environment influence each other.

In 1971, Presidential Decree No. 74 of 1971, established Batam Island as Indonesia's first industrial city. In addition, a center of economic growth in western Indonesia, located on the international sea trade route and connected to developed countries such as Singapore and Malaysia, it developed industries that influenced the social transformation and behavior of Indigenous tribes. A traditional coastal settlement is a valuable asset to the Suku Laut community, representing its origin and distinctiveness. The identity of the area is formed from the pattern of the environment, the structure of the built environment, and the characteristics of a typical community's social, cultural, and economic activities (Chanet et al., 2022). Moreover, social activity is the basis of social behavior mapping, which is the identity of the Suku Laut. To ensure that the Suku Laut cultural and social identity is preserved and development is in accordance with the community's needs and character, development plans should consider the social and cultural identities of the Suku Laut people.

Therefore, research is needed regarding the social behavior patterns of traditional coastal communities, how they are concern to human welfare, and related to the landscape elements of their settlements. The main aim of this research is to understand the complex interactions between cultural factors and the physical environment in forming patterns of social behavior in traditional coastal environments, as well as identifying their potential implications for sustainable development. The results of behavioral mapping serve as a direction for the government and the world regarding the importance of paying attention to Suku Laut in the midst of rapid development. Behavior mapping benefits the government in planning and managing Suku Laut traditional coastal settlements in mainland Batam.

2. Methods

This research is exploratory study, data was taken and collected by qualitative methods. The qualitative descriptive method was chosen in this research to describe and analyze existing phenomena and real situations in the field related to actual conditions (Muhadjir, 2002). This research is a study of the social behavior of the Suku Laut community in the Tiangwangkang coastal traditional settlement on Batam mainland, Riau Islands, Indonesia, which was carried out by analyzing and evaluating the community's movement patterns in their social activities and behavior. Research data was collected using direct observation through participant observation techniques on the daily interactions of the Suku Laut.

Photos, notes and video recordings are used to facilitate research and visualize the observed moments. Therefore, the qualitative approach involves fieldwork where researchers observe and record behavior and interactions in every moment of the Suku Laut's daily life. Qualitative data resulting from participant observation in this research carried out a data transcription process followed by analysis to obtain patterns of social interaction and behavior mapping and their relationship with the settlement patterns and spaces of the Suku Laut Tiangwangkang (Maksimovic & Evtimov, 2023). This is in accordance with the research objective of understanding more deeply the social behavior patterns of the Suku Laut community in the Tiangwangkang coastal traditional settlement on the mainland of Batam.

After data collection, the analysis process was carried out qualitatively. Data obtained from participant observation was then transcribed and analyzed to identify social interaction patterns, behavior mapping, and their relationship with settlement and spatial patterns of the Suku Laut Tiangwangkan. This analysis was carried out by paying attention to important details in the social interactions and behavior of the Suku Laut community. This method allows researchers to explore the complexity of interactions between cultural and environmental factors in forming unique social behavior patterns in these communities. To further explain the research diagram, it is presented in Figure 3.

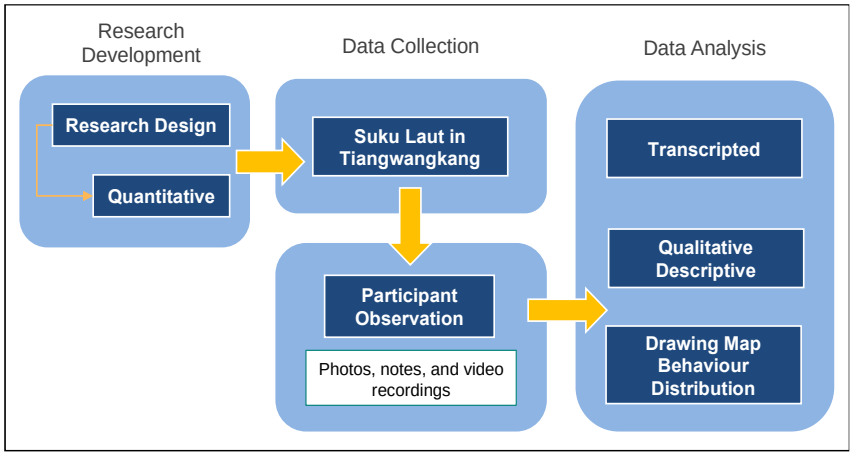

Figure 3. Research Methodology Diagram

3. Result and Discussion

Behavior setting and affordances

Social relationships in society are based on spontaneous social interactions and influence individual lives (Maitlis et al., 2013). These interactions create dependency and exchange of resources, expanding community identity (Shteynberg, 2015). This is also important for improving quality of life. The main challenge is that a person's behavior is influenced by the behavior of other people in social interactions (Bombari et al., 2015). Changing social norms requires the creation of new beliefs to change behavior. Social behavior is a spontaneous response in interaction, influenced by the environment and cognitive factors (Santrock et al., 2002). Interactions between individuals with different characteristics can create new behavior and change social norms (Suwarlan et al., 2023). Social behavior mapping is a cognitive technique that helps understand how an individual's behavior influences the responses of others. This involves extensive data collection to integrate community perspectives (Moore & Cosco, 2010). The goal is to identify areas that require special attention. This method allows the assessment of behavior related to outdoor physical activity (Boldemann et al., 2006). This research shows that physical environmental factors can influence social and physical activities in traditional settlements (Aguspriyanti et al., 2020). These findings contribute to the understanding of the dynamics of environmental behavior. The behavioral concept highlights the link between the physical environment and behavior (Barker, 1976). Behavioral mapping methods are used as an alternative to physical environmental surveys (Hume et al., 2005; Morrow, 2001). This research involves the Suku Laut community and explores their access to places in their environment for active social interaction.

The behavior setting facilitates the observation of spatial patterns of active affordances. According to Table 1, active affordances were evaluated in different behavior settings. Pathways are permitted for pedestrians and cyclists to walk (by foot or by bicycle/scooter). People sat, discussed, or stood under trees in other public spaces, including grounds with vegetation (trees). Moreover, people used grounds with hardscapes for drying seaweed, charcoal maker activities, and indoor activities such as: chatting while sitting on the terrace and eating betel together. Behavior settings with the highest active affordances were in grounds-hardscapes because of the many activities of seaweed farmers drying seaweed or sargassum. The second position was the mosque and churchyard, where the Suku Laut Tiangwangkang community has weekly religious activities to become a place for the community to interact. Meanwhile, the third position was grounds-vegetation (trees) because it is a spot shaded by trees, close to the main road, close to the village head's house, and easily accessible to the community because it is located in the middle of the residential area.

Table 1. Behavior setting and active affordances

Behavior Setting	Active affordance (n)	Walking	Resting, sitting	Standing	Chatting	Eating betel
Pathways	16	4.02%	-	1.91%	-	-
Grounds–vegetation/trees	23	-	6.11%	1.70%	5.19%	-
Grounds–sand, softscape	17	2.21%	3.04%	0.85%	3.21%	-
Grounds–hardscapes	30	6.09%	4.44%	2.53%	3.11%	-

Behavior Setting	Active affordance (n)	Walking	Resting, sitting	Standing	Chatting	Eating betel
Grounds–mosque/church	24	1.71%	5.15%	2.07%	5.07%	-
Grounds–house	19	-	1.98%	2.76%	5.14%	2.94%
Charcoal maker site	10	-	3.72%	0.61%	0.67%	-
Dock and *pelantar*	11	1.15%	2.29%	2.87%	0.57%	-
Sea and Mangroves	7	0.88%	1.46%	1.66%	-	-
Indoors	17	-	-	-	4.94%	5.06%
Total	174	16.06%	31.08%	16.96%	27.90%	8.00%

The highest behavior possessed by the Suku Laut community in Tiangwangkang in their settlement area is sitting and resting in a shady open field under a tree, with a figure of 6.11%, meaning that the community needs a communal space or green open space in the residential area to accommodate various social activities. The second highest behavior is that the community chooses to walk on settlement street built with hardscapes as much as 6.09%. For this reason, developing the Tiangwangkang settlement requires the construction of adequate street infrastructure. The lowest activity of the Suku Laut on the Batam mainland is in sea or mangrove activities; this is due to changes in economic, social and cultural life due to the influence of modernisation, which has caused the Suku Laut community on the mainland to abandon their sea identity slowly.

The behavior setting provides the opportunity to observe the spatial distribution of communities. The spatial distribution shown in Figure 3 indicates that women and men appear to be homogeneously distributed in terms of gender (green dots represents to female or women and red dots represents to male or men). However, there was a higher concentration of men at the specific location where work activities were concentrated. These men were seaweed farmers, construction material porters, construction laborers, and mangrove woodcutters. This means that the design of the Suku Laut coastal settlement needs to have areas that accommodate the needs of men in spots with a higher concentration, and conversely areas with a higher concentration of women need to be considered by designers. However, some spots or areas that are balanced between the concentration of men and women. This area can be a public or open space utilized by all genders.

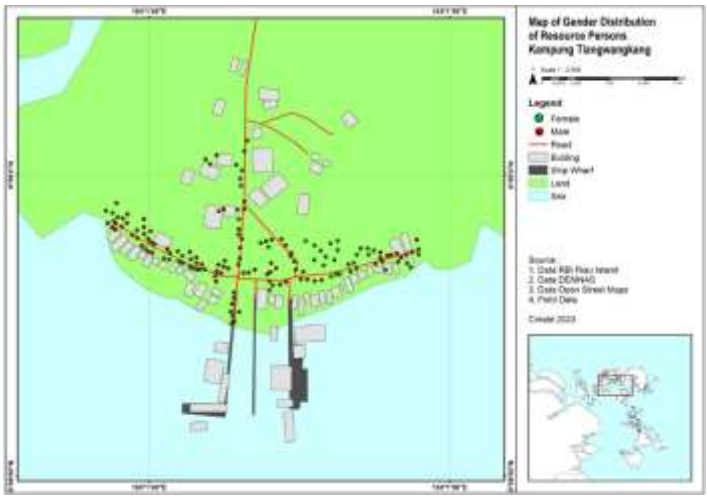

Figure 3. Gender distribution of behavior setting of Suku Laut in Tiangwangkang

Areas that are preferred for activities by men are areas that are close to infrastructure, environmental facilities, and accessibility as it relates to the work they do. Meanwhile, the areas of choice for women are more open areas such as ground and yard because they have more relaxed activities such as chatting and eating betel nut. Unfortunately, these activities have not been accommodated by the development of adequate facilities and infrastructure.

Social Landscape based on Behavioral Patterns

Four types of behavior settings accounted for the majority of the total social activity: Grounds, mosque/church/house yards, pathways, docks, charcoal kiln or *dapur arang*, sea and mangroves, and neighbouring houses. The amount of usage and activity level can be greatly influenced by certain attributes, such as the quality of the surface (whether it is hard or soft) and the width (whether it is wide or narrow).

The Suku Laut Tiangwangkang settlement has linear pathways. A tiny percentage of total activity was attributed to linear pathways adjacent to the houses. Considering this case, this research contends that a linear pathway offers a less exciting experience to the community due to its monotonous nature. Moreover, this study observed that activities generally occur in the house or yard rather than along the pathway alongside the houses. A further disadvantage of the pathway was that it lacked additional features or attributes (as opposed to the grounds or yard) that might have enhanced the affordance experience.

Figure 4. Linear pathway in Tiangwangkang

Grounds and yard open space types have high social activity. This is supported by activiy equipment or attributes, such as the sand grounds, which attracts many children to play sand every afternoon (every day) so that parents who watch their children play are included to have social activity in the sand field. Meanwhile, both in house yards and mosque or church yards, have activiy equipment such as trees and seating so that the community feels comfortable doing activities such as chatting while sitting under the tree or eating betel nuts together in the yard while sitting and relaxing.

Figure 5. Open space – grounds with sand in Tiangwangkang

Ground surface. The variability of responsive properties of various ground surface materials might afford different levels of activity when behavior mapping is applied to linked social activity data. This information could extend the study of the diverse surfaces by investigating social activity at different levels. This is evident from the low level of social activity in the pathways using paving blocks or concrete while the sandy field has high social activity. This grounds with concrete pavement were intended for community sports activities but is used for drying seaweed or fish rather than a place for children's play, sports or other social activities. Understanding the impacts of specific ground surfaces may assist designers and policymakers in delineating the necessary social activity zones of Suku Laut.

Figure 6. Grounds with concrete pavement in Tiangwangkang

A comprehensive analysis of behavioral arrangements and spatial patterns in the coastal settlement of the Suku Laut Tiangwangkang highlights the complex dynamics of community life and their impact on environmental design. An assessment of active affordances across a range of behavioral environments highlights the importance of the landscape as an essential space for various activities, particularly those related to the traditional practices of seaweed farming and charcoal making. Mosques, churchyards, and vegetated land also play an essential role in fostering community interaction.

Furthermore, the behavioral preferences of Suku Laut communities underscore the importance of providing adequate communal spaces, such as open fields under trees, to accommodate social activities. The emphasis on sitting and resting in shaded areas indicates the need for green open spaces within residential areas. The preference for walking on residential streets with hardscapes emphasizes the need for well-built infrastructure to support community mobility. Spatial distribution analysis revealed gender-specific concentrations, particularly in areas associated with specific work activities. This underscores the need for thoughtful urban planning that accommodates the diverse needs of both men and women, considering higher concentrations in work-related places and balanced areas for communal use.

The dominant behavioral arrangements of land, mosque/church/house yards, footpaths, docks, charcoal kilns, mangroves, and neighbouring houses further emphasize the diverse nature of social activities within the settlement. Understanding the nuances of each setting is critical for effective urban planning, ensuring that spaces are designed to encourage community engagement. The study also highlights the impact of ground surface materials on social activity levels and emphasizes the need for surfaces that can enhance the experience of affordability. This knowledge can guide designers and policymakers in determining appropriate social activity zones within settlements.

In summary, social behavior mapping could help understand social behavior variations among communities of different tribes, ethnicities, or races. Behavior mapping was an effective way to study the impact of environmental changes on community activities. As in Suku Laut Tiangwangkang, social behavior mapping benefits the government in planning and managing coastal settlements in Batam mainland for future development to adjust to the behavior and social activities of the Suku Laut community. Generally, the settlement pattern of the Suku Laut is linear, following the coastline by making the sea the front yard. However, the study's results found that in the settlements of the Suku Laut on the mainland, the sea was no longer the front yard but became the backyard. The social activities of the people of the Suku Laut on the mainland are more on land than on the sea, as evidenced by the fact that most activities are carried out on grounds, yards, and pathways. The community's behavioral activities influence the environmental design of the Suku Laut settlement. In particular, the landscape design of the Suku Laut settlements on the mainland is no longer suitable if planning on a sea landscape but on the land landscape of settlements because it follows the social activities of the Suku Laut mainland and fulfils the needs of the Suku Laut itself.

4. Conclusion

The Tiangwangkang Suku Laut's linear settlement pattern along the coastline reflects a shift in community focus from sea to land. This transition is evident in the dominant involvement of activities within the grounds, yards, and pathways. These findings underscore the critical linkages between community behavior and environmental design

and emphasize the need for future development to align with the evolving social activities and needs of Suku Laut communities on the Batam mainland. Therefore, integrating social behavior mapping into the planning process is a valuable tool for governments and designers to create sustainable and culturally sensitive coastal settlements.

Behavior mapping shows potential for measuring relationships between communities during social activity. This method connects amenities and opportunities behavior settings to community engagement. Such information could be utilized to formulate policies and standards adopted by professional organizations or the government. This would assist in the design and development of traditional coastal settlements. Design experts primarily identify environmental factors contributing to increased social activity. Through research findings, guidance can be provided for appropriate interventions that promote active areas of community engagement among the Suku Laut community by enhancing awareness of how the physical environment and its components can support or impede social activity. Development policies should be tailored to suit the social behavior of the Suku Laut community to achieve sustainable community-based natural resources management. However, it is critical to note that this study was limited to the traditional coastal settlement of the Suku Laut in Tiangwangkang, mainland Batam. This settlement may differ geographically from other Suku Laut settlements in Batam's hinterland. Future research should study Suku Laut's social behavior patterns in the hinterland areas.

In the results of this research, it was found that mapping social behavior towards Suku Laut settlements revealed complex social interaction patterns that were closely related to the physical environment in which they lived. Participant observation and qualitative analysis show that the social behavior of the Suku Laut community is significantly influenced by environmental factors such as settlement patterns, accessibility of natural resources, and infrastructure conditions. Social behavior mapping also illustrates the close relationship between people's daily activities and the physical structure of settlements, such as the location of houses, gathering places, and access to important resources such as water and fishing grounds. In addition, the findings highlight the importance of local wisdom in utilizing the physical environment to meet daily needs and maintain the continuity of the culture and identity of the Suku Laut.

These results imply that development planning and management of traditional Suku Laut settlements must take into account social and environmental factors that influence the formation of community behavior patterns. Efforts to preserve culture and the environment also need to be prioritized in order to support sustainable development and welfare of the Suku Laut community. Overall, the results of this social behavior mapping provide valuable insights into the complex interactions between communities and their physical environment, and provide a strong basis for planning and managing traditional coastal settlements in the context of sustainable development.

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