Coastal residential landscape model to support disaster risk reduction

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Abstract. Coastal settlements are formed in a fairly strong kinship system. Space that has the power of place will have an advantage over the natural environment and local wisdom. Coastal areas with high utilization rates face various negative impacts due to various human activities. Ecosystem damage, environmental pollution, land-use change, conflicts of social interest are some of the main problems that arise because of human exploitation of coastal areas. Coastal areas can be the areas most affected by disasters, such as earthquakes, tsunamis, abrasion, and sea-level rise. Therefore, quality landscape models and approaches are needed to strengthen community resilience in disaster-prone coastal areas. This study uses a library research method or approach. The results of the research in the form of a coastal-settlement landscape development concept can be done through ecological, functional/economic, socio-political, behavioral, and cultural approaches.

1. Introduction

The development of the post-tsunami settlement direction is towards the northern or coastal areas of Banda Aceh City, especially in the sub-districts that were hit by the tsunami, such as Meuraxa, Jaya Baru, Syiah Kuala, Kuta Alam, and Kuta Raja. The development of these settlements is experiencing rapid development because a large amount of housing assistance after the tsunami disaster and the construction of these settlements or houses of assistance are emergency response in nature or implemented immediately. The distribution of central facilities does not affect the direction of housing development in Banda Aceh City. This can be seen in the development of residential areas which are dominated in the northern or coastal areas of Banda Aceh [1]. Coastal settlements exist as a reflection of the existence of space which is influenced by the existence of the coast as a source of community livelihoods. Coastal settlements are formed in a fairly strong kinship system. This kinship system can be seen from the use of common space in one residential unit, as well as the use of common yards for various activities. In an urban view, space is understood as something that has certain characteristics, uniqueness, and character [2]. Space that has the power of place will have an advantage over the natural environment and local wisdom. Coastal areas with high utilization rates face various negative impacts due to various human activities. Most of the activities are concentrated in coastal areas such as fisheries and aquaculture. Besides, as a region with a high level of accessibility, environmental service activities such as transportation, industry, and tourism are also growing rapidly [3]. Ecosystem damage, environmental pollution, land-use change, conflicts of social interest are some of the main
problems that arise because of human exploitation in coastal areas. Meanwhile, apart from anthropogenic factors, coastal areas are also vulnerable to disasters. Some of the natural disasters that threaten coastal areas include earthquakes, tsunamis, abrasion, and sea-level rise. Uncontrolled land use is a threat to the carrying capacity and sustainability of coastal resources. In a city affected by a major disaster, the urgent need for physical and social development is inevitable in the development of the housing and settlement sector, infrastructure, and other areas. In addition to providing housing for communities affected by the tsunami, settlement development increased along with the rapid population growth in Banda Aceh from 2005 to 2009, which reached an average growth rate of 4.8% per year, higher than the Indonesian national average [4].

From the aspect of disaster risk reduction, recommendations are focused on providing accurate data information in understanding disaster sources, ecosystem integration, landscape approaches, and climate information-based forecasting into disaster risk, preparedness, and disaster reduction actions which are translated into written policies and integration of disaster risk analysis into in the Regional Spatial Planning (RTRW) and regional / village development plans [5]. In terms of climate change adaptation, adaptation forms that are environmentally sound and use local resources and wisdom need to be encouraged. If relocation due to disaster is the best solution, then community empowerment assistance to seek new livelihoods and livelihoods need to be done.

Most of the community's livelihoods are not adaptive to disasters, such as fishing, farming, gardening, and trading and services close to the coastline. The most economically affected by the disaster are MSMEs and low-income communities. To strengthen the economic adaptation of the community, it is necessary to have a maximum mentoring model that takes into account all aspects of community life, participatory and with the support of stakeholders.

Coastal areas can be the areas most affected by disasters. Based on these conditions, it is necessary to provide alternative input for the concept of coastal development in Banda Aceh. Therefore, quality models and approaches are needed to strengthen community resilience in disaster-prone coastal areas. Through a landscape approach model, researchers will find aspects that can support disaster risk reduction in coastal areas.

2. Materials and Method

The method used in this study uses a library research method or approach. Literature study can be defined as a series of activities related to library data collection methods, reading and taking notes, and processing research materials [6]. In literature study there are at least four main characteristics that the writer needs to pay attention to, including: First, the writer or researcher is dealing directly with text or numerical data, not direct knowledge from the field. Second, library data is "ready to use", meaning that researchers are not directly involved in the field because researchers are in direct contact with data sources in the library. Third, that library data is generally a secondary source, in the sense that researchers obtain material or data from second hand and not original data from the first data in the field. Fourth, the condition of the library data is not limited by speed and time [6]. Based on the foregoing, data collection in research is carried out by examining and tracing several journals, books and documents (both printed and electronic) as well as other data and sources of information that are deemed relevant to the research or study.

2.1. Study location

Banda Aceh city is astronomically located between 05° 16'15" - 05° 36'16" North Latitude and 95° 16'15" - 95° 22'35" East Longitude and has an area of 61.36 km². Banda Aceh City has an area boundary covering the north by the Strait of Malacca, in the south bordering Aceh Besar District, in the west bordering the Indian Ocean, in the east bordering Aceh Besar District. The coastal area of Banda Aceh City is broadly divided into plains on the north coast from Kuta Alam District to parts of Kuta Raja Regency, and part of the west coast area in Meuraxa Regency. The research area includes five sub-districts on the coast of Banda Aceh which include five sub-districts, namely Kuta Raja District, Jaya Baru District, Kuta Alam District, Meuraxa District, and Syiah Kuala District (Figure 1).
2.2. Data requirements
This literature research method is used to formulate coastal landscape concepts and approaches that can later be used as a basis for developing a coastal settlement landscape model to support disaster risk reduction. After determining the topic, it is followed by extracting information from various data sources to get the focus of the research (Figure 2).

Sources of data used as material for this research are books, journals, and internet sites related to the selected topic. Data collection techniques in a literature study can be done using documentation, which is looking for data about a thing or variable in the form of notes, books, papers or articles, journals, and so on. The research instrument used could be a research material classification checklist, a writing scheme/map, and a research note format.

2.3. Analysis technique
The data analysis technique used in this study is the content analysis method. This analysis is used to obtain valid conclusions and can be reviewed based on the context. In this analysis, the process of selecting, comparing, combining, and sorting various meanings will be carried out until a relevant meaning is found. To maintain thoroughness in the assessment process and to prevent and resolve misinformation (human misunderstandings that can occur due to a lack of author's literature), a literature review is carried out and heed the supervisor's comments. The analysis is used to determine the presence of certain words, concepts, themes, phrases, characters, or sentences in a text or series of
texts. Text can be broadly defined as a book, book chapter, essay, interview, discussion, headlines and newspaper articles, historical documents, speeches, conversations, advertisements, or in the form of documents.

3. Results and Discussion

3.1. Coastal area

Indonesia is one of the largest archipelagic countries in the world. The length of the coastline in Indonesia is about 81,000 km or about 14% of the length of the world coastline [7]. This makes Indonesia the country with the longest coastline in the world after the coast in Canada. The problem of coastal areas in Indonesia has become a serious problem due to natural disasters. Disasters that occur in coastal areas caused by threats that originate from land and from processes that happen in the sea such as floods, tsunami waves, earthquakes, and others [8]. The Coastal Zone is a transitional area between land and sea. When viewed from the coastline, the Coastal Zone has a boundary line, namely: a line parallel to the coastline (longshore) and a boundary perpendicular to the coastline (cross-coast).

The definition of a coastal area used in Indonesia is the area where land and sea meet; for the coast, the coastal area includes both dry and submerged land areas that are still influenced by sea characteristics such as tides, sea breezes, and seawater seepage. Meanwhile, towards the coast, coastal areas include parts of the sea that are still influenced by natural processes that occur on lands such as sedimentation and freshwater flows, as well as those caused by human activities on land such as deforestation and pollution [9]. The uniqueness of the coastal and marine areas and the variety of available resources show the importance of managing this area in an integrated rather than sectoral manner. Empirically, there is an ecological relationship (functional relationship) between ecosystems in coastal areas and between coastal areas and the highlands and open seas. So that changes that occur in coastal ecosystems (mangroves for example), eventually will have an impact on other ecosystems. Likewise, if the management of development activities (industry, agriculture, settlement, etc.) on land in a watershed (DAS) is not carried out wisely (with an environmental perspective), then the negative impact will damage the ecological structure and coastal functions. and the sea area. This phenomenon is likely to be the main cause of flooding and sedimentation.

The identification of disasters and environmental problems is currently very important and is a necessity in planning activities. A tsunami is a natural disaster that can occur anywhere along the coast. Coastal areas need to be protected from the impact of a tsunami by considering the number of people living there and their activities. Damage to the coastal environment due to disasters can be minimized in various ways. One way is to make efforts to manage resources (ecosystems) in coastal areas properly. Therefore, it is necessary to take systematic and comprehensive steps before developing and utilizing it on a wider scale.

Coastal housing can be defined as part of the earth's human settlements as a container with all the facilities and infrastructure to support the life of the population, which are united and located on land including inundated or non-flooded areas that are still affected. marine processes [10]. The development of residential areas in coastal areas as well as the development of residential areas in other areas has the main objective of improving community welfare. This activity is carried out through development planning with a process in which there are various approaches that need to be considered. In general, an area develops from a state of lower complexity to a state of higher complexity. The increasing complexity has resulted in an increasing number of regional development policy problems which are often difficult to resolve.
The concept of regional development can be carried out through several approaches and there are always more prominent problems depending on the conditions of the coastal area in question [11]. These approaches include (1) ecological approaches; (2) functional/economic approach; (3) socio-political approach; (4) behavioral and cultural approaches. The ecological approach emphasizes the spatial view as a single ecosystem. This approach is very effective in assessing the impact of ecological developments but tends to ignore the social, economic, and political dimensions of the region. The functional economic approach emphasizes regional space as a functional container of various activities, where the distance or location factor is important. The socio-political approach emphasizes the aspect of "control" of the territory. This approach sees the area not only as a variety of production facilities but also as a means of gathering labor. The conflicts that occur are seen as conflicts that occur between groups. This approach also views an area as a region, that is, connecting certain subsections in that area with certain organizational units. The behavioral and cultural approach emphasizes the relationship between the area and humans and the people who inhabit or take advantage of the area's space. This approach emphasizes the need to understand human and community behavior in regional development. This approach looks at various aspects of norms, culture, and social psychology that will produce various regional conceptions.

3.2. Ecological approach

The uniqueness of the coastal and marine areas and the variety of available resources show the importance of managing this area to be managed in an integrated rather than sectoral manner [9]. Empirically, there is an ecological relationship (functional relationship) between ecosystems in coastal areas and between coastal areas and the highlands and open seas. So that changes that occur in coastal ecosystems (mangroves for example), sooner or later will have an impact on other ecosystems. Likewise, if the management of development activities (industry, agriculture, settlements, etc.) on land in a watershed (DAS) is not carried out wisely (with an environmental perspective), the negative impact will damage the ecological structure and coastal functions. and the sea area.

The devastating tsunami disaster in Aceh Province, especially Banda Aceh City, illustrates the importance of urban spatial planning which must pay attention to the impact of the disaster aspect and the geographical location of the earth's plate, the source of the disaster, and its relation to the disaster. movement, and its possible impact. From this incident, it can be measured the extent to which seawater flows to land, water level, time, flow velocity, and water behavior so that the location of new settlements can be calculated, the prevention system for the magnitude and velocity of seawater flows. currents towards the land where waves and effort can be built. to tame the force of the currents that will enter the cities [12]. The protection of areas built from urban physical environments needs to use structural and non-structural mitigation approaches.
Protection within city boundaries and coastlines will maintain natural protection in the form of mangroves as a natural green belt that will protect the impact of tsunami waves when they reach land so that the movement of water can be slowed down due to the presence of mangroves.

3.3. Functional economic approach

The economy of the coastal community is the management of coastal resources and the people living in the area. The balance of economic, social, and environmental aspects in the development process is a principle that must always be the main basis for all stakeholders. The reason for the importance of coastal economic management objectives is because ecological economics studies the relationship between ecosystems, the economy, and human well-being. This is arguably one of the fastest-growing regions in the economy. An understanding of the coastal economy makes an important economic contribution of ecosystems to the economy for several reasons [13]. First, the coastal ecosystem is very productive and contributes greatly to the economic value of the coast. Second, all countries in general, and coastal economies in particular, have complex systems of ownership, markets, productive organizations, and governments that determine who receives economic benefits and who pays production costs.

3.4. Socio-political approach

Due to environmental concerns, sustainable development can only be carried out in a democratic system and atmosphere. Integrated Coastal Management is a concept currently considered the most ideal to be applied in coastal areas [14]. But there are several points to consider in developing this concept. In integrated coastal area management, several things need to be considered, including 1) The role of the principles of sustainable development of planners and policyholders is a challenge that must be transferred in management 2) Planning and management of coastal areas are very closely related. 3) Planning and management that refers to the commitment of various parties are important so that various forms of management such as community-based, collaborative, and community-based emerge. This formation is an anticipation of a conflict of interest for multi-parties. 4) Management of coastal areas is something that must be a common concern. Responsibility and sustainable management extend to international business to the local level, along with coastal users, residents, companies, private companies, private groups, advocacy groups, and governments. This partnership needs to be forged to obtain sustainable mutual benefits. 5) The successful management of coastal areas based on tradition (local wisdom), related to natural resources and their management. 6) Several planning techniques need to be developed innovatively to solve coastal environmental problems. 7) Strategies for planning and management of coastal areas can be mixed with various relevant stakeholders, referring to policies, and at different and related scales. So there is an integrated
orientation. 8) Evaluating success. Coastal policies and programs should always be evaluated and monitored to provide a measure of their success.

3.5. Behavioral and cultural approaches
One of the factors that influence the formation of culture is the natural physical environment in the form of situations and conditions that will indirectly shape the personality and cultural characteristics of the people living in the environment [15]. Talking about the natural environment, Indonesia has various natural environments ranging from urban, rural, and coastal areas. With Indonesia's diverse natural characteristics, of course, its culture is also diverse, both urban, rural, and coastal communities have different characteristics and cultures.

Coastal communities are groups of people who have certain patterns of life, behavior, and characteristics who live in the border area between land and sea. Coastal communities tend to survive and fulfill their needs from marine resources, namely fisheries, so that coastal communities form their own culture, namely the culture of coastal communities. In addition, coastal culture can also be defined as a knowledge system that contains concepts, theories, methods, or techniques used to apply and fulfill their physical and social needs. Coastal culture includes language, art, beliefs, knowledge, social (political) organization, technology, and economy.

4. Conclusions
The identification of disasters and environmental problems is currently very important and is a necessity in planning activities. A tsunami is a natural disaster that can occur anywhere along the coast. Coastal areas need to be protected from the impact of a tsunami by considering the number of people living there and their activities. The uniqueness of the coastal and marine areas and the variety of available resources show the importance of managing this area in an integrated rather than sectoral manner. The development of residential areas in coastal areas as well as the development of residential areas in other areas has the main objective of improving community welfare. The concept of developing a coastal settlement landscape can be carried out through ecological, functional/economic, socio-political, behavioral, and cultural approaches.

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