General Zoning Regulations in Coastal Areas of Bandar Lampung To Reduce Flood Risk

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Abstract. This time, many people in Indonesia, especially in Bandar Lampung, use coastal areas as a place to live and depend on their lives there. However, there are still many people who live in poverty and housing conditions that tend to be inadequate and have a bad enough environmental quality, making the settlement areas look so slum. If the coastal area is compared to other areas, it tends to be more prone to disasters due to the factor of low income communities being unable to carry out the recovery process independently. The purpose of this research is to formulate general zoning regulations in coastal areas of Bandar Lampung to reduce flood risk. The method of this research is map overlapping, quantitative descriptive analysis and formulating general zoning regulations. This research argues that general zoning regulation could be adopted to mitigate flood risk.

Keywords : General Zoning Regulations, Coastal Areas, Disaster Risk Reduction, Flood Disaster

1. Introduction

Space is a container used by humans and other living things as a place to interact. The role of spatial planning in regulating the growth of an area is very important so that regional growth does not focus on one area [1]. Furthermore, spatial planning also conducts a landuse in a proper zoning. The main function of zoning is to classify landuse of an area to minimized conflict of interest and mitigated natural hazards[2]. This time, many people in Indonesia, especially in Bandar Lampung, use coastal areas as a place to live and depend on their lives there. However, the growth and development of coastal areas in Bandar Lampung are not yet comparable to the dynamic developments in other cities that share coastal areas.

Social problems that have always been the main problem in the coastal areas of Bandar Lampung, such as the large number of people live in poverty, bad waste management that it tends to become slum areas. The coastal areas in Bandar Lampung particulary Lampung Bay, facing natural hazards such as the occurrence of tidal floods and urban floods that always occurs in the coastal areas every year. In others side, this place has been experiencing rapid urban growth.

Disaster defined as: “an event or series of events that threaten and disrupt the life and livelihood of the community which is caused by natural factors and / or non-natural factors as well as human factors resulting in human casualties, environmental damage, property loss, and psychological impacts.”[3]. To reduce disaster risk, it is necessary to increase the value of vulnerability to capacity by strengthening the capacity in society in managing the environment, recognizing threats, knowing the impacts that can be caused by factors that cause disasters.

Spatial planning as a legal instrument to control an urban development could reduce hazard and demage pervention [4]. Landuse planning is apart of spatial planning. By allocating proper landuse in an urban space, it is could mitigated and eliminate disaster risk [5]. Capacity building to reduce the risk of flood disasters in Bandar Lampung can be done by mitigating non-structural disasters through spatial planning controls such as the General Zoning Regulations. The importance of this research is that it can be used to assist the Bandar Lampung
The purpose of this research is to formulate general zoning regulations in coastal areas of Bandar Lampung to reduce flood risk. This is the target to achieve the purpose include the following. Identify spatial planning problems in the sub-districts around the coastal area of Bandar Lampung; Identifying environmental problems and the risk of flooding in the sub-districts around the coastal area of Bandar Lampung; and Formulatting the general zoning regulations in the sub-districts around the coastal area of Bandar Lampung.

2. Method

This research located in Bandarlampung Coastal Area which is consist of 4-Subdistrict, they are Panjang, Bumi Waras, Teluk Betung Selatan, and Teluk Betung Timur. This research employed a descriptive quantitative method. this method attempts to explain quantitative data systematically such as the total number of flood hazard, total number of coverage area and land use. the data type of this research used secondary data collected from the result of prior research. ArcGIS software is used to analysed spatial data to identify certain land use that overlapping with flood hazard risk. In an attempt to arrange the proper recommendation for general zoning regulation, a descriptive method is operated.

3. Discussion

3.1 Flood Hazard Area in coastal area of Bandar Lampung

This study conduct in four Sub-Districts in Bandarlampung, that bordering Lampung Bay, including Teluk Betung Timur, Teluk Betung Selatan, Bumiwaras and Panjang[6]. The fourth sub-districts is adjacent to:

1. The North is bordered by some sub-districs of Bandar Lampung, that is Teluk Betung Barat, Teluk Betung Utara, Tanjung Karang Pusat, Kedamaian dan Sukabumi.
2. The West is bordered by Kabupaten Pesawaran
3. The East is bordered by Kabupaten Lampung Selatan
4. The South is bordered by Lampung Bay
It can be seen that the flood area in Bandar Lampung is predominantly located in the coastal area bordering Lampung Bay (Figure 1). Floods in Bandar Lampung occurred in Teluk Betung Timur, Teluk Betung Selatan, Teluk Betung Barat, Teluk Betung Utara, Bumiwaras, Panjang, Peace and Sukabumi. In this study, it is focused on the sub-districts which are bordering the Lampung bay, they are Teluk Betung Timur, Teluk Betung Selatan, Bumiwaras and Panjang. In this picture, hazard classes are divided into 3 classes, they are low (<1 m), medium (1 - 2.5 m), high (> 2.5 m). In the picture below, it can be seen that the high hazard zone is around the border of Lampung Bay.

Based on the 2016-2020 Bandar Lampung Disaster Risk [7][8], Bandar Lampung has a high potential for flood hazard, it is 9,353 hectares, especially in the subdistricts of Teluk Betung Timur, Teluk Betung Selatan, Bumiwaras, and Panjang (figure 2).
The average amount of rainfall in Bandar Lampung is based on the results of observations every year which always fluctuate [9]. The high amount of rainfall usually occurs from November to April in every year. In early 2020, there was a flood disaster that occurred in Bandar Lampung which was caused by heavy rains. The worst floods were in Teluk Betung Timur and Teluk Betung Selatan [10].

Figure 2. Flood Hazard Map of Bandar Lampung

Figure 3. Flood in Bandar Lampung in 2020

source: m.lampost.co
Figure 4. Overlapping result of the flood hazard and the existing land use in Bandar Lampung

The figure 4 is an overlapping result of the flood hazard data and the existing land use in Bandar Lampung. In Teluk Betung Timur and Teluk Betung Selatan, the most extensive land use that is exposed to the threat of high-class flooding (> 2.5 meters) is empty land. While in Bumiwaras, the most extensive land use that is exposed to the threat of high-class flooding is residential area. While in Panjang, the most extensive land use that is exposed to the threat of high-class flooding is industrial area.

3.2 Disaster Risk Reduction in Bandar Lampung

Based on factual data and analysis of Bandar Lampung Regional Spatial Plans 2011 – 2030, that types of natural disaster prone to potential in Bandar Lampung are floods, tidal waves, earthquakes and fires. Therefore, in the Bandar Lampung Regional Spatial Plan 2011-2030, there is disaster mitigation to mitigate floods with flood control. Development of a flood control system in question includes:

a) normalization and rehabilitation of rivers in Bandar Lampung City;

b) cooperation between City/ Regency Governments and related institutions in the framework rehabilitation and revitalization of upstream rivers;

c) constructing reservoirs and infiltration wells using a polder system in vulnerable areas floods and in water catchment areas are scattered throughout the districts;

d) Housing is required to build a reservoir, especially in flood-prone areas.

e) establish the GSS as a protected area and revitalize the GSS to support the realization of Bandar Lampung;

f) limitation and control of settlement development in the District Kemiling, Tanjung Karang Barat and Teluk Betung Barat Districts;
g) limit and control cultivation activities in the Batuputu area can function as a catchment area and development of ecological tourism;

h) revitalization and reforestation of hill and mountain areas in Bandar City Lampung; and

i) maintenance of city drainage channels and prohibiting blocking of canals drainage permanently.

3.3 General Zoning Regulations in Coastal Areas Of Bandar Lampung To Reduce Flood Risk

The final output in this study is a strategy to reduce the impact of flood hazards through non-structural mitigation in the form of General Zoning Regulations in areas affected by floods in the coastal area of Bandar Lampung. The Zoning Regulation that is meant is the general elaboration of the provisions governing the requirements for spatial use and the provisions for their control covering the flood area around the coastal area of Bandar Lampung.

General Zoning Regulations are based on spatial structure and regional spatial land use. Regional characteristics, General guidelines for urban design, and other relevant sector laws and regulations. They are made per land use in the sub-districts around the coastal area of Bandar Lampung and consist of general provisions and building intensity. These land uses include protected area (local protected area – beach border area and green open space includes urban forest) and cultivation area (housing and settlement area, industrial area, warehousing, tourism area, government office area, trade and service area and mining area).

Protected areas in four districts around the coast of Bandar Lampung consist of beach border area and green open space includes urban forest. Beach coastal borders are areas along the coast and small islands that have important benefits for maintaining the sustainability of coastal functions. To reduce flood risk in this area, there are some general provisions such as the distance between 0 - 100 meters from the highest tide point should not be developed for built land and designated as a green belt, except for activities; port, shore excursion, road inspection, research and education activities. Then, green open space includes urban forest is Elongated and / or grouped areas, whose use is more open in nature, a place to grow plants, both those that grow naturally or those that are intentionally planted, and include forests city. To reduce flood risk in this area, there are some general provisions such as not permitted or allowing the existence of bare or open areas and covering the deforested areas with trees or grass/ shrubs without the permission of the authorized agency or official. For building intensity is the maximum basic building coefficient is 10% specifically for buildings that support green open space functions.

Other than, there are cultivation areas which have a lot of sub-land uses, one of them is housing and settlement area. It is an area that is restricted for living. They consist of high, medium, and low density urban housing. To reduce flood risk in this area, there are some general provisions such as providing a healthy, comfortable, safe, and beautiful residential environment supported by infrastructure, facilities and minimum utilities; do not interfere with the function of protected areas and pay attention to environmental aspects of sustainability and balance; and construction of house buildings must follow flood-resistant housing builders standards. Flood-resistant housing builder standards can be determined under the provisions of the Minister of Public Works Regulation Number 6 / PRT / M / 2009 concerning Guidelines for General Planning for Infrastructure Development in Tsunami Prone Areas.

Then, there is industrial area which consist of small industry/ household, medium industry and warehousing. Small industry/ household is The area where the concentration of small industrial activities is managed individually? in groups. To reduce flood risk in this area, there are some general provisions such as utilization of land for home industries can be incorporated into a residential / residential area, as long as it does not interfere with environmental conditions and the function of the residential environment; if you have formed a group, the entrepreneur must provide the industrial area for reforestation as an air filter and shade.; the construction of houses must follow the standards for building flood-resistant houses (according to technical regulations or local regulations regarding flood-prone areas), KDH must be added by 10% of the stated. For the building intensity, there are some provisions include Maximum KLB 1 (maximum 2 floors), Maximum KDB 40%, KDH minimum; RTNH maximum 20%; and GSB adjusted to applicable regulations.

Warehousing is an area where the concentration of the products of industrial activities is stored before they are marketed. There are some general provisions to reduce the flood risk such as in every unit of warehousing activity, the entrepreneur must provide industrialized land for reforestation, the need for office space joins the warehouse for space efficiency, and minimum facilities and infrastructure for environmental drainage must be able to accommodate a water flow of 1 m³/s. other than, there are some intensity building such as maximum KLB 1,
maximum number of floors 2 floors, maximum building height 20 m, KDB for warehousing lots of a maximum of 50%, KDH minimum 20%, RTNH as needed, and GSB adjusted to applicable regulations.

Nature, mountains and marine tourism – tourism area is one of cultivation areas which is defined as an area designated for landscape and nature-based tourism activities. To reduce flood risk in this area, there are some general provisions such as spatial use must be dominated for the use zone for the national park or community forest park, or the natural tourism park concerned; and if it is required that there is built-up land, it is not allowed to change the function of natural tourism areas as part of the function of a protected area, change the existing landscape, and disturb the visual view; and the development and implementation of tourism activities must be accompanied by integrated efforts in preventing and overcoming environmental pollution and accompanied by intensive supervision by local governments.

And then, Government office area is designated for the purposes of administering administration and commerce (but not shops, buildings or factories) and including bank buildings, transmitting studios, buildings, offices, stock exchange buildings and office parts. There are some general provisions to reduce flood risk in this area such as providing space for Green Open Space (RTH), Non Green Open Space (RTNH) and infiltration wells and minimum facilities and infrastructure for environmental drainage must be able to accommodate a water flow of 1 m³/s. For offices in the city center like Teluk Betung, there are some provisions of intensity building. They are maximum KDB 60%, KDH minimum 20%, RTNH maximum 20%, and GSB adjusted to applicable regulations. Other than, for sub-district scale offices as well as in residential areas are maximum KLB 1.80 (maximum 3 floors, height 20 m), maximum KDB 60%, KDH minimum 30%, RTNH maximum 30%, GSB adjusted to applicable regulations.

Then the land use that is most vulnerable to flood is trade and service area which is usually in the city centre. Trade and service area is an area dominated by spatial use for trade and service activities. To reduce flood risk in this area, there are some provisions such as residential construction is permitted only if the commercial building is already on the parcel or is part of a building permit (IMB), have a good environmental sanitation system, and must providing parking spaces large trades green open spaces, and space for activities for the informal sector (for trade large / modern traditional market / mall).

And the last is mining area which is defined as area where part or all of the activity stages are carried out in the framework of research, management and exploitation of minerals or coal which include general investigation, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, as well as post-mining activities. There some provisions to reduce flood risk in this area such as mining business activities cannot be carried out in a place that is prohibited from carrying out mining business activities in accordance with the provisions of laws and regulations, and before mining activities are carried out, a feasibility study and study of environmental documents must be carried out, the results of which are approved by the evaluation team from the authorized institution.

4. Conclusion

The flood disaster that occurred in the coastal area of Bandar Lampung was a flood disaster caused by an increase in water volume due to heavy rains and the level of population and dense buildings on the coast of Bandar Lampung. The dominant land use affected by flooding in the coastal area of Bandar Lampung is residential areas. From the result, the area that is exposed to the highest threat of flooding is the area around the shoreline of the Bay of Lampung so that a strategy to reduce the impact of flood hazards with KUPZ is needed, one of which is at a distance of 0 - 100 meters from the highest tide point, built land cannot be developed and designated as a green belt, except for activities, ports, shore excursions, road inspections.

5. Acknowledgements

We would like to show our gratitude to the LP3 ITERA that support this research.

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