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# The Direction of Development of Jambi City Based on Flood Disaster Mitigation

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**Abstract:** The city of Jambi as the capital of Jambi Province, hold an important role in the development of the region, namely as a National Service Center, the location of the city of Jambi which is located in alluvial causes the city of Jambi often flooded so that in the direction of development of the city need to consider the existence of flood-prone areas. The spatial planning of Jambi City needs to be anticipated through study of the direction of urban development which emphasizes disaster mitigation efforts in the form of a typology of disaster-prone areas, regulating space utilization through regulation of spatial functions and spatial development rules, as well as the rules of spatial forming elements. By delineating the hazard area and development arrangements in the region, the development of the city can be directed to develop a relatively safe area.

**Keywords:** the direction of urban development, disaster mitigation

## 1. Introduction

The rapid development of the city accompanied by an increasing population forced a city to need new land for residential areas. One technique used to obtain spatial information is using remote sensing techniques [1]

Spatial planning is a system for the process of spatial planning, spatial utilization, and control of spatial utilization, based on law no. 26 of 2007 [2] concerning Spatial Planning was held with due regard to the physical condition of the Indonesian territory which was vulnerable to disasters[3]. Geographically, Indonesia is in a disaster-prone area so that spatial planning based on disaster mitigation is needed in an effort to improve the safety and comfort of life and livelihood. Disaster Mitigation as a series of efforts to reduce disaster risk, both through physical development and awareness and improvement of the ability to deal with disaster threats in accordance with Law No. 24 of 2007 [4] concerning Disaster Management, its implementation can be realized in the Regional Spatial Plan which is categorized as one of the passive disaster mitigations according to the guidelines for Preparing a Disaster Management Plan. Jambi City as the capital of Jambi Province is a Local Activity Center (PKL) which plays an important role in the development of the region as a National Service Center because all activities are centered in the City of Jambi.

The development of floods that occur in several areas of the city is increasingly increasing in the area of flooded areas. Strong indicated the area of inundation that occurs due to the ability of the land



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to absorb and accommodate rainwater decreases, resulting in increased runaway water that occurs, which is caused by changes in land use from non-built land to built land [5]. Flood hazard conditions related to geomorphological and hydrological characteristics[6]. Jambi City, which is located in the Jambi Sub-Basin area, which is located in low land and relatively flat altitude with an altitude of 2-80mdpl, is very vulnerable to flood disasters, the development of Jambi city, in general, is influenced by internal and external factors. Internal factors include the potential of human resources and are the center of government, trade, and services. Furthermore, external factors that influence development are factors of urbanization that are influenced by accessibility which facilitates population movements and patterns of flow of goods needed. The development of the city of Jambi not only had a positive impact but had a negative impact, namely the emergence of problems that could hamper the development of the City of Jambi, as a city that is still developing must have a spatial information system that is used to support the development of the city and produce information needed by the community[1].

When viewed from the characteristics of Jambi City which is located in the Upper Batang Hari River which is one of the longest rivers in Sumatra, the development of Indonesian cities that once originated from the river banks also had an impact on the development of the city of Jambi, which began government, trade and service activities from the edge of the river. Therefore the location and topography of the city of Jambi which is located in the Batang Hari river certainly has a risk that must be faced every year, namely the Flood disaster caused by the overflow of the Batang Hari river due to high rainfall, in relation to spatial planning of course need to be anticipated through urban spatial planning based on disaster mitigation in the form of typology of disaster-prone areas, regulation of spatial utilization through the regulation of spatial functions and spatial development rules that are adapted to the carrying capacity of the region's vulnerability to flood disasters. Damage caused by floods is a reflection of a lack of disaster preparedness. Most of the reasons for the emergence of this problem are due to lack of infrastructure provision and lack of planning in managing disaster-affected areas[7]. The aim to be achieved in this research is to guide the development of Jambi city based on flood disaster mitigation that occurred in Jambi city using the Geographic Information System (GIS) and appropriate mitigation efforts based on the type/type of flood

## **2. Literature Review**

The application of the principles of sustainable development to mitigate natural disasters in developing countries becomes very important [8]. Defines disaster as follows: "an event, natural or man-made, sudden or progressive, which impacts the severity that the affected community has to respond to by taking exceptional measures"[9]. Disasters tend to reflect on the following characteristics:

- a) Disruption to normal life patterns. These disorders are usually large and sudden, unpredictable and widespread.
- b) Impact on humans such as loss of life, injuries, suffering and adverse effects on health
- c) Impact on social structures such as damage to government systems, buildings, communications, and other important service systems
- d) Community needs such as shelter, food, clothing, medical assistance, and social protection.

Natural disasters (natural disasters) are interactions between natural disasters and conditions of vulnerability usually created by humans. then the difference between natural disasters results from the misuse of natural resources by humans by inappropriate actions[10]. Based on this understanding, natural hazards are natural events that can trigger natural disasters, especially for humans if natural hazards occur in vulnerable conditions or conditions. Natural disasters are the result of the interaction between natural hazards and vulnerable conditions that are usually created by human actions with the impact that is so powerful affecting a community. Management of natural disasters can be done by mitigating. Disaster Mitigation can be defined as "a series of efforts to reduce disaster risk, both through physical development and awareness and enhancement of the ability to face disaster threats". Efforts or activities in the context of prevention and mitigation carried out aim to avoid the occurrence

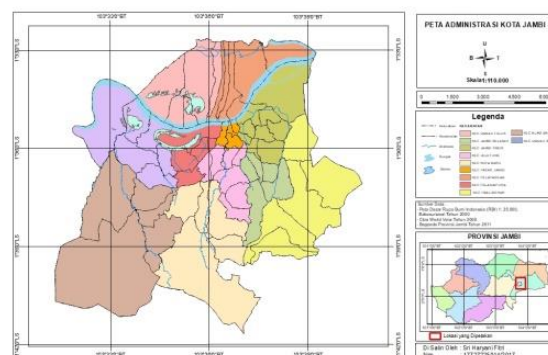
of disasters and reduce the risks posed by disasters. Disaster mitigation is part of the implementation of disaster management in situations where there is a potential for disaster. This mitigation action can be seen from its nature can be classified into 2 (two), namely passive mitigation and active mitigation. Passive mitigation is more non-physical, for example, legal/regulatory frameworks, incentives, education and training, community awareness raising, Spatial Planning, institutional development, etc. While active mitigation is a physical effort, such as building reservoirs, dikes, strengthening building structures, etc. Disaster mitigation can be translated into the context of spatial planning as a tool to prevent/avoid/ eliminate hazards, reduce the level of vulnerability, and increase the resilience of a particular region/region. The implementation can be realized in the Regional Spatial Plan which is categorized as a passive disaster mitigation tool. Some basic things in spatial planning based on natural disaster mitigation [3], including the following:

- a) spatial planning based on the introduction and understanding of disaster risks in the area to be arranged so that a study of hazard zoning is needed.
- b) The arrangement of spatial utilization that has a disaster threat, through the arrangement of spatial functions, building rules, restrictions on the use
- c) Development of space structures by taking into account the needs of important infrastructure/facilities supporting disaster-prone areas
- d) Provision of evacuation routes and areas and emergency assistance to anticipate emergencies.

space as a container that includes land, sea, air space including space in the earth as a whole area where humans and other creatures live [11]. Disaster mitigation has 4 important things, namely: 1. Availability of information and maps of disaster-prone areas for each type of disaster, 2. Dissemination to improve understanding and awareness of the community in facing disasters due to living in disaster-prone areas, 3. Knowing what needs to be done and avoided and knowing how to save themselves, 4. Arranging and structuring disaster-prone areas to reduce disaster threats[11].

### 3. Methodology

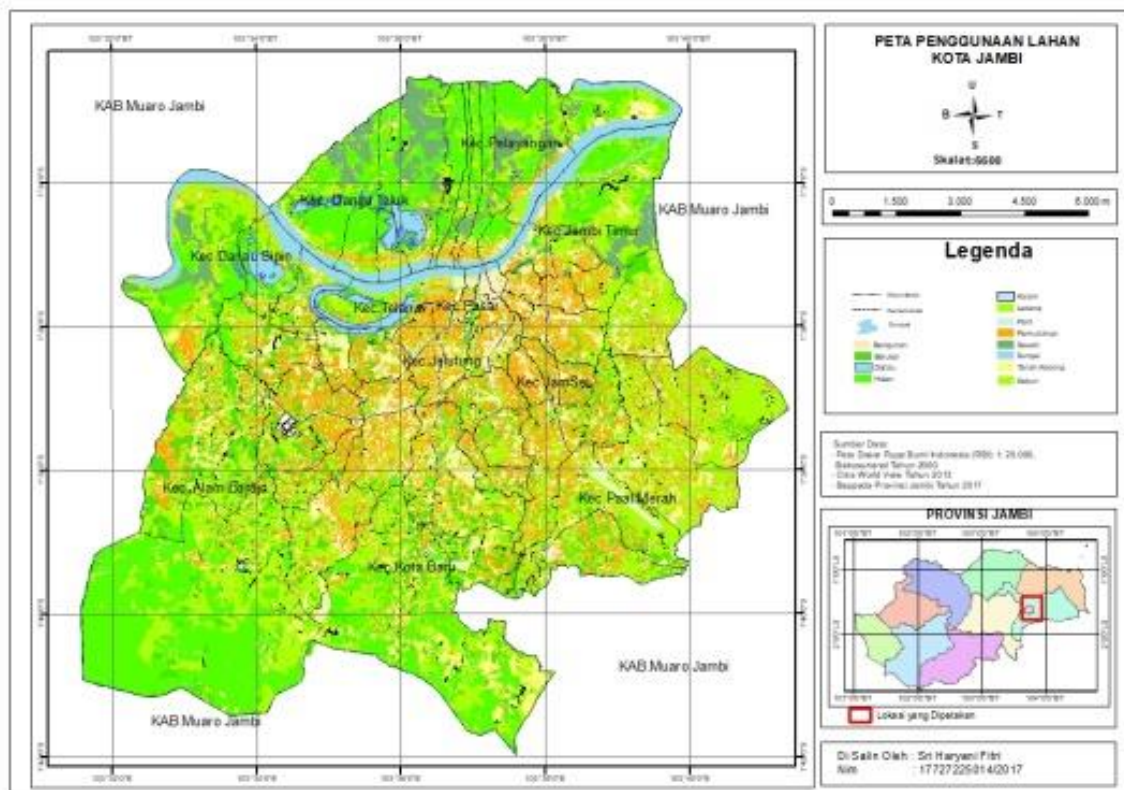
Administratively, the City of Jambi consists of 11 (eleven) sub-districts and 62 (sixty-two) villages, Jambi City is at an average height of 2-80 masl. Geographically the position of Jambi City is at 010 30'2,98"- 010 40' 1,07" Lintang Selatan dan 103 40' 1,67"- 10340' 0,22" Bujur Timur, Capital City of the Regency closest to the City Jambi is Sengeti, which is the capital of Muaro Jambi District with a distance of 29 km.



**Figure 1.** Administrative Map of Jambi City

Jambi city area which is located in the area of flood plains and alluvial plains is an important problem, considering the concentration of the majority of the population is in this region. Corrugated

parts are to the north and south of Jambi City, while swamp areas are along the Batang Hari River flow, if this area is affected by flooding it will cause enormous losses such as loss of life, damage to public infrastructure, damage to personal material of the population, and disruption of the city's economy which in turn will cause losses and misery for the affected population. The causes of flooding can be divided into 3 types, namely: (1) Flooding of shipments is a flood flow coming from upstream areas outside the inundated area. This happens if the rain that occurs in the upstream area causes a flood flow that exceeds the river's capacity so that runoff occurs in the area around the river or river border. (2) Local flooding is a pool of water arising from rain falling in the area itself. This is usually due to the rain that exceeds the capacity of the existing drainage system. (3) Tidal floods are floods that occur either due to the direct flow of tidal water and/or the water returning from the drainage channel due to obstructed by high tide [12]. The flood events in Jambi City were caused more by floods of shipments and local flooding because the high intensity of rainfall caused the overflow of the Batang Hari river. The following is a map of land use in Jambi,



**Figure 2.** Land use map of Jambi City

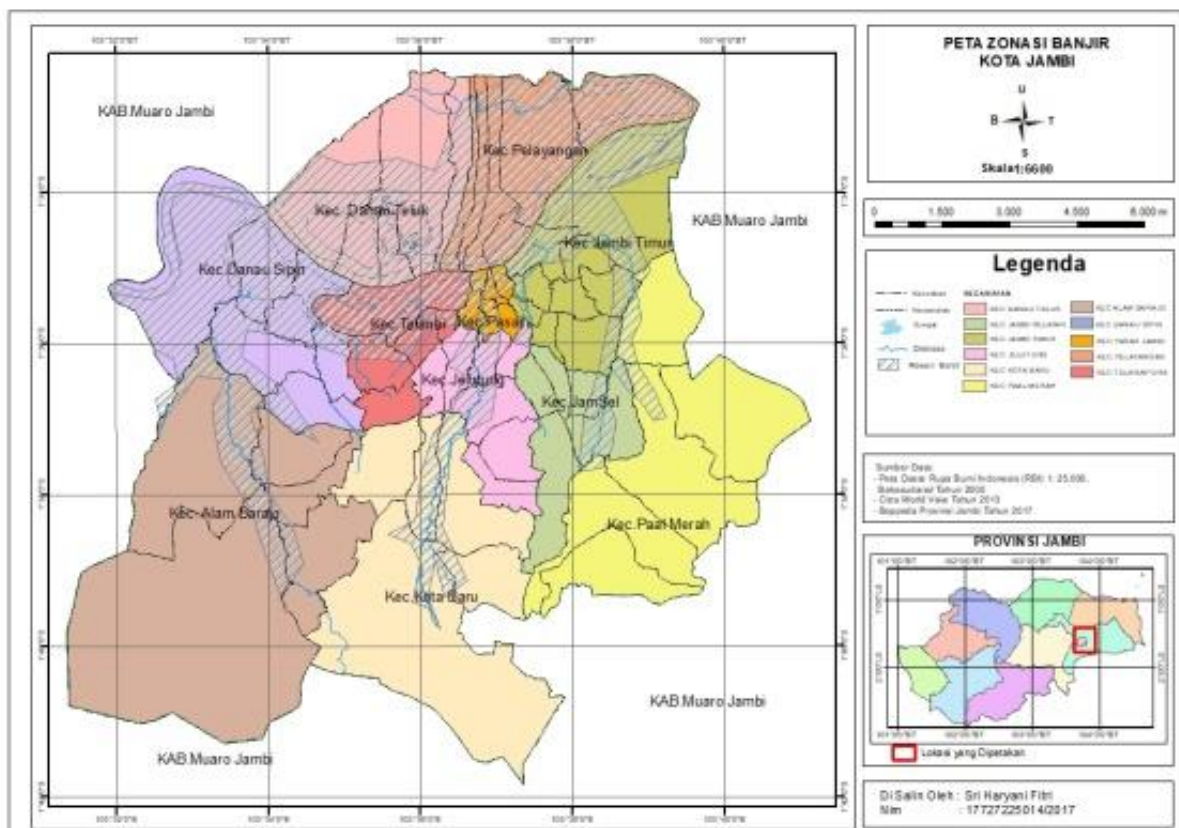
When viewed from the distribution of existing settlements in Jambi city land use map, many settlements were centered around the banks of the Batang Hari river, this means that the vulnerability to the danger of flooding is very high in the region for that there is a need for zoning maps of flood areas in Jambi City as a form of flood disaster mitigation .



## 4. Results and Discussions

### 4.1 Determination of typology of flood-vulnerability Areas

Jambi City, located in the Batang Hari river area with a watershed of 57,704 km<sup>2</sup>, has a length of 755Km and a width of 250m in the upper reaches and 400m downstream, the Batang Hari river passes through the city of Jambi and divides the city of Jambi into two parts in the north and south. floods in the city of Jambi increased, in 2001 - 2005 the incidence of floods with a height of 1-4 meters[13], flood events in Jambi City continued in the following year, in 2012 floods occurred in telanaipura and jeutung sub-districts, in 2013 there was a flood which was quite extensive and the impact was around 4543 submerged houses which were divided into seven sub-districts in Jambi City [14]. Subdistricts that are often affected by floods are Danau Sipin, Danau Teluk, Pelayangan, East Jambi, Telanai and Pasar Jambi Districts, the area is the area on the Batang Hari River and the Batang Hari tributary, from the data obtained can be made a map of the area who are a hazard to floods.



**Figure 3.** Flood Area Zone Map

In determining the flood-hazard zoning in the city of Jambi, the need for technology that helps analyze and compile the zoning map, GIS has a role in sustainable development post-disaster, during the emergency response can present informative and communicative data that helps decision making and in the medium term and long can be the main basis for development [15]. Utilization of Geographic Information Systems (GIS) is very important, where GIS applications that can explain, present objects of flood-hazard areas of the real world that are used in digital, the flood-hazard zoning map is based on secondary data obtained from the Department of Public Works and BNPB Province [16], Jambi, by analyzing areas that are frequently affected by floods every year, vulnerable areas are areas close to the banks of the Batang Hari river. Data of flood events obtained from the BNPB Office

of Jambi Province 2011-2016 stated that the most widespread flood events were in 2013, as many as seven sub-districts affected by the flood disaster, namely, Telanai, Pasar, East Jambi, Jelutung, Pelayangan, Teluk Teluk and Kota Baru, as many as 4543 houses and buildings were flooded.

#### 4.2 The arrangement of Space Utilization through Space Function Arrangements, Building Rules, Restrictions on Use

The pattern of space is the distribution of the allocation of space in an area which includes the designation of space for protection functions and cultivation functions [11]. So that there is a good balance in the development and development of a city area. In the Minister of Home Affairs Regulation No. 33 of 2006 [17] concerning general guidelines for disaster mitigation, there needs to be a policy adopted in disaster mitigation, in which there is a need to build public and government perceptions, which can be implemented in a coordinated and integrated manner, as well as preventive efforts to minimize damage and victims. implementing the policy requires the existence of a strategy in its implementation, namely; mapping of disaster-hazard areas, monitoring level of employment, dissemination of information and the existence of continuous early warning in disaster hazard areas. Disaster risk reduction is generally carried out structurally, namely building physical conditions such as river dikes, but can also be done in other ways, one of which is by increasing community resilience which can be done by adopting spatial planning, especially the contents of spatial patterns [18].

The regulation of spatial use of disaster-hazard areas is very important in the development of cities, land use that has a protected function must be preserved and not intended for the community to use it, for this space allocation in kawasan is for tourism and ecosystem tourism that can help preserve the environment, elements space builders that can be built are clean water networks, drainage, waste disposal systems, and local transportation networks. In this mitigation effort can be added to the making of danger signs or prohibition to enter the disaster area and the creation of embankments to prevent the entry of overflowing river water and continue to conduct counseling and socialization to residents who live in areas hazard to flood disasters.

## 5. Conclusion

Geographically, the City of Jambi is located in an area hazard to flood disasters so that spatial planning based on disaster mitigation is needed in an effort to improve the safety and comfort of life and livelihood. Disaster characteristics that threaten need to be understood by local government officials and communities, especially those living in disaster-hazard areas. Efforts to identify the characteristics of disasters is a mitigation effort that is expected to reduce the impact of disasters. Mitigation actions are in the form of passive mitigation, namely the formulation of directives for the development of urban spatial planning and active mitigation that are physical in nature. Disaster mitigation efforts in formulating the direction of urban development are expected to realize the creation of a safe, comfortable and productive city environment and can be a useful input for the regional government in formulating the direction of urban spatial planning and disaster management decision making. the direction of urban development based on flood disaster mitigation Jambi City is to the south of the City, which has a considerable distance from the Batang Hari river.

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