Abstract

Many cities in Indonesia are located in hazard prone areas. Each year when disaster strikes in cities especially in high density areas, it often comes as a surprise. It is as if that planning and especially spatial plans drawn for these cities or for its surrounding regions do not protect its residents. While plans do not claim to be fully protecting its citizens from such risks, the results of spatial audit, as a tool to review how far spatial plans are implemented, show that unplanned development in highly desirable, yet hazard prone areas have been delayed or prevented. Learning from the case studies of earthquake prone city of Palu, of flash flood areas of Sentani, and of Bukittinggi of Indonesia, the result of spatial audits leads toward enforcement of spatial laws in these areas long before the disaster struck. The presentation of these case studies are about the struggle to enforce such laws in these cities especially when there is a lack of or limited zoning or coding regulations imposed as an extension of spatial plans. Even with an existence of level of masterplan, spatial plans can have its impacts that affect the livelihood of the communities in these cities. Lesson learned from these experiences show that expediting the introduction of zoning as well as coding regulations have been a priority in ensuring that such spatial plans can have direct benefits for its residents.

Keyword: spatial plans, spatial audit, law enforcement, zoning or coding regulations
1. Background

Geographically, Indonesia's position is in areas that are vulnerable to natural hazards. Many cities in Indonesia have experienced a number of cumulative natural disasters with a variety of disasters, as well as similar disasters, but repeated.

Various disasters that have taken many lives, property and changes in the physical environment. Deaths and injuries often occur mainly in urban areas with high population densities, cities located on the coast, and cities located in highland areas.

At the end of 2018 and early 2019, Indonesia has experienced a variety of natural disasters which have killed quite a lot and died of minor to severe injuries, property, settlements, public facilities and social facilities, infrastructure (transportation network systems, roads and bridges, drainage network systems, wastewater and clean water), environmental damage in the form of top soil damage, land cover, vegetation and can even change the landscape.

Variations in natural disasters that often occur in Indonesia:

a. Earthquake: Last year in 2018 there were earthquakes which consumed many victims in North Lombok Regency, West Nusa Tenggara Province, Palu City, Donggala Regency, Sigi Regency, Central Sulawesi Province.

b. Tsunamis: earthquakes that occur at the end of 2018 in Central Sulawesi province cause tsunami waves that hit the city of Palu and are followed by liquefaction ground movements. And at the beginning of the year, a tsunami occurred along the west coast of Banten province and the southern coast of Lampung province as a result of an avalanche on Mount Anak Krakatau.

c. The eruption of the Sinabung Volcano in Karo District in the provinces of North Sumatra and Mount Agung in the province of Bali, has repeatedly erupted.

d. Floods, Flash Floods and landslides: High rainfall intensity and extreme weather in a number of regions in Indonesia also result in flash floods in
Padang Pariaman, West Sumatra. At the beginning of 2019 Mandailing Natal district took place in the North Sumatra province and Sentani district in the Papua Province. Floods and landslides in Sentani, Papua Province on 16 Maret 2019 which caused 112 deaths, 82 people were missing, and 965 people were injured. Losses and damages reached Rp 668 billion.

According to data from the National Disaster Management Agency (BNPB), in mid-2019 there have been floods in various places such as Konawe and North Konawe which have soaked 69 villages in 17 sub-districts, North Konawe District, Southeast Sulawesi.

The flood also forced 1,420 households or 5,111 people to flee. At least about 1,235 housing units were submerged and 185 other units were washed away. Damage to the agricultural sector includes rice fields covering an area of 970.3 hectares, 83.5 hectares of corn land and others 11 hectares. Whereas the land/pond fisheries sector covers 420 hectares. Even the Konawe Utara regional government has set a 14-day flood emergency response status starting June 2, 2019 until June 16, 2019.

During 2019, namely 1 January 2019 to 30 April 2019 in Indonesia there were a total of 1,586 disasters. The impact of the disaster caused 325 people died, 113 people were missing, 1,439 people were injured and 996,143 people were displaced and suffered. Physical damage included 3,588 heavily damaged houses, 3,289 moderately damaged houses, 15,376 houses slightly damaged, 325 damaged educational buildings, 235 damaged religious facilities and 78 damaged health facilities.

Statistically, compared to 2018 in the same period the incidence of disasters in 2019 increased 7.2 percent. In 2018 there were 1,480 disasters while 2019 occurred 1,586 disasters. For fatalities, there was also an increase of 192 percent where in 2018 there were 150 people died and disappeared while in 2019 the dead and missing victims were 438 people. Likewise the injured victims also increased 212 percent. Injuries in 2018 amounted to 461 people while in 2019 there were 1,439 people.

These natural disasters are in areas far from the origin of the disaster. The source of the epicenter is mostly located on the seabed far from the mainland or settlement and urban centers. The earthquake point measuring 7.4 on the Richter scale with a distance of 26 km north of Donggala with a depth of 10 km in Central
Sulawesi Province, was able to give a very wide effect to the mainland city of Palu, Donggala Regency, Sigi Regency and Parigi Moutong Regency.

Examples of affected areas with disaster resources

Based on data from the Central Sulawesi Provincial Government as of January 30, 2019, the number of dead and missing victims reached 4,402, of which 2,685 people died, 701 people lost and 1,016 victims were buried in mass. The highest number of casualties in Palu was Palu 3,679 people, then Sigi 405, Donggala 303, and Parigi Moutong 15. While the total damage to houses with mild, moderate, severe and missing categories of damage reached 100,405 units. The highest number for damage to houses is Palu, which is 42,864 units. The number of social facilities and public facilities, in the form of schools reached 1,299 in Palu, Sigi, Donggala and Parigi Moutong. Hospitals and health centers, total damage reached 325 units with categories of lost, heavily damaged, moderately damaged and lightly damaged.

The disasters that occurred in Palu City and three other districts, Sigi, Donggala and Parigi Moutong on September 28, 2018 caused tremendous losses. The total loss and damage caused by the earthquake, tsunami and liquefaction in Central Sulawesi reached Rp. 23.14 trillion and the budgetary needs for the better reconstruction of Central Sulawesi reached Rp. 36 trillion.

Indonesia as an archipelagic country located in the ring of fire area, with various active volcanic groups, fault areas (faults) which can move at any time, Watershed
areas (DAS) and combustible forest areas, is an area that does have high risk of disaster. Coupled with the influence of weather with two seasons that can cause floods, landslides and forest fires.

Indonesia Tectonic arrangement

**Tataan Tektonik Indonesia**

The question is whether the risk of natural disasters can be reduced .......? How to live and live comfortably in a disaster area......? Space will not increase, but population growth continues to increase. The migration of village residents to the city continues. Small towns grow into big cities. Cities and villages are increasingly united as big cities, big cities become metropolitan cities, and so on until there is no more land left. Even in cities in the highlands, such as Bandung, Bukit Tinggi, Semarang, population growth and the physical development of the city continue to grow up to the hillside. Even villages in various regions have become new growth centers. Forests as conservation areas become production forests into plantations and cultivation. Reclaimed beaches are places of settlement and commercial / shopping centers that are very attractive for investment. The Watershed (DAS)
which was originally a water catchment, became a place of residence. The agricultural area becomes the area of settlement and industry.

2. Spatial Audit Results

The acceleration of growth in a region brings very serious consequences to the function of space, especially if there is a natural disaster. Reflecting on the events of natural disasters that continue to increase and take casualties, property and environmental damage, then what needs to be seen is so far where is the spatial plan complied with and whether the spatial plan has been able to anticipate various threats of natural disasters that one day appears unexpectedly ...?

Based on the experience of the natural disaster events above and the identification of the results of the spatial audit the causes are:

a. Natural disasters occur because of changes in utilization of space functions caused by uncontrolled development (man made disaster).

1) Natural disasters occur in areas that are in accordance with spatial plans. These natural disasters include floods and landslides. The causes can be in the form of limited green open space, high density, lack of water absorption, poor drainage system, lack of water reservoirs (infrastructure).

2) Natural disasters can occur in areas that are actually in accordance with spatial planning but occur in other places which are referred to as affected areas. Natural disasters that occur such as floods and flash floods. The causes include damage to the upstream area and or limited infrastructure.

3) Natural disasters occur in areas that are not in accordance with spatial plans. This natural disaster occurred because of many violations and deviations from the spatial plan. Natural disasters include floods, flash floods and landslides. The reason is the change in the function of the catchment area and Watershed (DAS) into residential areas, mining areas, industrial areas, trade and commercial areas as well as agricultural land clearing and cultivation, and reduced green open space (RTH). In this area, natural disasters can have a broad impact and occur in other places that are appropriate or not in accordance with spatial plans.
b. Natural disasters occur because of natural disasters.

1) Natural disasters occur in areas that are in accordance with spatial plans and occur in the place of the source of the disaster, in the form of floods and landslides. The cause can occur because land cover exceeds capacity, environmental capacity and use of various functions (mix use).
2) Natural disasters occur in areas that are in accordance with spatial planning but far from the source of the disaster. The causes are earthquakes, volcanic eruptions and tsunamis.
3) Natural disasters occur in areas that are not in accordance with spatial plans and occur at the source of disasters. The causes are earthquakes, volcanic eruptions, floods and flash floods, landslides.
4) Natural disasters occur in areas that are not in accordance with the spatial plan, but far from the source of the disaster. The cause is flash floods, earthquakes, tsunamis.

3. Steps for Settlement

Based on the characteristics and patterns of natural disasters, the spatial plan at least accommodates the possibilities of a disaster that will occur. However, violations resulting from misuse of spatial plans can also contribute significantly to natural disasters.

The question is how to avoid and prevent loss of life and property, environmental damage and economic losses? and How to carry out supervision and control so that development in accordance with the spatial plan so that the risk of economic, social and environmental losses can be reduced?.....?

a. Development of disaster risk management

1) Coordination between institutions, between local governments, communities and the business world in regulating spatial plans needs to be integrated. The role of the provincial spatial plan is key in setting rules governing before the disaster, during disasters and after disasters. This is because natural disasters do not recognize the administrative boundaries of the regions.
2) Commitment and cooperation between local governments, communities and the business world need to be built in mutually beneficial synergies especially at the time after natural disasters occur. Efforts to implement
mutual function recovery and mutual benefit cooperation can be applied in accordance with local culture.

3) Openness of spatial plans in areas that are prone to natural disasters, by showing locations that are indeed vulnerable to natural disasters.
4) Community and business empowerment regularly and sustainably in areas identified as vulnerable to natural disasters, through the development of digital technology and social media applications.

b. Strengthening spatial plans in areas identified as vulnerable to disaster risk

1) Prepare rules for areas that are at risk of natural disasters and strict law enforcement in the form of strict application of sanctions and the provision of incentives and disincentives specifically for the area being built.
2) Implement rules of zones with zoning regulations and certain codes on areas that can be built, areas where development is limited, flowering that is in accordance with certain conditions and areas that are prohibited to be built clearly and explicitly.
3) Prepare guidelines for natural disaster management in the form of information on the roles, authorities, rights and obligations of all stakeholders that are clear and easy to understand in areas identified as vulnerable to natural disaster risk.
4) Develop tag line, movement to build community care about natural disasters and the formation of community groups in high risk areas due to natural disasters.
5) Prepare an early warning application for all residents located on disaster risk, according to zoning and types of disasters, through the development of digital technology applications connected with competent agencies such as the Geophisic Meteorology Climatology Agency (BMKG), National Search and Rescue Agency (BASARNAS) and National Agency Disaster Management (BNPB).
References: