Building Permit Regulation in Surabaya: A Review towards a Risk Management Perspective

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***Abstract*—Surabaya has various kinds of potential aspects both economic, demographic, and infrastructure support, so that attract the domestic as well as foreign investment. This economic activity was followed by the land use change that responds to the demand for housing and settlements. Not only horizontally, but vertical developments also began to develop marked by the increased number of high-rise buildings. To prevent uncontrolled building growth, building permit or Izin Mendirikan Bangunan (IMB) became one of the spatial control instruments in Surabaya. Apart from the economic aspect, Surabaya also has a potential risk of earthquake, which newly announced in 2017 by The National Earthquake Center. This paper aims to review building permit regulations in Surabaya from the perspective of potential earthquake risk management. It can be analtyzed based on structural, architectural, and building utilities requirements of building permit regulation. In order to build resilience against earthquakes, Surabaya need to modify the building permit requirements that refer to building resilience principles.**

Keywords—Building permit; regulation; Surabaya; earthquake;

I. INTRODUCTION

Surabaya as the second largest city after Jakarta intensively carried out development, in the context of economic, in the trade and service sector. At present, according to statistic data, the economic growth rate of this city is around 6.77% and is listed as one of the fastest developing cities in Indonesia. This growth has encouraged the development of higher economic values, increased urbanization, attracted investment, and increased physical development in urban areas.

This economic activity followed by land use change in responding to the demand for housing and settlements. The results of the land cover analysis show that residential area increased by 4,556.16 Ha (13.95%) for 14 years in 2001-2015 [1]. Also, to accommodate complex activities with limited land area, there is a demand for high-rise buildings. According to skyscrappercity.com, until 2019, at least 158 building units have been established. Unfortunately, this building growth tends to be random and spread throughout all parts of the city.

From a risk management perspective, these phenomena indicate risks because they have potentially increased vulnerability, especially earthquakes. Earthquakes can cause casualties, resulting in damage to the structure of residential buildings, high rise buildings, and infrastructure [2]. The direct impact when an earthquake occurs is building damage. For this reason, to prevent uncontrolled building growth and reduce risks in earthquake-prone areas, there must be an effective building control instrument.

The building permit or IMB, based on Minister of Public Works and Spatial Planning Regulation No. 05/PRT/M/2016, is granted by the regional government to building owners to build new, change, expand, reduce, and/or maintain the building according to the administrative requirements and applicable technical requirements. The purpose of IMB in the context of earthquake-resilient is that buildings can be well organised and meet the requirements of earthquake resistance, habitability, and minimise damage to earthquakes. For cities, IMB can be useful in realising optimal, balanced and harmonious city development or making resilient cities. This paper aims to review building permit regulations in Surabaya from the perspective of potential risk management of earthquake.

II. BUILDING PERMIT REGULATION

A. Surabaya City Development

Surabaya has a strategic position with the main function of trading and services is an area of ± 32,637.75 Ha. Based on Surabaya City Plan 2014-2034, land use dominated by the built-up area of 63%, unbuilt-up area of 27%, and green open space of 10%. The built-up area consists of housing, offices, trade and services, industry and warehousing, public facilities, and military areas. The population growth has increased significantly in the last dozen years. In 2001, it was 2.57 million. Then in 2017 it was 3.07 people or experienced a population increase of 506,531 people for 17 years.

This increased population was followed by land-use changes to respond to the demand for housing and settlements. According to the results of the land cover analysis, residential land area increased by 4,556.16 Ha (13.95%) [1]. From the broad development, it can be interpreted that 325.44 ha of land is converted into residential land annually. Instead, bushes gradually reduce the area's decline by more than 1,000 ha in the last 14 years.

The region that experienced the most significant land-use change was the western Surabaya and eastern Surabaya. Besides that, the trend of settlements, especially in the western region tends to be vertical. While the East Surabaya is more popular with settlements at affordable prices. The following figure 1 illustrates the comparison of the built-up and unbuilt-up areas in the City of Surabaya in 2001 and 2015.

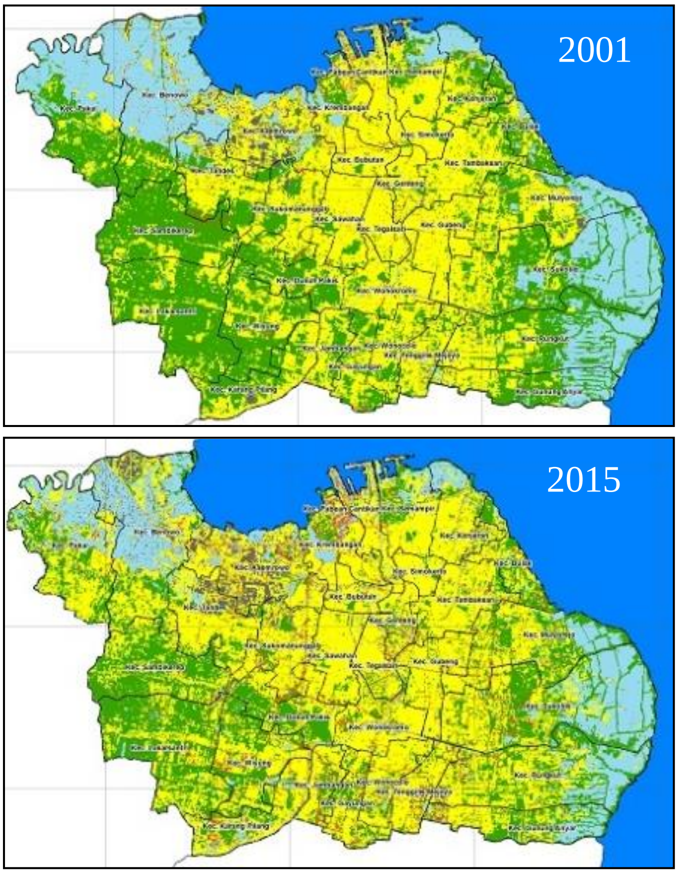

Fig. 1 Land Cover Map of Surabaya in 2001 and 2015

At present, Surabaya, as a metropolitan city, needs more land area to accommodate complex activities. However, limited land area is a problem because of land prices, availability of vacant land and land ownership. Thus, there is a demand for high-rise buildings. Until 2019, at least 158 building units have been established.

TABLE 1 HIGH-RISE BUILDINGS IN SURABAYA UP TO 2019

No.	Floors Number	Buildings Number (units)
1.	>12 – 15	51
2.	16 – 20	34
3.	21 – 25	15
4.	26 – 30	17
5.	30 – 35	10
6.	36 – 40	10
7.	41- 45	11
8.	46 – 50	5
9.	51 – 55	4
10.	>55	1
	Total	**158**

In the future, the number of high-rise buildings is predicted to increase dramatically. The number of IMB's as a certificate for legally building permit has indicated a significant increase in 2012-2015. The location of high-rise buildings spread throughout Surabaya shows an unclear pattern of development. This also shows that Surabaya's economic growth is still very promising and will spread to every corner of the city.

B. Building Permit in Surabaya

Regulations concerning Building Development refer to Law No. 26 of 2007 concerning Spatial Planning and Government Regulation No. 15 of 2010, carried out by the implementation of Building Permits (IMB). Referring to Surabaya City Governor No. 13 of 2018, the type of IMB service is for simple buildings, non-simple buildings, special buildings, and non-building buildings.

The IMB process in Surabaya City can be processed online through the Surabaya Single Window service (https://ssw.surabaya.go.id). IMB application process served by Integrated Service Unit or Unit Pelayanan Terpadu Satu Atap (UPTSA) and consists of 4 main processes, i.e. the required document submission, verification, mapping and measurement, then payment of retribution. In order to provide technical considerations in the process of organising buildings, including planning, implementation, utilisation, preservation and demolition, the Mayor forms a Building Expert Team. The building expert team consists of the building architecture, structure and construction fields, as well as installation and building equipment fields.

The requirements for the IMB application consist of administrative requirements and technical requirements. Technical requirements include general building data and technical building documents of buildings consisting of architectural plans, structural plans, and utility plans. Administrative requirements include applicant data, land data, as well as related documents and letters (including Keterangan Rencana Kota or Advice Planning, statements using basic earthquake-resistant requirements, statements using prototype designs, and statements using certified construction planners). Technical requirements include general building data and technical building documents for the building as follows (Table 2).

TABLE 2 TECHNICAL REQUIREMENTS OF BUILDING PERMIT

No.	Technical Requirements	Type of Buildings		
		simple buildings	non-simple buildings	special buildings
1.	General building information	a. Name of building; b. Building address; c. Building function and/or classification; d. Building floors; e. Ground floor area; f. Total floor area; g. Building height; h. Building position.	a. Name of building; b. Building address; c. Building function and/or classification; d. Building floors; e. Ground floor area; f. Total floor area; g. Building height; h. Basement area; i. Basement floor area; j. Building position.	a. Name of building; b. Building address; c. Building function and/or classification; d. Building floors; e. Ground floor area; f. Total floor area; g. Building height; h. Basement area; i. Basement floor area; a. Building position.
2.	Technical document plan	Architectural plan requirements		
		Simple 1 floor buildings: - Simple 2 floors buildings: a. Site plan; b. Floor plan; c. Visible image; d. Cut image	a. Site plan; b. Floor plan; c. Visible image; d. Cut image; e. Architectureal detail images; f. General specifications of building construction. g. The architectural plan must contain plans for providing facilities and accessibility for persons with disabilities in accordance with the laws and regulations	a. Site plan; b. Floor plan; c. Visible image; d. Cut image; e. Architectureal detail images; f. General specifications of building construction. a. The architectural plan must contain plans for providing facilities and accessibility for persons with disabilities in accordance with the laws and regulations
		Structural plan requirements		
		Simple 1 floor buildings: a. Fulfill the basic earthquake resistance requirements; b. Using a simple one-story building building prototype designated by the government; c. In the case of not using a prototype design, the applicant must provide a technical plan document drawn by the construction planner or the applicant with a simple picture with complete information Simple 2 floors buildings: a. Foundation plan including the details; b. Sketch plan of columns, beams, plates and details; c. Using a simple 2-floor building building prototype designated government	a. Calculation of structure for buildings with heights ranging from 3 floors, with a structure span of more than 3 meters, and/or having a basement; b. Results of land investigation; c. Foundation plan including the details; d. Sketch plan of columns, beams, plates and details; e. Sketch plan of roof truss, cover, and details; f. General structure specifications; and g. Special specifications. h. In case the building has a basement, the structure plan must be accompanied by a basement plan drawing including the details i. In the event that the specification has a model or test results, the model or test results must be included in the structure plan.	a. Calculation of structure for buildings with heights ranging from 3 floors, with a structure span of more than 3 meters, and/or having a basement; b. Results of land investigation; c. Foundation plan including the details; d. Sketch plan of columns, beams, plates and details; e. Sketch plan of roof truss, cover, and details; f. General structure specifications; and g. Special specifications. h. In case the building has a basement, the structure plan must be accompanied by a basement plan drawing including the details i. In the event that the specification has a model or test results, the model or test results must be included in the structure plan.
		Building utility plan requirements		
		Simple 1 floor buildings: - Simple 2 floors buildings: a. Sketch of a sanitation system consisting of a system of clean water, dirty water, liquid waste, and solid waste; b. Electrical network image consisting of source, network and lighting images; c. Sketch of rainwater management and drainage systems in the site.	a. Utility calculation consisting of calculation of clean water requirements, electricity needs, storage and processing of liquid and solid waste, and rainwater management burden; b. Calculation of noise level and/or vibration; c. Sketch of a sanitation system consisting of a system of clean water, dirty water, liquid waste, solid waste, and solid waste; d. Sketch of rainwater and drainage management systems on site; e. Sketch of an electrical installation system consisting of images of electricity, network and lighting sources; f. Sketch of a fire protection system that is adjusted to the level of fire risk; g. Sketch of natural and artificial ventilation systems; h. Sketch of a vertical transportation system; i. Sketch of internal and external communication system; j. Sketch of a lightning protection/protection system; k. General specifications of building utility utilities.	a. Utility calculation consisting of calculation of clean water requirements, electricity needs, storage and processing of liquid and solid waste, and rainwater management burden; b. Calculation of noise level and/or vibration; c. Sketch of a sanitation system consisting of a system of clean water, dirty water, liquid waste, solid waste, and solid waste; d. Sketch of rainwater and drainage management systems on site; e. Sketch of an electrical installation system consisting of images of electricity, network and lighting sources; f. Sketch of a fire protection system that is adjusted to the level of fire risk; g. Sketch of natural and artificial ventilation systems; h. Sketch of a vertical transportation system; i. Sketch of internal and external communication system; j. Sketch of a lightning protection/protection system; k. General specifications of building utility utilities.

C. Potential Risk of Earthquake in Surabaya

Based on the earthquake map information that was just released by the Indonesian National Earthquake Center or Pusat Gempa Nasional (PUSGEN) in 2017, the city of Surabaya is included in the area prone to tectonic earthquakes. PUSGEN has released a new version of the earthquake map, which contains information on Surabaya. It has a potential earthquake threat that has increased significantly. The potential of tectonic earthquakes which are these land earthquakes are the result of the Surabaya Fault and Waru Faults which were not previously identified. The Surabaya Fault and Waru Fault have been known by experts for a long time and are part of the Kendeng Fault that extends from Flores (NTT) to Bandung (West Java).

The shift and movement of the Surabaya Fault and Waru Fault passed the southern part of Surabaya and crossed 300 km from East Java and could threaten the future development of Surabaya City [3]. Surabaya fault and Waru fault move at a rate of 0.05 mm per year. This fault zone has the potential to cause earthquakes 6.5-7.5 RS [4]. The following is an active fault distribution map in the city of Surabaya.

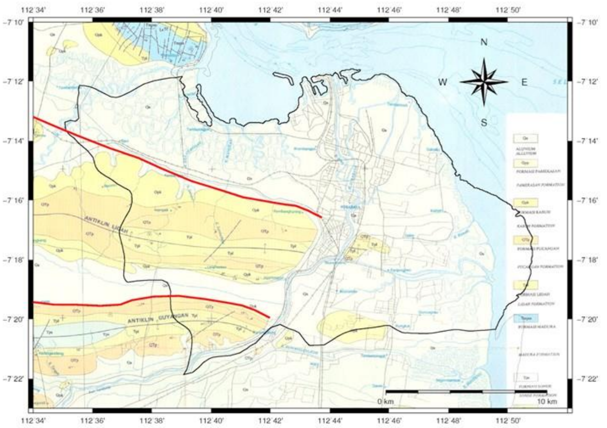

Fig.2 Surabaya Fault and Waru Fault Geological Map

Surabaya fault extends from the hills of Wonokitri, Mayjen Sungkono to the Cerme Gresik area. Whereas the longer Waru fault passes Rungkut, Sidoarjo, Mojokerto, Jombang, Nganjuk, Saradan, even to Cepu. Also, earthquake history data shows that Surabaya had the potential risk of earthquakes with a scale between MMI VI-VII even though the epicentre wasn't in Surabaya. The closest epicentre was in Sidayu with a scale of VI MMI in 1902 and Mojokerto with scale VI-VII MMI in 1937 [5]. With this scale, the level of potential earthquake hazard seen from the impact can be categorised into small to moderate hazards.

However, based on the land study, the city of Surabaya is dominated by soil types, which cause the possibility of large amplification, which is worth 1.1-1.87 [6]. This large amplification level will facilitate the propagation of earthquake vibrations and cause considerable damage [7]. With large amplification, the level of vulnerability of cities to earthquake hazards can be classified in the medium to high category. Seeing the level of hazard and the level of vulnerability, the pattern of earthquake risk in the city of Surabaya is included in the medium to high potential risk.

III. DISCUSSION

Earthquakes are a type of disaster that has a direct impact on buildings so that the resilience approach used is building resilience. Thus the efforts made to reduce earthquake risk are through the integration of the building resilience concept in the regulation of building permit. The policy formulated by the government shows its capacity to solve problems, including seismic problems.

Conversely, the direction of city development has not been supported by policies that are sensitive to the potential risk of earthquakes. Judging from the aspect of government capacity, the results of the assessment of the relevance of land development control instrument of Surabaya in making resilient city show a value of 2.4 (on a scale of 1-5) which means that Surabaya is not ready for reducing earthquake risk [8]. Surabaya's land development control instruments haven't been mainstreaming disaster risk reduction and less relevant in making Surabaya's resilient.

This unpreparedness of the Government can be seen from the policy of establishing buildings at the local level (Regional Regulation No. 7/2009 in conjunction with Regional Regulation No. 6/2013 concerning Buildings and Surabaya Mayor Regulation No. 13/2018 concerning Technical Guidelines for Building Permits) that have not mainstreamed earthquake risk reduction in the requirements for building permits (IMB). At the national level, several rules for building construction have taken into account the seismic aspects of Law No. 28/2002, Government Regulation No. 36/2005, Minister of Public Works Regulation No. 29 / PRT / M / 2006, and SNI 1726: 2012 (the process is being updated in RSNI 1726: 201x). It regulates the technical requirements for building development at the national level, including architectural, structural aspects, and building utilities. These regulations need to be assessed for their relevance in reducing the potential risk of an earthquake. Then the gap between the applicable regulations and the criteria for building resilience to the earthquake was identified to produce a more rigid seismic-based building permit regulation recommendation at the local scale according to the seismic risk characteristics in Surabaya.

IV. CONCLUSION

Requests for a building permits are based on structural, architectural, and building utility requirements divided into three types of buildings, i.e. simple buildings, non-simple buildings, and special buildings. To build resilience against earthquakes, it is necessary to modify the building permit requirements that refer to building resilience principles. This study views the potential risk of earthquakes in Surabaya as an urgency to review current regulations regarding building permits. Thus, it is important to formulate the concept of building permit in Surabaya, which is oriented to reducing the potential risk of earthquakes.

ACKNOWLEDGEMENT

The article is a part of various steps of research programs funded by Institut Teknologi Sepuluh Nopember. We thank our colleagues for full support related to finishing this paper.

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