

CONDITION OF URBAN PHYSICAL ELEMENT IMPACT ON LAND SURFACE SUBSIDENCE IN PANGLIMA SUDIRMAN CORRIDOR, SURABAYA

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ABSTRACT

Surabaya is the second largest city in Indonesia and has been categorized as a metropolitan. The development of Surabaya is quite fast in terms of physical development. One of the corridors in Surabaya city centre is Jalan Panglima Sudirman. The corridor is a high density mixed-used area, dominated by commercial and service such as office retails and hotels. From the measurement, it was found that land subsidence happened at Jalan Panglima Sudirman which in the future will impact on environmental physical condition at the location. Therefore, observation of certain items mainly related to urban physical element impact on land subsidence was important. The result expected is the visibility of urban physical element impact in land subsidence at the corridor of Jalan Panglima Sudirman Surabaya.

Keywords: *Jalan Panglima Sudirman corridor, urban physical elements, land subsidence*

ABSTRAK

Surabaya adalah kota terbesar kedua di Indonesia dan dikategorikan sebagai metropolitan. Perkembangan Surabaya cukup pesat dalam hal perkembangan fisik. Salah satu koridor di pusat kota Surabaya yaitu Jalan Panglima Sudirman. Koridor ini merupakan kawasan mixed-used dengan kepadatan tinggi yang didominasi oleh area servis dan komersial seperti hotel dan kantor sewa. Dari pengukuran, ditemukan bahwa pengurangan lahan terjadi di Jalan Panglima Sudirman yang mana di masa depan akan membawa pengaruh pada kondisi fisik pada lokasi tersebut. Oleh karena itu, observasi terhadap hal-hal tertentu terutama yang berkaitan dengan pengaruh elemen fisik kota dalam pengurangan lahan penting dilakukan. Hasil yang diharapkan adalah diketahuinya pengaruh elemen fisik kota dalam pengurangan lahan di koridor Jalan Panglima Sudirman Surabaya.

Kata kunci: *koridor Jalan Panglima Sudirman, elemen fisik kota, pengurangan lahan*

INTRODUCTION

Surabaya is the second largest city in Indonesia after Jakarta. Based on data recorded by Department of Population and Civil Registration until December 2007, Surabaya population is 2.861.928 people. Surabaya is an old city which in time has been developed as it is known today. In earlier times, people live in kampung with population growth rate 1.2% per year.

Surabaya had been developed rapidly in a period of 30 years (1970-2000) along with the emergence of various land use which impacted to building types, whether high-rise buildings (more than 2 stories) or low-rise buildings (1-2 stories).

One of city centre's corridors is Jalan Panglima Sudirman. The corridor is the city main circulation line and is classified as part of primary road network. One of the center or node of the corridor is the Bamboo Monument, an icon of Surabaya. The location of research object is Jalan Panglima Sudirman with observation point is at Bamboo Monument.

The area around Bamboo Monument has a high density of high-rise buildings and one of commercial and economy activities in Surabaya. Types of land use and activities in this area are dominated by offices and trade-services based on the city master plan (RTRW) and the city spatial planning (RTRK) of Surabaya. The trade and service occurred in that area includes hotels, automotive showrooms, restaurants, and stores. Meanwhile, the office buildings include private office such as banks, travel agencies, and advertising agencies. Besides offices and trade-services, there are also some old settlements on the east and the west side of the Bamboo Monument. The settlements are mostly located on Jalan Embong Kenongo, Jalan Embong Tanjung, and Jalan Embong Trengguli.

Generally, urban physical element conditions (Shirvani) – which includes land use, building form and massing, circulation and parking, open space, pedestrian way, and supporting activities – in Panglima Sudirman corridor show changes that impact the corridor environment. One of those impacts is the land subsidence on Panglima Sudirman corridor in the period of 2007-2010 as much as -3.7 cm or -1.2 cm a year (Handoko, 2010).

THEORY / RESEARCH METHODS

Urban physical element according to Hamid Shirvani was divided into 8 elements:

1. Land use
2. Building form and massing
3. Circulation and parking
4. Open space
5. Pedestrian way
6. Signage
7. Supporting activities
8. Preservation

In urban planning, soil quality is a quite important element because determining the building function in urban area depends on the existed soil condition factor. According to Garret Eckbo on Open Space and Land Use, it is described that land use planning in a new understanding is the key to control the quality of physical environment, and the basic land uses are residential, commercial, industry, corridors, utilities, and open space (Lovejoy, 1973).

There are types of land subsidence (Abidin, et.al, 2006), namely:

1. Land subsidence as a result of groundwater abstraction;
2. Land subsidence due to the effect of urban load;
3. Land subsidence caused by the consolidation of alluvial soil; and
4. Land subsidence as a result of geotectonic process.

In Indonesia, land subsidence in urban area is commonly caused by excessive groundwater abstraction (Abidin, et.al, 2006). Land subsidence due to the effect of urban load was explained by Abidin et.al. (2006). Almost every building was erected on the ground surface that make the land has an important role in a construction site. Additional load on the ground surface may cause the layer beneath suffered decompression. The decompression was caused by the soil particle deformation, particle relocation, the discharge of air or water from the soil pores, and other causes that is strongly associated with the regarding soil condition and quality. This decompression process in the end caused the land subsidence. Besides, the change of land use may also cause change in numbers and loads of buildings that will accelerate the land subsidence. Figure 1 shows the land subsidence scheme.

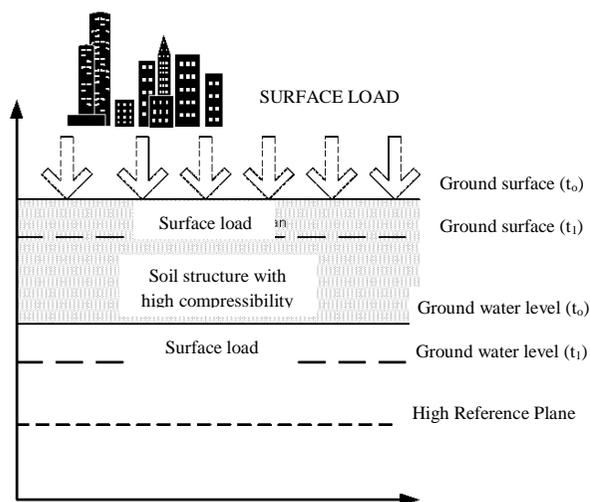


Figure 1. Land Subsidence Scheme

Source: author

Research Methods

Analysis was conducted by using evaluation technique. Evaluation method based on Jones (1992) was used as an analysing method to identify Shirvani’s urban physical elements – land use, building form and massing, circulation and parking, and open space – on Jalan Panglima Sudirman corridor. This identification was then used to evaluate the municipal policy and the result of land subsidence measurement. The urban physical elements – pedestrian way, signage, supporting activities, and preservation – was not included in this research.

RESULTS AND DISCUSSION

Land Use

From the observation, it was found that there are changes of land use from residential to commercial as how it was defined in Surabaya master plan and spatial plan. Building forms that were emerged after the land use change are high-rise buildings that will bring impact to the soil load. Recent land use are shown in Figure 2.



Figure 2. Land Use Map in Panglima Sudirman Corridor

Source: Dinas Tata Ruang dan Bappeko Surabaya

Building Form and Massing

According to the spatial plan in the area, the Lot Coverage should be 50% and building height should be 2-5 stories. However, there were many plots at Jalan Panglima Sudirman that have Lot Coverage more than 50%. Mostly, those are residential buildings modified to non-residential with Floor Area Ratio (FAR) 100% with 2-5 stories high even more. Changes of building condition from low-rise building to high-rise building as a result of land use change brought changes of building structure and eventually impact the soil surface load. The intensity of continuous high-rise building usage also resulted in building structure imposition to soil surface. Fi-

Figure 3 shows the spots of high-rise buildings while Figure 4 shows some examples of high-rise buildings at the corridor.



Figure 3. Location Map of Tall Buildings in Panglima Sudirman Corridor
Source: Google Earth



Figure 4. Some High Rise Building in Panglima Sudirman Corridor
Source: Google and field survey

Circulation and Parking

Circulation in Jalan Panglima Sudirman corridor was road for vehicles with a width of 20 meters and was divided into 2 (two) lines of one-way track system (see Figure 5). The classification of this corridor was categorized as main road. With this category, the road then had a high density of vehicle circulation. Road circulation density mostly happens every morning and evening. Thus, the load caused by the vehicle movement happens daily at those times.

Parking lot in the observed area was located on each buildings site. There were 3 (three) buildings owned basement parking (see Figure 6). Basement parking

are generally owned by those with 2 (two) stories or more. Those buildings with basement will impact on additional building load because the structure used is heavier and directly impact on soil surface endurance.



Figure 5. Vehicle Circulation in Panglima Sudirman Corridor
Source: Google and field survey



Figure 6. Building with Basement Node in Panglima Sudirman Corridor
Source: Google and field survey

Open Space

There were two types of open space on Jalan Panglima Sudirman corridor, namely open space on building site and on median (see Figure 7). Open spaces on building site were mostly hardscapes. Greeneries were only in the form of potted plants while open spaces on boulevard divider were in the form of greenways. Based on that condition, it can be said that the corridor was lack of open spaces, especially green open spaces that supposed to be used as water infiltration area.



Figure 7. Open Space in Center of Panglima Sudirman Corridor
Source : Google and Survey Documentation)

CONCLUSIONS

At Panglima Sudirman corridor, the land use is rapidly change from majority of residential into commercial and service area. The transformation from low-rise building to high-rise building gives impact on soil surface load. Furthermore, the continuous usage of high-rise building also brings impacts to structural load and eventually to the soil surface. Beside that, buildings that are used as trade and service (especially hotels and offices) give impact on groundwater usage in the area since the piped water cannot fulfill the needs. Moreover, the area is lack of green open spaces that can be used as water infiltration.

As a corridor located on urban center and functioned as trade and service area, there are many transportation modes that come across the corridor, mainly in the morning and afternoon. The daily load from the road caused by vehicles crossing will impact the soil load as well.

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