Inventory of old buildings and land subsidence in Semarang Old Colonial City

R S Rukayah¹, A B Sardjono², Abdullah M³ and A M A Aziz²

¹ Architecture and Urban Planning PhD Program, Department of Architecture, Universitas Diponegoro, Semarang, Indonesia
² Department of Architecture, Faculty of Engineering, Universitas Diponegoro, Semarang, Indonesia
³ Indonesian Literature, Universitas Diponegoro, Semarang, Indonesia

tututrsiti68@gmail.com

Abstract. There have been many researches on the conservation efforts of historical cities. The building inventory stage is the first step in conservation efforts to protect buildings from the past in order to have benefits in the present. This paper provides some data on buildings that undergo land subsidence in historical areas. Semarang Old City is a historical area built by the Colonial government in the 17th century. After nearly 320 years, some of these buildings have been damaged. This research, which focuses on buildings damaged by land subsidence will collect data from 245 existing buildings in 40 ha area. The approach method uses historical buildings, photos of old buildings, and field surveys. Several old buildings have been detected to be decreased in height due to land subsidence. This can be seen by comparing photos of old buildings from the past and the present. The research analysis uses sketches and photoshop to provide information on how much the height is decreased visually. This inventory results will be able to give advice to the government regarding the appropriate conservation actions to take in an area experiencing land subsidence. This research will also help preserve buildings and environment according to current and future needs in order to preserve their cultural meaning.

1. Introduction

World Heritage City is a city designated by UNESCO which has "Outstanding Universal Value/OUV" based on "The Convention Concerning the Protection of the World Cultural and Natural Heritage 1972". Several cities in the world are included in the list of heritage cities which are expected to have an impact on economic, social and environmental sustainability [1]. In the Charter for the Preservation of Indonesian Heritage Cities, it is stated that a heritage city is a city or district that has superior inheritance assets in the form of knitted sustainable natural and cultural heritage which includes physical (artifacts, buildings and areas with open spaces), life, economy and socio-culture elements [2].

Heritage cities are assets that must be preserved wisely in ways that are not destructive so as to provide the greatest possible benefit for the preservation of their environment and society. Nowadays, heritage cities need to be preserved because they have the potential for socio-cultural value which is an important element for the growth of a region and city [3]. The main reason why heritage cities need to be preserved is because these heritage cities have important values, including: national identity, historical, environmental, social, political, ideological, economic and cultural values which if managed optimally.
One of the heritage cities in Indonesia which is located in the Semarang City is the Old City. Old City stores a lot of Indonesian history from when it was colonized by the Dutch. The area which is filled with old buildings with high architectural value has become a cultural heritage of Indonesia to be conserved. The efforts to preserve the Semarang Old City have been quite successful to become a tourist destination [4]. This is different from the conditions when in the 1990 this area was still a slum area. However, until now, apart from the aforementioned potentials, Old City has not escaped the threat of rob flood and land subsidence. This is rarely a discussion for the emphasis on conservation which, as mentioned above, still only emphasizes the visual and physical aspects.

The rob flood is an indication that the land level in the area is below sea level. Every time there is a high tide (rob), a part of Semarang City, especially the 3,100 ha coastal area, will be flooded [5,6]. Meanwhile, the symptom of land subsidence, which is located near the coast, also threatens the overflow of sea water inland. In the Subdistricts of Genuk, Gayamsari, North Semarang and East Semarang, land subsidence from 0-2 cm/year to >8 cm/year occurs in areas where rob flood happen [7–9]. Regarding this issue, this paper aims to reveal the symptoms of rob flooding and building subsidence in the Semarang Old City. The benefit of these findings is that the preservation efforts of heritage city which has been quite successful by focusing only on the visual aspect will now also pay attention to environmental and building vulnerabilities to disasters. Therefore, from the start there have been efforts to handle buildings against disaster aspects. The global benefits are the impact of preserving heritage cities for economic, social and environmental sustainability.

2. Methodology
To carry out an inventory of old buildings that undergo building subsidence, the researchers took a historical approach by searching for old archives in the form of photos and maps. Old photos of the building were obtained from kitlv.nl. Old photos depict the condition of the building in the past. The method used is to compare old photos from Dutch archives such as from kitlv. The photographs were taken in the 1900. The photo will be compared with the conditions in the field. The age of the building will also be a consideration in determining the influence of land subsidence that occurs each year. The buildings that are used as samples are buildings that became icons and had unique architectural characters. The buildings are the ones that are still standing firmly to this day, including the GPIB Immanuel Church (Blenduk Church), Cianjur Grilled Fish, Mandiri Bank and Cigarette Factory building.

3. Results and discussion
Semarang Old City is located in Bandarharjo District, North Semarang Subdistrict, with an area of approximately 0.3125 km2 (+31 ha) [10]. The boundary of the Old City of Semarang is in the north, it is bordered by Merak Street (formerly “NorderwalStraat”) and Tawang Station. In the East, it is bordered by the Cendrawasih Street (formerly "OosterwalStraat"). In the south, it is bordered by Sendowo Street. In the West, it is bordered by Mpu Tantular Street (formerly “WesterwalStraat”) and along the Semarang River. The Semarang Old City was once a fortress city which was a residential area specially for the Dutch (see figure 1). The Old City center is currently known as the Old City (Oude Staat) area of Semarang. Old City is designed in a concentric pattern with Paradeplein as the nodes which is the central plaza with churches and all trading activities along the roadside. The city is also known as "The Little Netherland" [11] because the Old City has European-style buildings.

The Old City area is also a Dutch residential area that is well planned and equipped with various facilities and infrastructure [12,13]. Apart from the beauty of European-style architecture, the Semarang Old City is also an administrative and financial area related to agricultural products as well as being a military base [14,15]. This means that administrative and economic activities also rely on this area. The city seems to be split in two by Heerenstraat, which is part of the de groote postweg network that was built during the reign of Governor General Daendels. The Old City stores a lot of Indonesian history from when it was colonized by the Dutch. The area which is filled with old buildings with high architectural value has become a cultural heritage of Indonesia that should be conserved. The number of buildings in the Kota Lama area are 245,177 of which are privately owned (72% of the total).
3.1. Blenduk Church

Belenduk Church is now more than 200 years old and is located on Lieutenant General Suprapto Street. This building is one of the old buildings that stands majestically among other colonial architectural buildings, and is often dubbed the “tetenger” or “landmark” of the Old City. There is no doubt that Blenduk Church has the attractiveness from both history and architectural aspect because of its unique and elegant style [16]. This church was built in 1753 and is now one of the oldest Christian churches in Indonesia. Its neo-gothic architecture shows that there is a European touch to the construction process [17]. Overall, Blenduk Church is still well maintained. Parts of the building have not been remodelled in recently. However, the decrease in height still occurred on the physical building due to rob flooding. Rob flooding causes land subsidence which resulted in a slight decline, although not significant but is still very clear. In figure 2, it can be seen that initially the entrance of the building has several stair treads but when compared to figures 4, the doors and columns of the building show that there is a slight decrease in height of up to 30cm. In figure 5, the photo comparison shows that the existing photo has a shorter door height compared to the old photo. As is the case in figure 6, the column feet from the existing photo have fewer traps and appear shorter compared to the old photo.

![Figure 1](maps.library.leiden.edu)  

**Figure 1.** The establishment of fortress city on the land of former ocean which became Semarang’s mainland; (a) Before the Sedimentation in the 8th century, (b) The arrival of Chinese traders in the 14th century, (c) The construction of Vijfhoek Fort in 1709. (maps.library.leiden.edu)

![Figure 2](kitlv.nl)  

**Figure 2.** The past Blenduk Church and its land subsidence sketch. (source: kitlv.nl (left))
3.2. Cianjur Grilled Fish

Cianjur Grilled Fish occupies a building that is more than 200 years old which makes this restaurant has an added value. This building which was founded in 1760, was once a special district court building to try non-European people (Rad Van Justitie). This building was one of the main elements of the city at that time. This is evident from its position on the side of the main road Heerenstaart and adjacent to Paradeplein. Before being used as a court building, this building was used as a residence until after independence. Then around the 1970s this building was used for the Semarang district court office and the homes of class I and II employees. After the building was abandoned, this building could not function optimally again. It was then converted into a restaurant in 2006 [18]. This building has a fairly wide window openings with almost the same proportions of windows openings and walls. In general, while the exterior lighting is only in the form of signage and does not affect the character of the facade [19]. In figure 7 it can be seen that this building has also decrease in height by 20–40 cm.
3.3. Bank Mandiri
Bank Mandiri building was formerly the office of the *Nederlandsche Handel-Maatschappij* (NHM), which is one of the largest corporations during the Dutch East Indies colonial period. This building began construction on August 2, 1908, the declaration of the first stone was carried out by Gerda van Sraaten as written on the inscription inside the building. *Nederlandsche Handel-Maatschappij* (NHM) was a company that was founded in 1824. This company is a new form of the VOC, which was dissolved in 1799. NHM was an association of traders in colonial era, perhaps similar to the chamber of commerce in the present. NHM is dominated by traders of agricultural products. Until now Bank Mandiri is still well maintained, but in fact there is a decrease in height of 20cm. It can be seen there is a slight decrease in height that on the bottom of the building at the entrance area. Bank Mandiri has several stair treads but now there's only 1 left (see figure 9).

![Figure 6. Illustration of the decline of Cianjur Grilled Fish Building. (source: kitlv.nl (left))](source: kitlv.nl (left))

3.4. Prau Layar Cigarette Factory
In the Old City’s Tawang Polder area, to be precise on Merak Street, there is a Praoe Lajar (Prau Layar) cigarette factory, which has been operating for a long time, until now. Praoe Lajar Cigarettes Factory is one of the few cigarette factories from Semarang that has survived amidst the large corporations onslaught of the national cigarette industry. This cigarette company, which claims to be the Fishermen's
There are no changes to the front of the building, only the addition of the Praoe Lajar Cigarette Factory signboard on the front side of the building facing the polder. In addition, there are very significant changes due to road elevations caused by flooding at the building site so that there is a decrease in height of the building by 50-60cm (see figure 11). The entrance door to the building is now only left with two door hinges which used to have three or four hinges. There is also a slight change in the first floor of the building where almost half of the floor has been elevated.

![Figure 9. Comparison of Praoe Lajar Cigarette Factory in the past and present. (source: kitlv.nl)](left)

4. Conclusion
The decrease in height of several buildings in Semarang Old City area has become a warning tool for the environment about land subsidence disaster. Symptoms that are not felt because they occur slowly and are formed for a long time result in analysis and conclusion of wrong treatment. Improvement of drainage management and water disposal infrastructure as well as polders is the answer to solving rob problems. The main problem in the Old City area is that it is the lowest area in Semarang City. Efforts to raise the road elevation by the government will cause the condition of the building to be below the road level. Based on data in the field and comparisons with old photos, some buildings have experienced land subsidence. This depth of building subsidence ranges from 20 cm–90 cm. Despite all that, the revitalization activities carried out by the Semarang City government have been quite successful in changing the image of a slum building to be neater and more organized.

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