

Vernacular Architecture in Settlements near Water: Stilt Style Architecture Surrounding the Old Demak Swamp of Indonesia

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Abstract

There are several colonial and pre-colonial panggung/stilt buildings in the old Demak city center. They are now cultural heritage buildings. According to historical records, the sultanate of Demak (Present-day Demak city center) was the first Islamic maritime kingdom in Java in the 15th century. During the Demak sultanate, the area was often flooded. The Dutch colonial records show that the old Demak area was a swamp. This phenomenon appeared when they built the postal road. They reveal appropriate building designs for the swamp areas. It is assumed that the local communities and the Dutch colonial government built stilts to adapt to the frequently flooded areas.

The Demak area used to be on the edge of the strait that united the islands of Java and Muria. The loss of the waterway means that Demak no longer has a sea. Old records reveal that the Muria strait was then passable by ships. Bujangga Manik's notes show that Demak was a swampy area, often flooded until the King ruled from Prawata during the flood season. Now the area has become a densely populated area. The old records emphasize the environmental conditions of the swampy soil. However, no research discusses the architecture of the wooden stilts.

This research aims to uncover the wooden stilt buildings. It focuses on the design of the stage building in the 18th century, which represents the concept of stilts built by the local people and the Dutch colonialists in Indonesia.

The stage building is to the South, North, and East of the old Demak center. It has survived to this day and has been used by people from the past to the present. It shows the distribution of old buildings made of wood and shaped like stilts. A stilt model house design is adaptive to the swampy areas.

The research uses grounded theory within a historical approach and employed field surveys. It concludes that the stilts show community wisdom that need to be conserved and can be used as a model that can be applied to coastal geological disaster areas

Keywords: Demak, panggung/ stilt building, Dutch colonial Architecture, tidal flood, swamp

Introduction

In addition to threats caused by geological factors, Indonesia also faces hydro-meteorological threats triggered by global climate changes. These hydro-meteorological

threats include floods, landslides, droughts, forest and land fires, extreme weather and climate, extreme waves/dangerous sea waves and abrasion. Hydro-meteorological threats that cannot be overcome and managed by their potential impacts can become disasters that cause casualties, economic, social, and cultural losses, infrastructure damage, housing and settlement damage, environmental damage, and other development outcomes.

The flat and low topography makes Demak, the central Java, Indonesia prone to tidal flooding. There is a lack of information about map data of coastal areas affected by the tidal floods in Demak. However, the Department of Housing and Settlement Areas is making efforts to optimize information about map data of coastal areas affected by the tidal flooding in Demak based on the GIS (Geographic Information System) (Fig. 1). This office collected data on the condition of infrastructure in the coastal areas in the Demak area, which were affected by tidal floods and identified needs. Referring to the satellite data collected for 20 years by ITB (Institut Teknologi Bandung), sea level rise in Indonesian waters is estimated at around 3 - 8 mm per year. Meanwhile, land subsidence is estimated to be more drastic, ranging from 1-10 cm per year. In some places, the decline reached 15-20 cm per year.

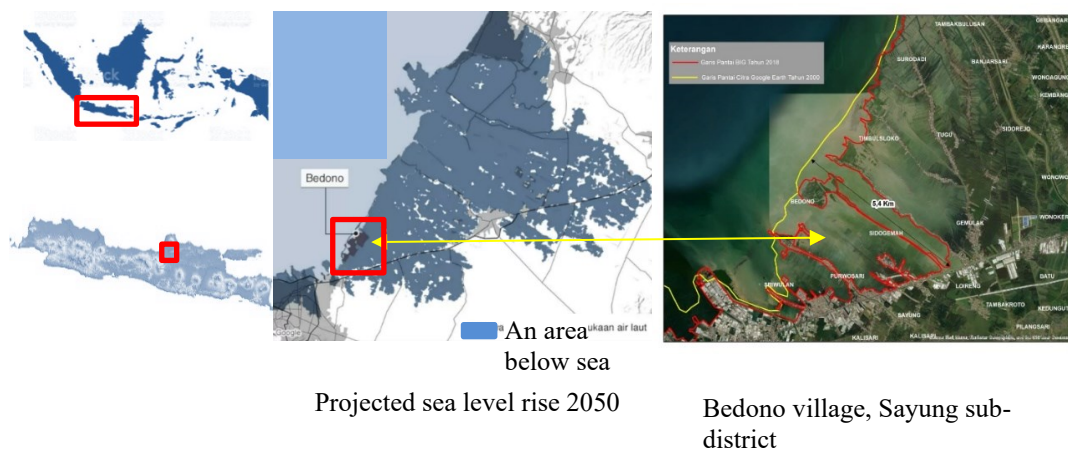


Fig. 1: The sinking of two villages in the Sayung sub-district in Demak and predictions of rising sea levels that will make some areas below sea level by 2050
Source: Projected Sea Level Rise 2050, n.d.

The map above shows a projected sea level rise in 2050. Meanwhile, Senik and Tambaksari hamlets in the Bedono Village, Sayung District, Demak, Central Java, located on the North coast have been submerged by high tidal floods (Fig. 1). The disaster forced hundreds of families living in the area to be relocated. Not only are two hamlets in Demak missing from the civilization map, but other hamlets on the North coast also have the same fate as Dusun Semut in Pekalongan, which is waiting for relocation due to tidal flooding. Around 1,473 hectares in Demak were affected by abrasion. The results show that 1,174 hectares of 4,563 hectares of mangrove plantations have been damaged in Sayung Karangtengah, Bonang, and Wedung Districts. Mangrove plants no longer reduce the existing land.

Currently, the number of residents living in the Bedono Village has decreased by 50% from previously 4,000 households to 2,000 households. The map in Fig. 1 shows the area that will be submerged in 2050. Due to land subsidence and tidal flood, the place that used to be the Muria Strait (Fig. 2b) is again inundated with water.

Sedimentation and tidal problems on various coasts of the world have predicted that several cities will sink, including Jakarta, Semarang, Surabaya, Demak, and Pekalongan. The small town of Demak has a high subsidence rate compared to the three cities (Suryanti & Marfai, 2016). Two villages on the coast of Demak have disappeared, and the coastline is advancing inland (Afif et al., 2018). Van Bemmelen, a geologist, stated that the city on the northern coast of Java is located on young alluvial soil (Bemmelen, 1949).

On this young alluvial soil, the city of Demak is growing. The city center is on the edge of the estuary of the strait at Muria in 1478. Evidence as a maritime empire, the Demak sultanate once sent its fleet to attack the Portuguese in Malacca. In the 17th century, the Muria strait was lost, and the City of Demak no longer had a sea due to a sedimentation process that had united the Java Island with the Muria Island. The problem of geological disasters and civil war is suspected of causing the collapse of the Demak sultanate. Traces of the palace, which characterizes it as a traditional city in Java were not found. As an Islamic city, Demak also has a component of Islamic cities in Java which has four elements, namely the palace (South side), the square (the traditional city square in Java), the mosque (West side), and the market (North side) (Rukayah & Vania, et al., 2022). Only now has there been an agreement between historians and archaeologists about where the palace of Demak was located. In the city of Demak, we can only find squares, mosques, and markets.

Around the palace are remnants of the toponym of the village name, just like in the center of the government of other Islamic sultanates in Java (Erikha & Lauder, 2022; Jayanti, 2021; Membrado-tena, 2018). Uniquely, in the former center of the Demak Islamic sultanate, there is a scattering of wooden buildings in the form of stilts. The building is now listed in the list of cultural heritage buildings. According to interviews with related agencies and post office historians, there were several other wooden stilt buildings, which have now disappeared. The building has been replaced with a new building. At that time, there were no regulations governing the importance of the conservation of cultural heritage buildings.

This research aims to reveal the distribution of stilt buildings in the 18th century which are assumed to be an effort to adapt to society when at that time, the city center of Demak (the city center was the center of the Demak Bintoro sultanate) was a swampy area and often experiencing flooding.

Research Methods

The research uses a historical approach to reveal the design of stilt buildings in the 18th century and uncover old data (Kuntowijoyo, 1994) from architectural history from books, and the geological history of the island of Java. Despite the lack of data on the pre-colonial and colonial eras, several historical sources, old records, photo archives, sketches and old maps were found. Images provide more information than narratives (Pole, 2004). The research method also borrows from the toponym approach used by archaeologists in uncovering the former sultanate area in Java (Adrisijanti, 2000; Tjandrasasmita, 2000; 2009).

The research uses analysis of tidal flood problems, which are still ongoing today. This research has mapped the distribution of stilts and has placed them on old maps and drawings by the Dutch East Indies government. Through an old geological map by Van Bemmelen, Demak stands on young alluvial soil resulting from river deposits that unite the islands of Java and Muria. We can see a river from the zoomed sketch drawing by Yohannes Racht. Based on the year, the paintings of the view of Demak were made in 1750-1800 and maps from the 1700s sourced from Atlas Mutual Heritage, it is estimated that the river is a Muria strait that is narrowing to become a river and no longer navigable.

The stilt building located near the river and the height of the stage was the efforts against tidal flood that often occurs in this area. Based on the historical records of the Centini fiber, at that time (17-18th century), the city center of Demak (the city center was Demak Bintoro) was still experiencing tidal floods (Widiyarti, 2013). From the findings of old buildings with wooden materials, the researchers classified them based on buildings built by local people and buildings made by the Dutch East Indies government. On the list of cultural heritage buildings in the city of Demak, there are 25 relics of old buildings.

Four buildings in the form of stilts were studied. The three buildings are a small mosque, an Islamic boarding school and a post office. One more building is a former school for Bumiputra, which is now the building of the Tourism Office. The finding of a stilt-shaped building complements the lack of data about the architecture at Demak in the past. The research aims to reveal the distribution of stilt buildings in the 18th century as an adaptation to flooding areas.

The Demak Sultanate in Swampy area

The author's patent in 2021 finds that the architectural distribution of old buildings and historic areas in coastal cities in North Java can be used as an indicator tool to measure land subsidence and tidal depth (Rukayah & Pribadi, 2020). Several studies have found that Demak has a high abrasion rate (Parman, 2010) and high land subsidence (Afif et al., 2018), thus eliminating two villages on the coast of Demak. (Hakim et al., 2015; Ristianti, 2016)

Demak was located on an island that arose from sedimentation processes in the past. Demak is also has button sediments that connects the mainland of Java and the Muria mainland. It is indeed surrounded by tidal marshes. During the period of the Demak kingdom, the islands around Demak also had many settlements. This can be seen from the results of research and archaeological excavations conducted by the Yogyakarta Archeology Center in the Moro and Tridonoharjo areas, which found fragments of Chinese and local ceramics and building foundations.

With the strait separating the Muria Mountains from Java, it is estimated that the central city of the Demak kingdom is indeed not far from the coast. The geomorphological condition of the Demak achieved are to determine the environmental conditions of the Demak area in the past so that it is suitable for the growth and development of the royal city of Demak. Avoiding the danger of flooding, soil fertility factors and its strategic location for political, economic and religious activities. Perhaps with all these factors, the government at that time made a soil consolidation / landfill for the location of the palace area in anticipation of swampy soil. Regarding the location of the centre of the kingdom, it is estimated to be in the centre of the present city of Demak. This can be seen in the presence of the Grand Mosque and an *alun-alun* / traditional square in front of it, the tombs of Demak kings in the mosque complex, the names of villages or streets (toponyms) around the Grand Mosque and the traditional square.

According to Tjandrasmita, the lives of coastal city people are more dynamic compared to the inland cities, even though they are still a traditional society. Layers of the population, among others, consist of the merchant class, the fisherman class, the slave class, the worker or craftsman class, the aristocracy or kings class, and members of the bureaucrats. There are few groups of farmers in these cities, but they may function as owners of the rice fields or field orchards outside the cities (Tjandrasmita, 2000; 2009).

In cities, especially in royal centers, community groups usually have their settlements based on position, religion, place of origin, expertise, situation, etc. (Adrisijanti, 2000). From the remains of the toponym village during the Demak sultanate, the researchers found a distribution of wooden stilts built around the 1800s. it is assumed that the designers made an effort to adapt to the site conditions.

As other coastal cities, such as Tuban, Cirebon, and Banten, based on news from the Dutch, the original structure of the town of Demak was surrounded by thick and high brick walls which probably functioned as a fortress (Tjandrasmita, 2000). According to Graaf et al., one of the factors causing the construction of strongholds, is the presence of middle-class Muslims who live in villages around large mosques who feel the need to secure their material interests and help protect the religion (Graaf and Pigeaud, 1985).

The old note from Tomé Pires also saw that the city of Demak was crowded with foreigners. Persians, Arabs, Gujarati, Malays, and the Chinese. In addition, many Muslims were in Demak when Pires visited there. Demak grew up and became one of the richest cities on the North coast of the Java Island (Corteseo 1967). The foreigners who came were generally merchants. Some of them decided to settle down and marry people around them. There are more and more places of worship, especially mosques in Demak. Not surprisingly, the propagator of Islam, namely Walisongo (nine guardians of Islam spreaders in Java), made this city a center for the spread of Islam.

About the territory and inhabitants of Demak in the early 16th century, there is little information from Tome Pires. It is stated that the Demak area is considered to be larger than other coastal cities in the vicinity. The city has eight to ten thousand houses (Corteseo 1967). Based on this information, it is impossible to immediately estimate the population, but if

each house consisted of 5 people, then the population of Demak at that time ranged from 40,000 to 50,000 people, a number that was quite reasonable for the city of Demak at that time (Rahardjo & Rameln, 1997).

The old record about the city of Demak being a marshy area is a source from the Perfectur Semarang Report (February 1810) in the form of an archive of "Tusses Bestuur in Nederlandsch Indie: No. 2753", (Eko Punto et al., 2021). The construction of the 'Postweg' road that crosses Demak faces considerable difficulties because besides crossing swamps and rivers, it also crosses the area in front of the Demak Mosque and the square, which according to the statement of the Regent of Demak, Raden Tumenggung Adinegoro, is the former palace of Demak (Patah) which was sacred to the people. It is seen now that the Postweg road has been completed and still cuts across the square and the former location of the Demak palace.

Based on the Portuguese and Dutch travel records and based on chronicle books, it can be seen that around the 16th century, the center of the Demak kingdom was crossed by a river (Tuntang) which could be navigable by merchant ships, although to go through it, one had to wait for the high tide (Hendro, 1995).

It is concluded that the old Demak location is at the estuary of a river (Fig. 2c), the tidal flood that often hits the downtown area.



a. Map of Sumatra, Java, Kalimantan, Makassar, Madura, Bali in 1614, Source: Atlas of Mutual Heritage

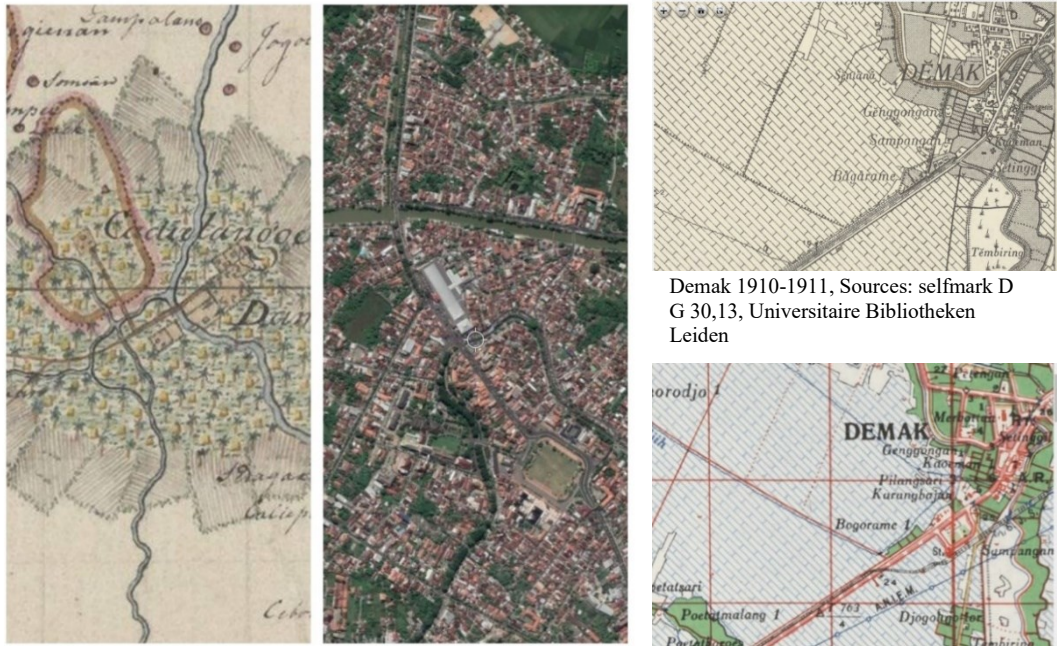
b. Blue color depiction of the Muria strait that separates the island of Java source:1989, Semarang, shelfmark D M 32.10, Leiden University Libraries, <http://hdl.handle.net/1887.1/item:2408018>

c. Map of Demak in the 17th century, the Muria Strait has been turned into a river. Source: Mutual Heritage Atlas

Fig. 2: Demak on the north coast of Java, the strategic location of the city of Demak in the Muria strait, 17th century the strait had narrowed into a river

Source: atlas mutual Heritage and <http://hdl.handle.net/1887.1/item:2408018>

According to Pigeaud & Th (1960), Demak is located on the Java island, on the shore or the riverbank, as an area (place) that can (must) be reached by boat by river or sea (Fig. 2). According to historical sources, during the Dutch colonial rule, the Demak area was a swampy area prone to flooding. Thus, since that time, the Dutch government has continuously managed this area with quite a large amount of funds, including making canals and dams. There are four artificial rivers (canals). Two canals stretch North and South, namely the Buyaran Canal, which is in the West of the city of Demak and the Jajar Canal, which is in the Eastern part of the city. It is also told in the Dutch sources that with the construction of these canals, some swamps could be drained, and the danger of flooding and famine could be overcome, although not completely (Stibbe & Graaff, 1921).



Demak 1910-1911, Sources: selfmark D G 30,13, Universitaire Bibliotheken Leiden

Old Demak,

Sources: collection of cultural expert Demak M Kholidul Adib, secretary of the Cultural Conservation Lovers Community (KPCB) at Kabardemak.wordpress.com

Demak

Sources: google earth 2022

Demak in the Colonial Era.

Sources: Collection, Java & Madura AMS Topographic Maps, https://maps.lib.utexas.edu/maps/ams/java_and_madura/

Fig. 3: the city center of Demak stands in a swamp area that may have been backfilled to become a stable area. This can be seen from the symptoms of land subsidence which are not very visible.

Source: Kabardemak.wordpress.com, google earth 2022, https://maps.lib.utexas.edu/maps/ams/java_and_madura/

Based on old records that the downtown area is often flooded (Hendro, 1995), the construction of a postal road that passes through a swampy area in Demak (Toer, 2005) was hindered by the condition of the area which is a swamp (Pigeaud & Th, 1960), the construction of canals in the government era Dutch East Indies (Stibbe & Graaff, 1921), and the finding of a wooden building with stilt construction reveals about the adaptation of the local community and the Dutch East Indies government to build a stilt building. A spread of four wooden structures in the form of stilts is found here. The number of wooden stilt buildings in the past possibly was more.

Based on interviews, some stilt buildings have been demolished and converted into modern ones. At that time, the government still needed to regulate the cultural heritage buildings. This paper will contribute to adapting stilt buildings in marshy areas with tidal waves that often hit these areas. Research needs to uncover architectural and historical data on how the local community and the government at that time anticipated it by designing the stilted building.

We also conducted research in the city of Semarang. The city of Semarang is subordinate to Demak. Ki Pandan Aran I was the first regent of Semarang. He is the son of the second sultan of the Demak with a reign that was not too long, around 1518-1521. The sultan of Demak Bintara appointed him as regent Semarang. In Semarang, he founded a settlement in Tirang Amper. After Ki Pandan Aran died, his position as regional Ruler was replaced by his eldest son, Ki Pandan Aran II. At that time, the Kingdom of Demak was

destroyed by a power struggle. The kingdom that ruled at that time was the Kingdom of Pajang. By Raja Pajang, the appointment of Ki Pandan Aran II as the Ruler of the Semarang region was also designated as regent, with the title Adipati Pandan Aran II. Based on historical facts and the results of a study by the Semarang Historical Research Team, Ki Ageng Pandanaran was appointed Regent of Semarang in 1521.

The formation of a government in Semarang is one of the efforts to unite Demak with the surrounding areas. Due to the sedimentation process that united the group of Semarang islands, it was moved to a bustling area near the coast, which in the 14th century was around the present Sleko area (Rukayah, Susilo, & Abdullah, 2018; Tio & Winatayuda, 2002). Pandanaran cleared new land a forest in a place called Kampung Bubakan (from the origin of the word bubak). In its development, the successors of Ki Ageng Pandan Arang I moved the government center of Semarang to several places, namely to Gabahan Village, then Sekayu Village, and finally to Kauman-Kanjengan. The pattern of government city Semarang is similar to the city center of the Demak sultanate. (Rukayah, Vania, et al., 2022).

The city center consists of the main square, the mosque, and the regent's house, surrounded by the multi-ethnic settlement (Java, Malay, Chinese, Arabic) (Roy, 1695). The model of the city center of Semarang is a continuation of the city center of Demak, even though the city of Semarang is not a sultanate city (Rukayah, Vania, et al., 2022). Even though Semarang was a coastal city then, and is a subordinate city of Demak, the researchers did not find any form of stilt houses in the downtown area. The existence of stilts in Demak, compared with the environmental conditions in the city of Semarang, further strengthens the evidence that stilts are an adaptation of the community to a swampy environment in Demak

Stilt Building

The stilt house is an old tropical house found in Indonesia, especially on river banks or sea coasts. Stilt houses are a type of building that is synonymous with fishing villages. There are several Jakarta areas with fishermen's houses on stilts in the Muara Angke Coastal Area, the Kamal Muara Fisherman's Village Area, and the Muara Baru Fisherman's Village Area (Trison & Epifania, 2020). The stilt house can be divided into two: the land stilt house and the fisherman stilt house. Fishermen's stilt houses have different characteristics from land stilt houses. Based on its purpose, the stilts on land aim to avoid dangerous animals/predators and withstand earthquakes. Meanwhile, fishermen's houses on stilts aim to avoid sea/river water when it overflows or during high tides. Underneath the land, a stilt house can usually be used as a food storage warehouse, while fishermen's stilt houses are always submerged in water (Pribadi et al., 2011; Trison & Epifania, 2020).

Stilt building by the Dutch East Indies Government

Indonesia is a country that has cultural diversity and has experienced various historical periods. Each period has its uniqueness and leaves historical heritage that can become an identity for the area. One period that influenced developments in Indonesia was the period of the Dutch East Indies government (Sumalyo, 1995). Colonial architectural styles in Indonesia are divided into three, namely, Indische Empire (18-19 centuries), Transitional Architecture (1890-1915), and modern colonial architecture (1915-1940) (Handinoto, 2012). The Indische Empire style of architecture (18-19 centuries) arose due to a culture in the Netherlands mixed with Indonesian culture and a bit of Chinese culture. The characteristics of Indische Empire architecture include:

1. The floor plan is fully symmetrical. In the middle, there is a "central room." The central room is directly related to the front and back terraces (Voor Galerij and Achter Galerij).
2. The terrace is usually very wide and ends with rows of columns in the Greek style (Doric, Ionic, Corinthian).
3. Kitchen, bathroom/WC, warehouse, and other service areas are separate parts of the main building at the rear.
4. Sometimes, besides the main building, a pavilion is used as a guest bedroom.

The characteristics of transitional architecture (1890-1915) include

1. The floor plan still follows the Indische Empire style, with full symmetry, a circular terrace, and eliminating Greek-style columns from the looks.
2. Gevel-gevel in Dutch architecture, located on the river's banks. Adding a romantic impression to the face and making a tower at the main entrance, as found in many churches.
3. The form of gable roofs and shields with roof tiles is still widely used. The Modern Colonial Architectural Style (1915-1940) was a protest by Dutch architects after 1900 over the Empire Style.

Modern architecture has the following characteristics:

1. Floor plans are more varied, according to creativity in contemporary architecture.
2. Many forms of symmetry are avoided, and terraces around the building are no longer used. Instead, light-retaining elements are often used.
3. The appearance of the building reflects the Form Follow Function or Clean Design.
4. The shape of the roof is still dominated by a gable roof or shield, with a roofing material or shingles.
5. The building uses concrete construction, using a flat roof made of concrete that has never existed before. The colonial Architecture period consists of two periods, namely Architecture before the XVIII century and Architecture after the XVIII century. The style, character, and features of colonial architecture are influenced by the combination of Dutch and Indonesian cultures (Tamimi et al., 2020).

These theories are yet to discuss the work of the Dutch East Indies government in the form of a stilt building that anticipates swampy areas and frequent tidal floods. The work of the Dutch East Indies government on the distribution of stilt buildings in the city of Demak which still exists today. Below are some heritage houses on stilts (3 pieces) and one wooden stilt building lost in the 2005s.

Analysis of Stilt Buildings around the Center of the Old Demak

Based on the survey results in the field, four buildings in the form of stilts were found. According to its location near the river, formerly the city center was still a swamp, the type of stage building is classified as fishermen's houses. The stilts aim to avoid river water when it overflows or during the high tides. Underneath the land, a stilt house can usually be used as a food storage warehouse, while fishermen's stilt houses are always submerged in water (Pribadi et al., 2011; Trison & Epifania, 2020). The four buildings are the same as in terms of data on cultural heritage buildings. The post office stilt building, which was once used as the postmaster's house, is on the square's East side. The tourism Office Building, used to function as a local boy's school. The small mosque building in Settinggil village is on the northeast side of the square. The mosque building at the Sindon Islamic Boarding School, is on the South side of the square. Below is the spread of location and an explanation of each stilt building.

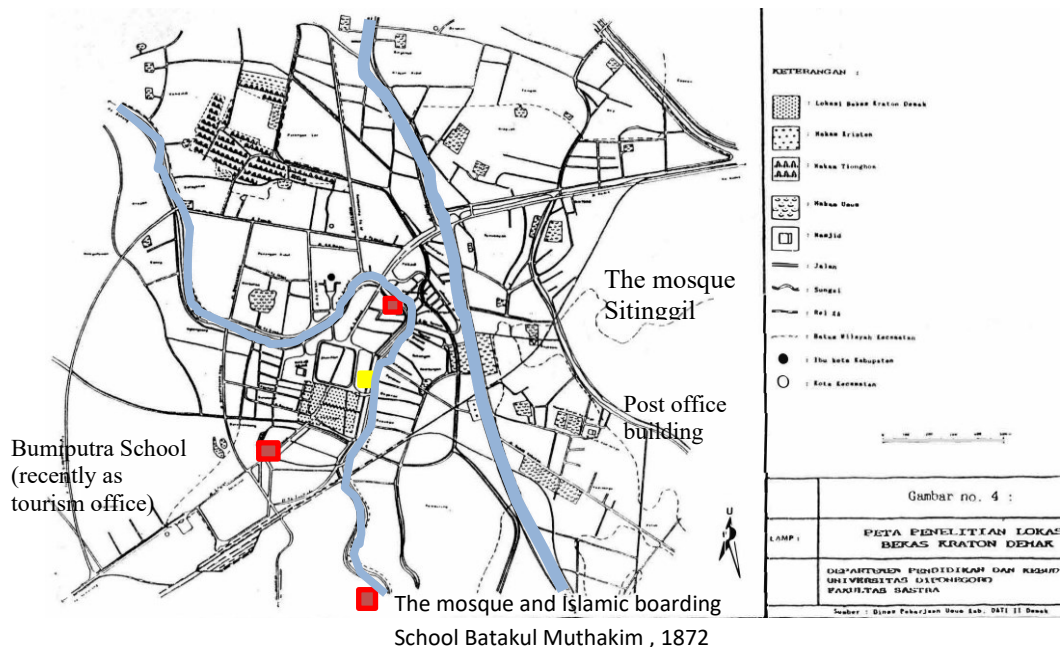


Fig. 4: The spread of old stilt buildings
Source : (Hendro, 1995) and field survey in 2022

The Sitinggil Mosque



The mosque Sitinggil, wooden stilts. source: google street view 2022

The mosque Sitinggil, the first floor used to be under the stage building

The mosque Sitinggil, Right on the bank of the river surrounding the old town of Demak. source: google street view, 2022

Fig. 5: The mosque Sitinggil, the 1800s, located on the river bank north side of the square, the first floor used to be under a stilt building with stilts four meters high
Source: (google eratt street view 2022 dan 2015 Hendro, 1995)

Langgar Sitinggil is located on the bank of the river on the North side of downtown Demak. The river curves around the center of the Demak sultanate. In the past, the river was a natural stronghold for the center of government. There are allegations that the main access to the mosque was from the river and the land. Access from the river makes it easier for traders to anchor. Langgar, located in the Kampung Sitinggil area has two floors. It is estimated that the building was built a few years after the proclamation of independence. The mosque is a two-storey building of wooden construction.

According to residents, originally, the first floor of the mosque was a stilt with four-meter-tall wooden pillars supporting the second floor and they used a ladder to enter the mosque. Now the first floor is used as a prayer room with walls (Hendro, n.d.).

Islamic Boarding School and Mosque (1872 and 1902)



Three meters high stilt building

The building faces the river bank, and there was an access in the past via the river.

Fig. 6: The mosque and Islamic boarding school stilt building
Source: Hendro, 1995

About 5 kilometers behind the Demak terminal, Central Java, there is a tomb and an old building that looks like a house on stilts. The entire building is made of teak wood that is hundreds of years old. The building is the Sabilul Muttaqin Sindon Islamic boarding school, located in Sindon Trimulyo, Guntur District, Demak. The tomb next to the pesantren is the tomb of KH.

Sholeh Sindon was one of the clerics who spread Islam in Demak in 1875. This mosque was built around 1892 by KH. Sholeh bin Solomon. This Sindon mosque is one of the cultural heritage mosques in Demak besides the Great Mosque of Demak. The hallmark of the Sindon mosque is the four pillars of the teacher using teak wood with flower vines carved motifs on the pulpit and ceiling. Everything is still original, with no changes or renovations. The mosque and Islamic boarding school is located on the river bank. The height of the stilt building floor is three meters. It is conjectured that the shape of this high stilt building is to anticipate the location of the riverbank and flood conditions.



Fig. 7: The Malay village mosque in Semarang and the Langgar Tinggi mosque in Jakarta. A stopover place for Indian or Arab traders and merchants with access from the river (Semarang River and Angke River)
Source: kitlv.nl

Two mosques in the form of stilts in different locations have been compared. The similarity of the site on the river bank, the period, and the influence of Islamic religious broadcasting efforts could be noted. Placement of the mosque in the past adjacent to the river as a transportation route is significant. The traders who have stopped and settled have built the mosques. It has a stilt building design and can be reached from the river as the right place for other traders to anchor. The stilt building in old Demak was compared with the Layur mosque in Semarang and the Langgar Tinggi mosque in Jakarta.

The Layur Mosque has been built in 1802 AD. This mosque has been built by several merchants from Yemen who live in Semarang. It is also known as the Kampung Melayu

Tower Mosque. It is on the bank of the river and has an entrance from the river. The first floor is a stilt. Unfortunately, people have filled the first floor with soil to anticipate tidal flooding. Now the second floor of the building is the ground floor (Rukayah, Susilo, Abdullah, et al., 2018; Rukayah & Abdullah, 2021; Susanto, 2014).

The second comparison, namely Langgar Tinggi mosque, is in the Pekojan area, which was established thanks to the interaction of trade routes for centuries. The name Pekojan comes from the word Khoja, a Muslim from India, especially Bengali. Langgar being in the Angke river flow allows trade relations between nations to occur in this region, especially Arabs who mostly come from the Hadramaut region. Many Arabs live in this area. The engraving of the inscription on the pulpit in Langgar Tinggi has been written when the mosque was founded around 1275 H (1859). Langgar Tinggi mosque was a stopover for Indian or Arab traders and merchants. Traders who had just arrived at the port have used canoes to stop over at the Angke River to rest at the Langgar Tinggi mosque.

By making these comparisons, we conclude that stilt buildings adapt to environments such as riverside areas. The river was a transportation route for traders and missionaries who spread Islam until they built mosques or Islamic boarding schools. The stage shape makes it easier for them to place the boat under the building and dock.

Culture and Tourism Office in Demak

The Office of the Department of Culture and Tourism of Demak is a Dutch colonial building. Using the stilt floor in this office shows that the land surface around the square during the Dutch East Indies colonial period was often flooded. The raised floor uses a 3 cm thick board, 20 cm wide. The combining main beams from wood with a cross-section of 12x18 cm and beams from timber with a cross-section of 10x12 cm supports the raised floor. The beams and wooden floor construction rest on a masonry pedestal in the form of a cube of 40 cm x 40 cm x 40 cm.

The wooden walls at the front of the building and some side planes are supported by a brick wall construction whose surface is finished with small-scale stones. The boundary between the dwarf panel wall and the wall is emphasized by horizontal plastering. Besides, a unique wall construction is still made of small cross-sectional board panels installed horizontally.



Fig. 8: The building by the Dutch East Indies government. It used to function as a Bumiputra school. The stilt building, the walls and floors are made of wood.

Source: Author, 2022

This building on stilts by the Dutch colonial works enriches the type of Dutch colonial architecture in Indonesia. From several classifications of architectural works in the Dutch East Indies era, they have not yet touched on the explanation of the types of wooden-stage architecture.

A Post Office: the Former Official House

In some cities, most old post offices have additional buildings as official houses used by postal officials. The building that once served as the official residence of the Head of the Demak Post Office directly faces the Square and the Great Mosque of Demak. This building complements the postal facilities of the City of Demak, which is one of the routes for the Post Road, which Governor General Daendels has built in 1809-1811. The road in front of

the post office connects cities that stretch from Anyer to Panarukan. Postal buildings and streets are linked to cities in Java (Rukayah et al., 2019). The Dutch East Indies government has built a complete road infrastructure with horse carriage stops, which later have become the fore-runner of the post office (Toer, 2005). Following the Dutch-era records that found rubble of red bricks around the square (Pigeaud & de Graaf, 1976), it is assumed that the post office is located at the ruins of the Demak palace. This building has been established around the early 18th century.

Like other post offices in Indonesia, the Demak Post office is an important component of urban areas. Some post offices have become the zero point of the city, the entrance to the old town, or have been in the square (Rukayah, Juwono, et al., 2022; Yuwono & Rukayah, 2018). Before a regulation on the conservation of cultural heritage buildings, the stilted building has had the floor demolished and replaced with ceramics. However, the walls, windows, roofs, ceilings, and the layout of the official residence have not changed. The floor change has been due to the post office renting the building to the department store owner.

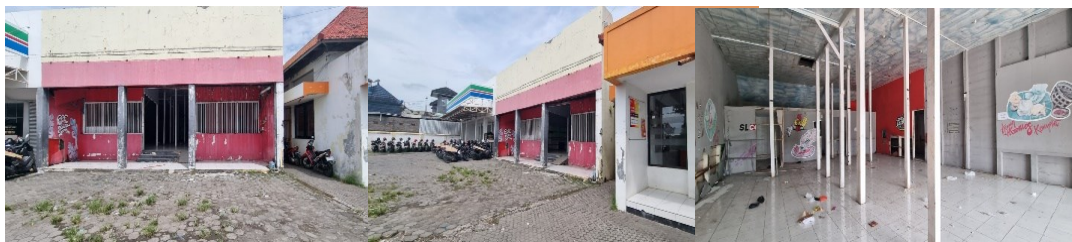


Fig. 9: The rest of the stilt building, the stilt floor, was replaced with ceramics. Meanwhile, the interior, such as the pillars, walls, roof, and ceiling, is still intact: survey 2022

In contrast to the Demak Office of Culture and Tourism, which has pillars in a more regular position, the pillars of the Demak Post Office building are placed rhythmically. In the direction of the width of the building, the pedestals are installed at a distance of 204 cm-186 cm-280 cm-186 cm-204 cm. Along the length of the building, towards the rear, 340 cm-480 cm-150 cm-330 cm-470 cm-210 cm. The supporting beam for the stilt floor construction has a cross-section of 30 X 30 cm. The *umpak* (foundation) has also been used for masonry construction. The perimeter wall combines horizontally mounted plank panels and vertical bars above them. The roof of the *emper* (roof porch) is usually used for buildings with Indische architecture in urban villages (Hendro, n.d.).

The roof is in the shape of a pyramid-like an official's residence. When the author visited this building in 2004, it was still intact, with a stilt floor with teak wood planks. Almost all houses are clapboard. The height of the stilt from the ground is approximately 50 cm. From the former building, it appears that there is a veranda with a fence. The house has two bedrooms. Living room and family room, and the back of the kitchen. This building has been rented to the Maharani clothing store. After that, part of the wooden plank floor has been dismantled and adapted into a shop (Fig. 10).

Below is a description of the old stilts based on a survey in 2004 (right side). On the left is the current condition of the building after the floor has been changed to tile by the building tenant.



Fig. 10: (a) The building of the former official residence of the post office head changes to the front view, the stilt floor that has been lost. The interior of the building remains in good condition; (b) A sketch of the former official residence building is still visible in 2004
Source: field survey in 2004 and 2022

Based on the distribution of the wooden stilt buildings around the old Demak, this paper found that the construction of wooden stilt houses is an ideal alternative in swampy areas that are frequently flooded.

Conclusion

The stilt buildings are used to anticipate swampy areas prone to flooding. Serat Centini has stated that during the flood season, the King moved to Prawata to organize the government. Thus, the downtown of Demak is an area prone to flooding. Types of stilt buildings at Islamic boarding schools, offices, and small mosques are made to save archives, Quran/Islamic holy books, and teaching and learning activities. This type of stage building is classified as fishermen's houses on stilts, aiming to avoid river water when it overflows or during high tides and swampy areas. Underneath the land, a stilt house can usually be used as a food storage warehouse.

The colonial stilt building complements the knowledge of colonial-style architecture that is adaptive to the local environment. This finding complements the findings of Handinoto (2012) and Sumalyo (1995), that Dutch architectural styles in Indonesia are divided into three, namely, Indische Empire (18-19 centuries), Transitional Architecture (1890-1915), and modern colonial architecture (1915-1940). The Indische Empire style of architecture (18-19 centuries) arose due to a culture in the Netherlands mixed with Indonesian culture and a bit of Chinese culture.

The city of Semarang, which at that time was a subordinate area of Demak, had the same downtown prototype. Multi-ethnic settlements surround mosques, squares, and government centers. Even though they are both in the Muara Beach area, no stilt-shaped buildings have been found in the old city of Semarang. Thus, this paper reveals the stilted building as an adaptation of the Demak area, which is a swampy area.

The Great Mosque of Demak in the downtown location is not in the form of a stilt. No data has yet been found about whether this mosque also experienced flooding when the king moved to Prawata when managing the Demak government during the flood season. Does the question arise as to why the Sultan did not make the stilted building? The temporary assumption is that the mosque, which will become the prototype for the forms of mosques in the city center of Java, is large. The structure of stilt buildings in the archipelago at that time was not found, which had a large rectilinear shape.

In addition, there is an allegation that the palace building is not a stilt building, considering that the King does not occupy this area during the flood season. People also found former palace foundations shaped to refer to structures that stand on the ground. However, the palace is probably a wooden building because it was easier to destroy the enemy then.

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