Colonial Engineers in the Dutch East Indies and the Expanding Vision from Water to Settlement Projects

Yulia Nurliani Lukito

Department of Architecture, Faculty of Engineering,
Universitas Indonesia
Depok, Indonesia

Abstract

The influence of colonial engineers in the Dutch East Indies can be traced back to the rise of modernization and urban projects, especially after the articulation of the Ethical Policy at the turn of the nineteenth century. Colonial engineers—who in the early period of Dutch colonization in the Indies mostly worked for maritime and irrigation—tried to systematize the substantial environment of the colony with their public works. Those engineers made significant contributions to the development of settlements connected through water, either the sea or the river. This study is a historical and theoretical investigation of the expanding vision of colonial engineers and aims to discuss how the vision of the Dutch engineers contributed to the construction and changes of the colonial city. The city of Batavia as presented as an example. The engineers in the Indies presented themselves as progressive middle-class and wanted to implement their technological plans as part of their contribution to modernize the colony. The paper argues that colonial engineers had played an important role in supporting modernity in the colony and their efforts had resulted in rapid changes in the settlements of the Indies society.

Keywords: colonial engineers, the Dutch East Indies, Batavia, traditional settlement.

Introduction

During the Dutch colonial periods in the Dutch East Indies (present Indonesia), the Dutch developed some infrastructure and settlement projects such as irrigation, roads, railways, and housing. At first, the development was only around the coastal areas such as the North Coast of Java known as the fastest growing area in the Indies. After establishing a multinational trading company of the Dutch East India Company (*Vereenigde Oost-Indische Compagnie*), the Dutch came to the Indies archipelago to take over the spice trade in Asia. In 1800, the Dutch East Indian Company was dissolved and came under the administration of the Dutch government who then extended their rule to the entire archipelago. The city of Batavia was the central of the Dutch colonial administration who built the city starting from a walled city. It consisted of warehouses and some basic-accommodations for merchants and military personnel. Later on, the walled city of Batavia developed into a big city to accommodate commerce and military activities, and the Dutch progressively took over surrounding territories to safeguard commercial interests.

Batavia was on the north coast of Java and it became the most populated island in the Indies and later became the capital of Indonesia. The oldest city center was located near the Java sea and the relatively newer city was developed to the south around the Ciliwung River. In Batavia, the Ciliwung River was used for irrigation, water supply and transportation. Areas near the River developed with settlements and shop houses were built facing the River. In the eighteenth century, Batavia had a typical city structure of the

Javanese coastal city that consisted of a small European core adjacent to a Chinatown and segregated communities of other Asian traders. Beyond a city's official boundaries were the indigenous Javanese villages that provided food and labor for the cities. Figure 1 shows the settlements inside the Batavia walls and the surrounding countryside areas in the seventeenth century. To accommodate the growth of the city, the Dutch started to build canals and new areas in the south including the governor's palace, the church, canals and roads.

Fig. 1. Map of Batavia in 1655
Source: Indonesian Heritage: Architecture (1998: 104-5)

Structuring the city can be seen as a great effort by colonial authorities to organize urban space and modernize the colony. Consequently, those efforts changed traditional settlements. With the development of a new city center and the spread of modernity, many aspects of colonial life changed. Most of the time, historians discussed changes in cities and vernacular settlements in the colonies as a result of the colonizers' efforts but only few scholars connect those changes with technological developments in the colonies (Adas, 1981).

This paper discusses the role of the Dutch engineers to develop the city and modernize Batavia during the colonial era in the East Indies, that was connected through water, either the sea or the river. This paper uses historical and theoretical approach to investigate the role of Dutch colonial engineers in the development of the settlements in Batavia. The research conducted in this study relies on historical data as well as qualitative analysis in order to explain the meaning of Batavia's development and connects this meaning with the projects done by Dutch colonial engineers. The research relies on a descriptive method by conducting a literature survey to collect information of both the history of the Indies and analyze the information on the colonial engineers and the development of Batavia. The paper first discusses the development of Batavia starting in the early period of the Dutch colonization in the Indies. Then the paper elaborates the role of the Dutch colonial engineers as one of the main actors in the development of the

Indies and their visions in modernizing the colony. Development of the city of Batavia illustrates how the vision of the engineers expanded from water to the settlement projects.

The Dutch Colonial Engineers and the Development of Batavia

Started in the sixteenth century, cities located along the North Coast in Java, such as the city of Batavia, had developed into important trading posts and ideal cities for the Dutch. Besides a centre of commerce, Batavia also became the center of Dutch military and colonial administration that was built as a walled and well planned city in grids just like big cities in the Netherlands (Figure 2). The Dutch built canals to control transportation and river stream to the sea. The structure of the city was organized following the Ciliwung River that was developed into a straight canal from North to South and channelled to some branches in the east and west areas. Buildings, streets and settlements were organized in relation to the canals. The surrounding country side began to be developed and used for the cultivation of sugar and coffee. More canals were constructed to irrigate land, facilitate the transport of agriculture produce and resolve the flood and related issues.
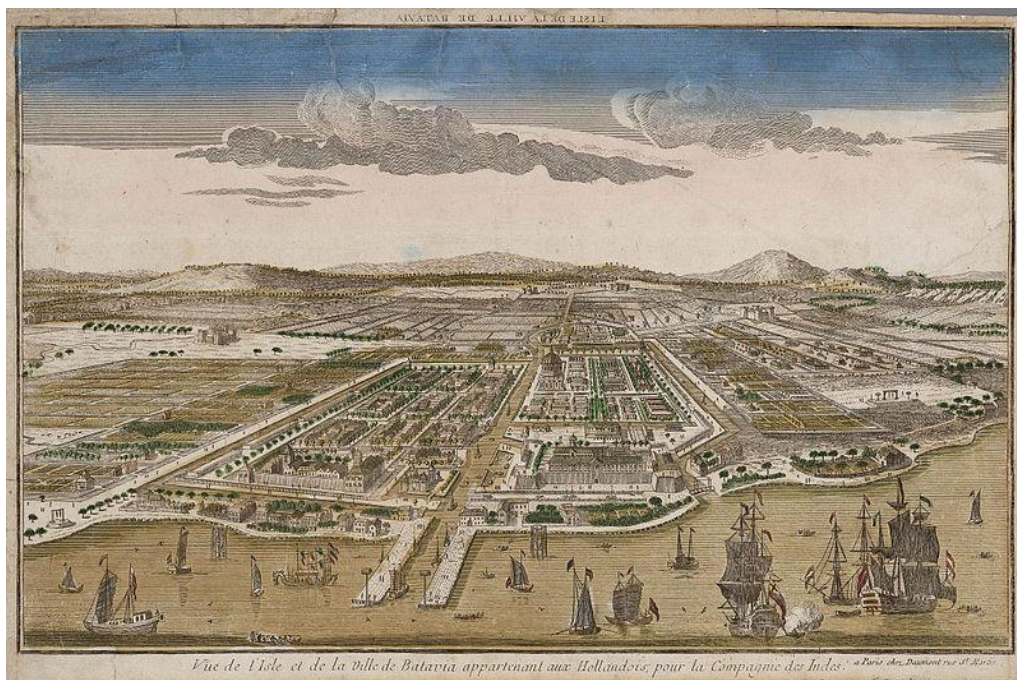

Fig. 2. Image of the capital of the Dutch East Indies Batavia circa 1780
Source: Public domain

Following the VOC bankruptcy, the company was dissolved in 1800 and all of the VOC's territorial claims became the Dutch state's colony named the Dutch East Indies. The claim of the Dutch imperialism also included to control the outer islands of the Dutch East Indies. The exploitation of Indies archipelago began to reach inland regions with Java —home to four out of every five inhabitants of the Indies—still became the most profitable area for the Netherlands (Ricklefs, 1981). The Dutch applied the cultivation system or *cultuurstelsel* and local inhabitants should plant part of their lands with export crops, such as coffee and sugar in order to pay the big tax that the colonial government demanded from its inhabitants. The success of Dutch colonial government to extend its control and economic interests to the outer regions of the archipelago went along with military operations.

The expansion of the colonial territory during the second half of the nineteenth century, the increase in the number of European private entrepreneurs and the development of modernity led to socio-economic changes. Furthermore, a new political program called the Ethical Policy was initiated, which was meant to give some benefits to the colony. In her annual speech from the throne, Queen Wilhelmina talked about the moral duties of the Dutch towards their colonial subjects such as the educational agenda to emancipate the colonial subjects (Gouda, 2000). Following this statement, the Dutch colonial administration introduced the decentralization of the administrative system and established local councils. Although the Dutch authorities agreed that the natives needed improvement especially through education,

they did not want the natives to become like Europeans or adopt technological development as a way to bring colonial order. This kind of hesitation was partly a response to developments in theories of human diversity and to the widening gap in technological progress between European and non-European societies (Banton, 1983).

The Dutch used indigenous aristocracy to make their practices work and created local administrative unit or the Regency, which was led by the local aristocrat *bupati* or the *regent*. There was also a development of indigenous officials who came from the higher socio-economic classes or *priyayi* and in part supplanted the old aristocrats as important indigenous allies (Ricklefs, 1981). The regency's city layout consisted of *alun-alun* or a traditional square surrounded by *bupati's* administrative buildings and the mosque. The traditional axis of north and south still existed following Javanese cosmology but the settlement was mixed between the indigenous settlement with the Dutch elements.

In the early nineteenth century, the Dutch colonial government started to develop a new district of Weltevreden on the south of Batavia with the Koningsplein (the King's Square) as its center. Some important government buildings and infrastructures were built next to the square. There were new European suburbs located on the southern part of the Koningsplein where spacious and airy houses were built following current trends in Europe. Previously, new canals were built following the main canal of Amsterdam along Dutch-style houses, showing a disconnected surrounding in comparison to vernacular settlements of Indies people. The linear structure of Batavia was well established with the old core and port located in the north and the new European residential area in the south.

Van Roosmalen (2011) says that the development of town planning during the Dutch colonial era gave a significant extent to the modernization in the Indies and even affected later the development of the city. Peter Nas (2011) asserts how Indonesian cities and architecture included influences from many cultures that resulted in hybrid style. Both architects elaborate the eighteenth century typical city structure on the Javanese coast with segregated communities around the core. Indigenous Javanese villages were located beyond the city's boundaries that actually provided food and labor for the cities. In addition to this, a historian Abidin Kusno argues that architecture and urbanism in Indonesia's colonial and postcolonial era was a result of political and historical conditions during the Dutch colonial era that created a cognitive map of cities in Java (2000). In general, there was a division of settlements following racial and social classes division. Neighborhoods for Europeans, well-to-do Chinese and local noble people had relatively big lands and houses following European architecture. Middle class Indies and Indo-Europeans usually lived in denser populated areas and smaller houses with mix atmosphere of indigenous, Chinese, Europeans or Arabs. Most of the indigenous population lived in densely populated areas of kampongs and predominantly indigenous settlements.

Starting from the middle of nineteenth century, the Dutch government endorsed the Cultivation System that required a portion of agricultural production to be devoted to export crops and resulted in new open lands (Vickers, 2005). In 1901, the Dutch Queen Wilhelmina announced that the Netherlands accepted an ethical responsibility for the welfare of their colonial subjects and began the Ethical Policy. This policy brought the emancipation of the colony and the colonial program changed to exploration and development of East Indies through irrigation, education and emigration programs. Around 1870, there was a rapid development of private enterprise and an expansion in commercial activities in the Dutch Indies, including the establishment of trading offices in Batavia. Many rural people moved to big cities like Batavia to find jobs and some new Dutch employees and their families moved to the Indies. New houses for the Dutch were built closely packed together with traditional settlements. However, even though traditional settlements in Batavia grew fast, there was no significant urban planning advocated for those settlements. It was the Dutch engineers that imposed a distinctive urban visual order around the early twentieth century but those urban planning was mostly done for developing European areas in the cities and building middle class settlements (Roosmalen, 2011).

Michael Adas (1989) proposes the connection between technology and the civilizing missions in the colonies, and how the colonizers believed that their overseas conquests gave benefits to local populations. This civilizing mission gave a moral dimension to arguments for imperialist expansion and it was the role of the colonizer to introduce the colony to modern standards. A Dutch engineer Homan van der Heide argues that "if the native peasant was to achieve welfare, then above all, he must be freed from every form of interference from non-professional native chiefs and colonial civil servants, particularly in the area of rice cultivation and irrigation" (van der Heide, 1989). Both arguments highlight how the colonizer looked at their colonized people and how the advancement of technology justified the dichotomy of modern colonizers and traditional colonized people. Moreover, Western values become the standards of

assessing colonial conditions while technologies have been the subject of negotiation between the colonizers and the colonized (Boomgaard, 1999). A sociologist Syed Alatas states that colonial ideology in Southeast Asia created an image of a population in need of development as a justification for Western rule (2013). In addition to this, Rudolf Mrazek (2002) discusses how technology and colonial image of the native in Indonesia were connected, as the Dutch used technologies both to legitimize their power and keep local populations at a safe distance. In conclusion, it seems that colonial engineers took Western model as their standards and thought that they had capabilities to bring progress to the colony.

Engineer

Engineer was a term for laborer who became a progressive profession in the Dutch colonies. As the irrigation professional became a course into engineering curriculum, the Dutch government also had a policy to promote jobs in the colony to attract more graduate engineers (Lintsen, 1980). In the Indies, colonial engineers took irrigation as their main program since agriculture was the main product of the colony and due to the famine issue in the colony. According to the Stroebe's trip report to the East Indies in 1916, he called Java as 'garden of the East' for having irrigation system that worked well to keep the 'garden' beneficial for the Dutch (Blussé van Oud-Alblas, 2012). He says that the Dutch on Java had every reason to protect the carefully nourished image of the island agriculture wealth as they presented it as the product of their engineering achievements and as evidence for the success of their rule".

The growth of technology in the indigenous society in Java made the Dutch thought that technology became a promising aspect in improving colonial conditions and the key to modernize the societies because natives had only limited access to technology. There were impacts of what engineers did on various aspects of colonial life such as agricultural practices, the construction of deep water ports, railroads and on the Dutch civilizing mission in the colony (Ravesteijn, 2009). The development of technology and the ambition of colonial engineers led to the idea of technocracy – a society where confidence was vested in the possibilities that technology created improvement and the possession of specialist expertise was the defining measure for the legitimacy of policy (Doorn, 2013). However, Van Doorn stated his surprise in his study of the role of engineers in the governance and development of the Indies colony that they were under-represented in the debate on the course of the Ethical Policy.

A consequence of new technological developments in the East Indies was that the colony required more engineers. The Dutch colonial government made a decision to establish the East Indies Public Works agency; an institution named Bureau of Public Works in 1854. This Bureau was responsible for supervising and the maintenance of public works, including bridges, harbor works, canal and major buildings.

The Expanding Visions of Colonial Engineers in the Dutch East Indies

This section discusses the projects of public works in relation to the role of colonial engineers in expanding building activities, especially in relation to water and settlements. Between the mid of nineteenth century to the 1940s, the Dutch engineers laid the foundations for the public works such as canals, irrigation facilities, roads, railroads, and harbors in the East Indies.

The idea that technological change was a necessary component of Indies development and in the nineteenth century the term development generally indicates a biological meaning that illustrates how economies, industries and societies would go through phases of growth (Williams, 1983). This is in line with Michael Adas discussion of how Europeans in colonial settings understood technical differences as proof of the superiority of the West over indigenous culture and projects. Technological changes were based on the idea that indigenous people needed help to adjust to modernity (Adas, 1981). When adopting the idea of development to colonial conditions, the Dutch colonial government in the Indies emphasized the distinction between Europeans and Natives as well as the notion of changing the attitudes, behaviors and technical practices of Natives.

The Dutch sociologist Jacques van Doorn expressed his surprise in a study of the role of engineers in the governance and development of the Indies colony that they were under-represented in the discussion of the Ethical Policy in comparison to the legal profession which worked for the colonial government (Doorn, 2013). Engineers were a significant group in the colonial administration, because in the period between 1898 and 1918, civil engineers working for the colonial government grew from 92 to 201 (Ravesteijn, 1997). There was also a trend during the mid-nineteenth century that more than a quarter of all Delft graduates wanted to work in the colony. New Dutch engineers who came to work in the colony experienced a confrontation between their idealism and racialized social relations in the Indies.

Irrigation became an important part of the colony's welfare approach. The irrigation plan in the Solo Valley for example, was an ambitious project aimed to divert the river's estuary away from the Surabaya area to the Java Sea to prevent sedimentation. Although not all the project plan was implemented, some new source irrigation or *waduk* were built for the Solo Valley. The number of engineers employed by the Bureau of Public Works, mostly related to irrigation projects, was more than 200 in the early 1920s, and a decade later the number reached 263 (Blussé van Oud-Alblas 2012). Community-based forms of irrigation organization already existed within the village but the Dutch believed that such local institutions were incompatible with the hierarchy of colonial water organization. Therefore, the Dutch created a distribution system that involved both local rulers and the Dutch. Thus the system was integrated into colonial hierarchies.

The Bureau of Public Works or *Bureau Openbare Werken* (BOW) in the East Indies was established in 1854 when the Governor General J.J. Rochussen set up an organization that became the continuation of the Inspectorate Department of Irrigation Administration, Irrigation and Civil buildings. Previously, local governments were responsible for all of the irrigation projects in their own areas and the local government did not have an engineer. Rochussen's intention was to support the implementation of the Cultivation System in a more efficient way and accelerate the modernization process happening in Java. In 1885, BOW was reorganized and the irrigation engineers had a large degree of independence to the funding mechanisms of the colonial state. As Ravesteijn mentions in his book *Engineering an Empire*, "The rise of East Indies Public Works was coupled with an emancipation struggle on the part of engineers who were often obstructed by non-technical civil servants involved in administration" (Ravesteijn, 2007). In 1928, the government merged this institution with the Inspectorate Department of Irrigation Administration, Irrigation and Civil buildings.

Since its establishment, BOW built many buildings and infrastructures, more than 12,000 km asphalt roads and 16,000 km of unimproved surfaces that became one of the greatest achievements of the nineteenth century of the colony (Mrázek, 2002). The Public Works agency was also responsible for the design of hospitals, schools, post offices and other public utilities that followed standard designs to reduce construction costs. The rise of the Public Works agency resulted in the spread of modernity in the Indies as well as made a significant progress in defining the role of engineers from the authority of the other civil servants in the Indies. To monitor building intensity and higher architectural demands, the colonial government appointed S. Snuyf as "architectural engineer" in July 1909 who then constituted the newly-formed Architectural Office at the Department of Civil Public Works (BOW).

In relation to the Indies environment, the leading figure in the colony, the pharmacist H.F. Tillema, advocated the need for environmental improvement, especially since there was epidemics of plague and cholera that continued to break out as a result of unhygienic conditions in the cities. In some of his lectures and publications, Tillema stressed the importance of the work of engineers and architects for the colony and stated that it was crucial to improve residential areas with modern architecture and city planning (Tillema, 1923).

Batavia experienced a fast development of its settlements starting from the second half of the nineteenth century, around the same time the number of colonial engineers grew significantly. Depicted in Figure 3 is some changes in Batavia's settlements, including the loss of traditional settlements around the city. Along with the development of alternative means of transportation, the Dutch used the roads as access to transportation and they rarely used canals for transportation. The canals were originally used for defense and territorial boundaries, but later used mostly by local people for transportation. They were also sources of water for daily lives. Public activities of Europeans such as recreation and festivities took place on canals in the seventeenth century but later in buildings or public spaces like in squares. In this way, rivers and canals became a medium to differentiate European and indigenous settlements and even determined civilized society.
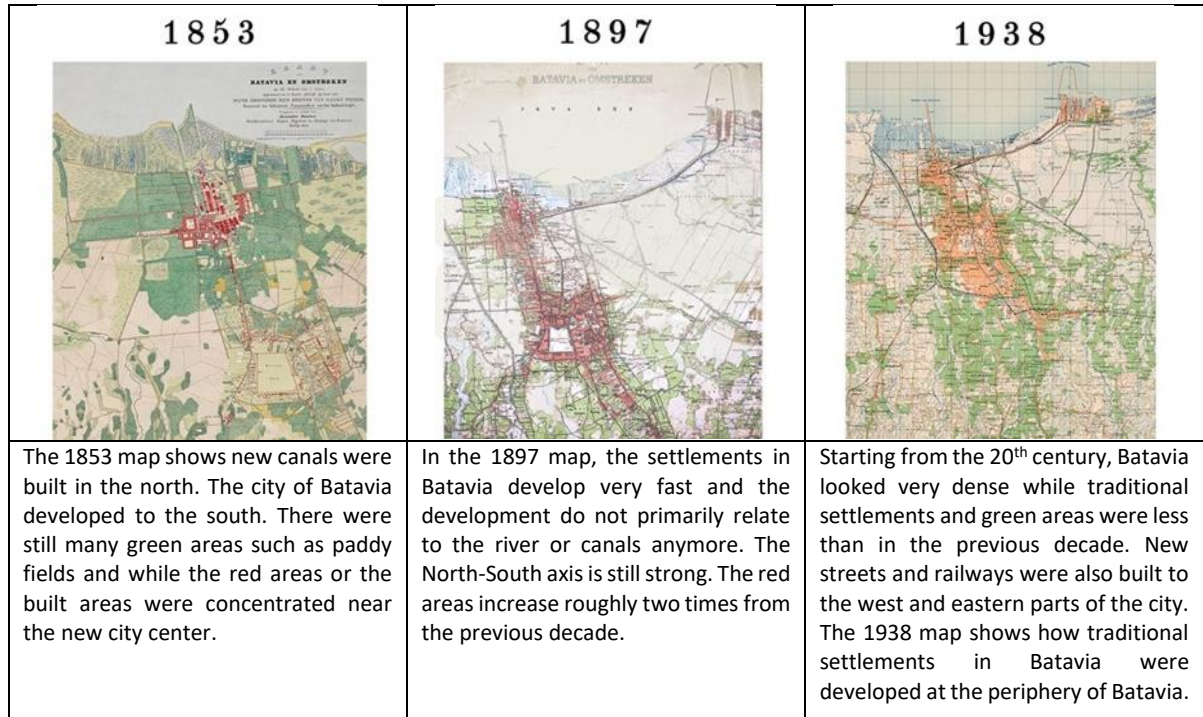
1853	1897	1938
The 1853 map shows new canals were built in the north. The city of Batavia developed to the south. There were still many green areas such as paddy fields and while the red areas or the built areas were concentrated near the new city center.	In the 1897 map, the settlements in Batavia develop very fast and the development do not primarily relate to the river or canals anymore. The North-South axis is still strong. The red areas increase roughly two times from the previous decade.	Starting from the 20th century, Batavia looked very dense while traditional settlements and green areas were less than in the previous decade. New streets and railways were also built to the west and eastern parts of the city. The 1938 map shows how traditional settlements in Batavia were developed at the periphery of Batavia.

Fig. 3. The development of settlements in Batavia.
Source: KITLV Library, Leiden University, texts by author.

European water supply moved from non-piped provision to private household connections to the construction of artesian water reservoirs within the European spaces of the city. In contrast to European spaces, native water vendors sold water to the native population. A modern, centralized, high pressure, spring water supply developed from 1900 to 1920 and this developed system demonstrated technological mastery, facilitated a modern urban lifestyle and symbolized the emergence of a new city that required the native population to urbanize their traditional habits. Native population who could not afford to pay for water supply subsequently moved out from the modernized kampongs in the urban center to the peripheries of the city. New areas with piped water became populated by middle class of Indies people and Eurasians (Abeyasekere, 1989). The struggle for living space changed the traditional communities by means of building new European residential areas. The spatial separation of the two distinct urban societies was a result of colonial engineers vision of water network and modern town planning.

After the decision of the colonial government to move the city center to the south, there was a new residential area developed in Batavia 1910, namely Menteng-Nieuw Gondangdia, planned by Pieter Adrian Jacobus Moojen as an effort to fulfill the need for housing. Moojen's plan resembled the garden city model of the English reformer Ebenezer Howard, including wide boulevards, some squares and concentric ring of streets. The plan of Menteng residential area was then changed by F.J. Kubatz some years later to support the growth of business and residential demands. The design of modern buildings in Menteng gave an impression of the expansion of Batavia into a modern city.

In 1923, the center of the city Koningsplein was redesigned by a Dutch architect Thomas Karsten who suggested that the huge 900,000-square-meter-site should be divided into several functional zones and emphasized the visibility between the centers, public buildings and traffic to create a sense of order for the grounds (Kusno, 2000). In the plan, Karsten designed Koningsplein with the idea of planning based on vistas or aesthetic concepts, so that there was a regularity in the city. The street plan was bordered by plots of land destined for housing and some open, public spaces. It seemed that the architect did not put into account how the new neighborhood connected to the existing town or the existing traditional settlements or *kampongs*. Karsten actually believed that *kampong* improvement would change the outlook of *kampong*, but some part of *kampong* should be preserved with its traditional character. To him: "It is highly important, above all for cultural reasons and reasons of social psychology, to base modern solutions on the traditional ones wherever possible, particularly in the native residential sections and in the smaller towns where Western influence is less (Karsten1958:70). The improvement of *kampong* was the focus primarily of the

setting up of modern infrastructure and the upgrading of *kampong* appearance. The government needed only to provide some infrastructure and traditional community needed to perform their own traditional organization and practice their own culture. A model for well-planned indigenous neighborhoods with good houses and public hygiene facilities was established but unfortunately this plan was never fully implemented. Moreover, the planner even overlooked the social and cultural aspects such as the spatial and hierarchical arrangement of the area and the traditional construction, as well as the needs of local people to clean water.

Karsten had once challenged the practice of zoning in urban planning based on ethnic and racial differences. To him, this kind of practice would strengthen the spatial ethnic division in Indies cities. Previously, colonial ethnic differentiation was favorable for most urban planners because this kind of differentiation frequently coincided with the socio-economic division; a division that corresponded with the urban planning principle practiced in European. Karsten wanted to apply economic zoning as a break to the cultural determinism that caused racial categories. In his plan for urban expansion in Semarang for instance, he built a large European neighborhood (New Candi area) on the cooler mountains, and a dense Indies kampong right at the bottom of this mountain, where it was hot and cramped. The European settlements had beautiful views and the kampong had relatively ordinary views. The European part of New Candi had wide and green roads, as well as public facilities, while Indies part was in contrast with smaller roads and less facilities.

Even though his initial intention was to organize the settlements not based on ethnic and racial differences, Karsten's plan still responded to the expectations of colonial society to show order and power of the colonizer. Historian Anthony King has defined colonial urban planning was part of a broader process of colonial segregation, where the urge for orderly development was in fact based on historically and socially derived ideas that were applied to both city and indigenous environment (King, 1990). In relation to improvements of kampong, Jacques van Doorn by building the city based on Western criteria, the colonial government wanted to reinforce their authority (Doorn, 2013).

Town planning can be seen as an extensive effort by colonial authorities to organize urban space and to bring order, which was related to regularity as an aesthetic ideal and standardization. For European settlements and middle class local people in the case of Batavia and New Candi, houses should follow building lines, new roads were built and urban greenery was added. There was not much change in the kampongs. kampong lacked order such as building lines, sanitation and piped water. Dwellings in kampongs was described as 'with shutters but no windows, with no floors but earth, with no bathrooms, no washing place, and no water-closets' (Mrazek, 2002:77) and smelly and dirty (Coté 2002:334). The division of urban spaces according to race and level of modernity was combined into the water supply infrastructure in the colony. Colonial engineers wanted to help modernize the colony through the use of technology. However, by locating the artesian hydrants within the European settlements, the establishment of urban water supply was aligned with the colonial government strategy to physically secure a more modern European population, while kampongs still became un-serviced areas of the city.

Conclusions

This study attempted to connect the development of the city of Batavia with the development of technology and colonial engineers. The link between engineers and society was visible after the Ethical Policy movement that at first focused on irrigation, education, and emigration. Colonial engineers in the Indies, some of whom worked for the Bureau of Public Works, made significant contributions to the changes of settlements that was connected through water; either the sea or the river, and became a distinct group within the colonial administration. In some ways, colonial engineers helped to modernize Batavia through the development of the built environment and urban settlements. Residents of Batavia witnessed the introduction of modern technologies and regularity in settlement and new forms of social life that was ordered through the extension of water projects. The engineers in the Indies wanted to implement their technological plans and help to modernize the colony. However, the result was the segregation in the city through water supply without contributing so much to traditional settlements.

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