

Urban Sanitation Problems and the Efforts to Overcome It in Medan City, 1909–1930s

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Abstract: The growth of the city of Medan since the end of the 19th century had not only shown changes in terms of city infrastructure but also caused problems of urban sanitation such as slum settlements, industrial and household waste as well as river pollution. This study aims to explain sanitation problems in Medan City and the efforts to overcome them. This study used historical methods consisting of heuristics, source criticism, interpretation, and historiography. The sources used are archives, documents, city reports, city sheets, meeting minutes, contemporary newspapers, and other sources relevant to this study. The results show that the city's sanitation problems are caused by the habits of residents, plantation companies and institutions in the city government itself. These various sanitation problems were solved by developing urban sanitation despite having a limited city budget. This city sanitation development effort was focused on the aspects of public bathroom projects for the natives and the construction of a sewer system.

Abstrak: Pertumbuhan Kota Medan sejak akhir abad 19 memperlihatkan perubahan dari sisi prasarana kota namun juga memberikan permasalahan sanitasi kota seperti permukiman kumuh, limbah industri dan rumah tangga serta pencemaran sungai. Studi ini bertujuan untuk menjelaskan permasalahan sanitasi di Kota Medan dan upaya penanggulangan yang dilakukan. Penelitian ini menggunakan metode sejarah yang terdiri dari heuristik, kritik sumber, interpretasi, dan historiografi. Sumber-sumber yang digunakan adalah arsip, dokumen, laporan kota, lembaran kota, notulen rapat, surat kabar sezaman, dan sumber lain yang relevan dengan studi ini. Hasil penelitian diperoleh bahwa masalah sanitasi kota disebabkan oleh kebiasaan penduduk, perusahaan perkebunan dan institusi pada pemerintah kota itu sendiri. Berbagai permasalahan sanitasi tersebut diatasi dengan membangun sanitasi kota meskipun memiliki anggaran kota yang terbatas. Usaha pembangunan sanitasi kota ini memperlihatkan konsentrasi dan kepedulian dalam bidang proyek kamar mandi umum bagi penduduk bumiputra dan pembangunan sistem saluran pembuangan limbah kota.

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INTRODUCTION

In the early 20th century, the issue of urban sanitation became a public discussion in the Dutch East Indies, which is partly triggered by the change in government health policy from curative care to hygienic prophylactic. This policy change entered the stage of improving the sanitation quality of the population since the decentralisation of health services at the regional level (Sciortino, 2007, pp. 30-31). The planning and focus of urban sanitation development was mainly due to the settlement of Europeans and the urbanisation caused by the migration of residents to the city since the late 19th century. The Europeans as the first-class citizens in the Dutch East Indies wanted a city that is comfortable, clean and free from disease (Loedin, 2005, pp. 92-106; Pols, 2019, pp. 8-9).

The development of a colonial city had resulted in the density of space and



the separation of settlements based on segregated population groups (Basundoro, 2016, p. 77). The city centre was usually prioritised for the Europeans, then surrounded by foreign Eastern settlements, while the suburbs were inhabited by the native or *Bumiputra* people. According to Jaelani (2017), the planning and mapping of the city centre aimed to improve the quality of life of the Europeans. Meanwhile, the improvement of the native settlements on the outskirts of the city was carried out to avoid or minimise bad conditions that could further threaten the health and cleanliness of the European residences at the city centre. Urban planning which consisted of water supply, toilets, and sewers was a colonial political intention that was interrelated between the health, social and cultural contexts of the citizens (Jaelani, 2017).

This Western colonial political intention gave rise to beliefs and attitudes that as if only they were clean, while perceiving that the colonised population as the party that had to be cleaned (Van Dijk and Taylor, 2011; Kooy and Bakker, 2015). This prejudice formed the boundaries of cleanliness in the colonial power of the West (Bashford, 2004, pp. 1-4). It was stemmed from modern discourses of cleanliness that was defined, designed, adapted and even manipulated for the needs of the Western colonials (Prasad, 2015, pp. 5-8). This Western colonial political practice in urban spatial planning and sanitation showed discrimination and segregation of the population as the basis for their superiority.

Urban sanitation is not a naturally formed environment but a technical system in the development of urban infrastructure. This occurs due to changes in the urban environment caused by the economic industry, colonialism, population growth, and urban infrastructure (Melosi, 2008, p. 3). Urban sanitation is related to urban infrastructure in improving population hygiene, namely (1) clean water supply, (2) waste disposal, and (3) waste and sewage management (Hanley, 2000, pp. 75-76). According to Melosi (2008), this sanitation business requires the role of the city's political authorities in improving public health and controlling waste as well as pollution, while doctors and technical engineers play a role in disseminating environmental views in modifying the physical and urban environment (Melosi, 2008, pp. 1-3).

One of the studies on urban sanitation problems was conducted by Reza Hudianto (2012) who photographed the construction of culverts in Malang City to overcome environmental pollution. This policy separated European population from other regions and discriminated against the indige-

nous population (Hudianto, 2012). In addition, Suriani and Syaiful Anwar (2019) explained that water supply by water companies and the construction of sewers in Medan City were also discriminatory based on certain population groups. The existence of the city of Medan in the early 20th century can be seen with the regulation of clean water management and the city's sewer system (Suriani and Anwar, 2019).

The city of Medan has developed since the late 19th century as the centre of plantation economy and colonial politics in East Sumatra. Initially, this area was a small village at the confluence of the Deli and Baboera rivers (Nasution, 2018). The plantation economic industry had transformed the city with the development of urban infrastructure and the segregated division of settlements. The rapid development of Medan City since the early 20th century had changed the demographics of the population in terms of the number and variety of population groups consisting of Europeans, Chinese, Indians, Arabs, and the *Bumiputra*. The population growth and infrastructure development of Medan City on the one hand showed the development of the colonial city, but on the other hand it created environmental and sanitation problems for the urban population.

Based on the explanation above, this paper seeks to explain how the city's sanitation problems and the efforts to overcome them were carried out by the Medan City government. This study starts from the existence of the Medan City government in 1909 to the peak of its growth in the 1930s. The issues of urban sanitation and its handling continued to be a debate between the authorities, which slowly decrease the power of the colonial government in the midst of the progress of Medan's infrastructural development. Moreover, the role of plantation companies, the activities of the city government in polluting rivers and the bad, unhealthy habits of some citizens are contributors to the quality degradation and sanitation problems in this city.

METHOD

This paper used historical methods consisting of (1) heuristics, namely the collection of historical sources consisting of archives and documents, city reports, city sheets, meeting minutes and newspapers of that time, which are obtained from the National Archives of the Republic of Indonesia and the National Library of the Republic of Indonesia; (2) source criticism, namely criticising the collected sources to determine the authenticity and credibility of the data as historical facts; (3) interpretation,

namely the process of studying historical facts to develop historical arguments and narratives; and (4) historiography, namely the process of writing as a synthesis and construction of history.

THE GROWTH OF MEDAN CITY

Before the mid-19th century, Medan was known as Kampung Medan Putri, a village of the Malay people in the territory of the Deli Sultanate, that was located at the confluence of the Deli and Baboera rivers (Halewijn, 1875, p. 150). Geographically, Medan is located in the lowlands with a tropical coastal climate and is influenced by the Karo Highlands (Pelzer, 1985, pp. 44-45). The region is at 23 meters above sea level, with a quite high annual rainfall of 1,894 mm and a high humidity with an average dry season of only 17 days a year (Stibbe, 1935, p. 273).

In the 1860s, Medan developed into an agro-industrial economic centre. This change was caused by the arrival of J. Nienhuys, a tobacco trader. Nienhuys obtained concessions for tobacco cultivation from the Deli rulers. After that, foreign investment came flocking and transformed Medan from a village into a plantation city. One of the influential plantation companies in Medan City was the Deli Plantation Company (NV. Deli Maatschappij) which was founded in 1869 (Thee, 1977, p. 68). Besides developing as a plantation city, Medan also slowly became the centre of Dutch colonial politics in Sumatra. In 1879, the capital of Afdeeling Deli was moved from Labuhan Deli to Medan. As a matter of fact, since 1887, Medan was appointed to be the capital of the Residency of East Sumatra. Eventually, the Deli Sultanate followed suit by moving its capital also previously in Labuhan Deli to Medan in 1891 (Sinar, 1991, p. 100).

The growth of Medan City was different from other colonial cities in the Dutch East Indies such as Batavia and Bandung. Medan City planning was based on the interests of plantation businessmen so that their influence could be stronger than the government itself. The growth of Medan City depended on plantation capitalism whose roles were divided into groups of businessmen (plantation owners), entrepreneurs (especially Chinese), and the Deli Sultanate as the local ruler (Buiskool, 2005, pp. 286-287). The development of urban infrastructure had been started since the establishment of *Gemeente Fonds* in 1886. *Gemeente Fonds* was an institution mostly made up of plantation entrepreneurs and city aristocrats. The role of this institution was to manage the city by building roads, bridges, city streets lighting, maintenance of culverts, and cleanliness of the city. The budget was obtained from the

rental of land from residents in the city (Winckel, 1934, p. 1).

Medan officially changed its status to *Gemeente* on the 1st of April 1909. However, it had yet to be led by its own mayor. Up until April 1918, this position was concurrently held by the Assistant Resident of Afdeeling Deli Serdang who was also the head of *Gemeenteraad*. Interestingly, in addition to the Dutch colonial government, within the city there is also an area of the Sultan of Deli which was subjected to the jurisdiction of the sultanate. In 1918, the city of Medan was officially occupied by a mayor. At the same time, the city territory expanded due to a land grant from the Deli Sultanate to the Medan City government (Sinar, 1991, p. 50).

The development of Medan City which was built for the benefits of plantation entrepreneurs could be observed based on its arrangement as a modern city. An Esplanade Field was built at the city centre with the construction of buildings and warehouses around it. In addition, the Medan Electricity Company (*Electriciteits Maatschappij Medan*) and the "Ajer Beresih" Water Company was established (Mackay, 1930, p. 384). Developments of supporting urban infrastructures which included a post office, a warehouse of the plantation organisation "Witte Societe", the Medan Grand Hotel, shops, Chartered Bank, and a building of the *Nederland Handel Maatschappij* (NHM) branch, were also built around the city centre (Bremen, 1997, p. 50; Hartono, 2005, p. 434).

In order to maximise the performance of the city government, a department that took care of the construction and maintenance of urban infrastructure, cleanliness, housing, as well as public health was established in 1911, which was the City Public Works Department (*Gemeentewerken*). This department was in charged with several sections under it, which included the Public Works Section, the City Cleaning Section, and the Building Supervision Section. In addition to the City Public Works Department, there were also other departments, namely the Land Affairs Bureau and the Public Health Service. The Public Health Service could be divided into several sections, namely the City Slaughterhouse Section, the Market, and the Hygiene Supervision and Research Section (Van Ommen, 1934, pp. 10-25).

The development of the government and city infrastructure had a significant impact on the demographic growth of Medan City. The plantation industry had attracted people to come to Medan, outnumbering the local Malay population. They consisted not only of businessmen, staff, officers

Table 1. Population growth of Medan City, 1900–1930.

Population group	1900	1905	1912	1920	1930
European	549	954	1.408	3.128	4.292
Chinese	7.745	6.397	10.997	-	27.180
Other foreign Eastern	1.301	3.708	1.318	18.297*	3.408
Natives or Bumiputra	3.129	3.191	13.254	23.823	40.096
Total	12.724	14.250	26.980	45.248	74.976

*including Chinese

Source: Mededeelingen en Rapporten van het Departement der Burgerlijke Openbare Werken, *Drinkwaterleiding te Medan*, Deel I: Tekst. Batavia: Landsdrukkerij, 1919, p. 2; Nasrul Hamdani, *Komunitas Cina di Medan Dalam Lintasan Tiga Kekuasaan 1930-1960*. Jakarta: LIPI Press, 2013, p. 85 and 87; and *Gedelte bevolking der Gemeente Medan 7 op 8 October 1930*, accessed from <http://colonialarchitecture.eu>

and plantation labourers but also Chinese, Arab, and Indian traders as well as the other indigenous people around Medan such as the Mandailing and Minangkabau who were attracted by the plantation economy (Pelly, 1984, pp. 2-3). Table 1 shows the population of Medan City from 1900 to 1930.

This population growth also had an impact on the separation and segregation of settlements in accordance with the colonial character. Europeans lived in an elite area of the city called New Polonia (*Nieuwe Polonia* or *Polonia Wijk*). Meanwhile, the Arab population and most of the Chinese population were located near the trading centre or market which was the economic centre of the city (Pelly, 1984, pp. 66-67). The centre of trade and economy was in Kesawan. Indians lived exclusively in Kampung Keling or Madras (Buiskool, 2005, pp. 291-294). This settlement was located on the border between the European settlements in New Polonia and the native *Bumiputra* settlements in suburban villages.

Bumiputra settlements were divided into villages that surrounded the city centre. Based on the reports of the *Bumiputra* settlements in Medan City, the settlements were divided into areas near the city centre, the western part of Medan, the eastern part of Medan, and the Sultan's area. There were 14 villages located near the city centre, namely Doerian, Padang Loemba, Aoer, Djati, Mesdjid, Koeboer, and Kebon Melajoe. Meanwhile, in the western part of Medan, there are four villages, namely Gloegoer-Silalas, Sekip, Petisah Oeloe, and Petisah Darat. In the eastern part of Medan, there were three villages, namely Sei Kerah, Sei Kerah-Pandau, and Sei Rengas, also known as Tempel Village (Old Batu Burned). Whereas in the Sultan's territory there were three villages, namely Sei Kerah-Pertjoet, Soeka Radja and Kota Matsoem

(Gemeente Medan No. 67, 1924, pp. 4-32).

The conditions of the *Bumiputra* settlements in areas near the centre and the outskirts of the city were mostly poor and unorganised. The building was semi-permanent made of wood and bamboo (Gemeente Medan No. 67, 1924, p.14). This condition affected the health of the population. Tillema (1923) explained that humid house conditions and lack of sunlight posed risks to environmental threats such as bad weather and air, as well as pests such as mosquitoes, fleas, and rats. Houses that were slums and densely populated with domesticated animals also posed risks of diseases and health for the occupants such as respiratory organ diseases, tuberculosis, malaria, hookworm, dysentery, typhus, and cholera. In addition, the habit of the *Bumiputra* labourers who vomit or spit betel in the house also had the potential to degrade the quality of health and environmental sanitation (Tillema, 1923, pp. 18-19).

URBAN SANITATION ISSUES: HOUSEHOLD WASTE AND DELI RIVER POLLUTION

Urban environmental problems consisting of slums, industrial and household wastes, garbage as well as air pollution had resulted in the degradation of the health quality of the citizens. These problems were not only associated with health but were closely related to the socio-political situation of the population in the city (Bashford and Tracy, 2012, 495-503). The development of infrastructure and the rapid population growth of the city of Medan since the early 20th century had caused urban environmental problems. In subsequent developments, the infrastructure and settlements in Medan City were divided based on population groups, namely the European, Chinese, Indian, Arab and *Bumiputra* areas. The European population as the main class

citizens of the city was placed in the city centre to protect themselves from various pollution and sources of disease, such as the problem of household waste and the threat of pollution of the Deli River that had occurred since the late 19th century. Meanwhile, the *Bumiputras* who lived in villages on the outskirts of the city had poor conditions that can be considered as slums were threatened with environmental pollutions.

The main sanitation problems in Medan City then were household wastes and environmental pollution. Initially, the disposal of household wastes, in this case the faeces of residents, was carried out by private officers (Chinese vegetable sellers) for a certain fee. Since 1911, the disposal of faeces had been managed by the Medan City Government. However, the government admitted that this was not a good system because it only applied to a part of the population, especially Europeans. In the Chinese settlement (*Chinese Wijk*), which was located in the vicinity of Kesawan (city centre), almost the entire population threw household wastes into open sewers, causing a pungent odour that polluted the air. Air pollution got worse because the wastes accumulated in the gutters at the edge of narrow alleys (Van Ommen, 1934, p. 12). Even though it was regularly cleaned or watered by the cleaners, wastes accumulated again and continuously polluted the air. In the city's 1921 report, officers always warned residents to clean up the wastes, but the residents often ignored it (*Verslag betreffende de Gemeente Medan over het jaar 1921*, 1922, pp. 82-83).

Air pollution also occurred at the city's waste collection and disposal site on Oranje Nassau Road in eastern Medan (Mackay, 1930, p. 388). This condition was exacerbated by the disposal and cleaning of waste vats by officers around the area. Cleaning was carried out on the ditches leading to the river. This activity was carried out at night, where there was no supervision by the police or security officers. The local newspaper described that this activity had been going on for months, during which no residents were disturbed, and it was even considered normal because residents also dumped their household waste into the sewers ("Hygienisch Medan", 1917).

Apart from pollution in Chinese settlements, a similar situation also occurred in the *Bumiputra* settlements. This condition became a problem for cities in the Dutch East Indies. The habit of littering created serious dangers to the hygiene and sanitation of the population. Residents dug manure pits around their houses without paying attention to

water infiltration sources. Those digs were only covered with leaves, which made it easy for flies to spread as the source of disease contamination (*Gemeente Medan No. 67*, 1924, p. 42).

Based on information from the reports of the *Bumiputra* settlements in Medan City, it showed that of 3,576 houses, more than half of them, namely 1,831 houses, had residents disposed of their faeces carelessly. This poor hygiene condition also occurred in the *Bumiputra* settlements located on the banks of the river. Residents of 413 houses on the riverbank dumped their garbage and household waste into the river (*Gemeente Medan No. 67*, 1924, pp. 36, 42). The activities of these residents made the river dirty, slummy and smelly ("Kotoran", 1918). On the other hand, the river was actually significant as a place for residents' daily activities such as washing, bathing, and accessing water needs.

River pollution did not only occur due to population activities but was also caused by the activities of plantation companies and the city government. On 27th July 1922, a resident living in Gloegoer Village (on the banks of the Deli River) sent a letter to the Mayor of Medan, Baron D. Mackay, protesting the disposal of rice husk wastes by the Deli Plantation Company into the Deli River. According to him, this activity resulted in residents around the Deli River suffering from coughs, itchy skin, and digestive infections. On 28th July 1922, the Mayor of Medan responded by asking the Deli Plantation Company to take responsibility to resolve and handle the complaint. Three days later, the Deli Plantation Company said that the company would take action so that the residents would not be disturbed by these activities (*Gemeente Medan No. 112*, 1922, p. 367). However, it was not fully explained what kind of actions were to be taken to solve the problem.

In addition to requesting action from the Deli Plantation Company, at the same time the Mayor of Medan also coordinated with the Deli Sultanate because the *Bumiputra* settlements were located on the city border with the Sultanate's territory, and the Deli River was under the jurisdiction of the Sultanate. The Deli Sultanate through *Mahkamah Kerapatan* conducted an initial investigation by investigating the head of the Gloegoer Village and several villagers. On 5th August 1922, the results were presented to the *Onderafdeeling Benden Deli* Controller. This investigation found the fact that the Deli Plantation Company dumped rice husk wastes into the Deli River every day. In addition, another fact was found that the Deli River pol-

lution was also caused by the Deli Plantation Research Institute (*Deli-Proefstation*) as well as the Medan City Government through the City Public Works Department and the City Slaughterhouse (*Gemeente Medan No. 112*, 1922, pp. 368-369).

The waste disposal carried out by the city government consisted of human faeces and animal wastes, namely cow dung and pig blood. These wastes were disposed of twice a day. Human faeces were disposed of at 8 am and 11 pm. Cow dungs were disposed of at 4 am and 6 pm, while pig bloods were disposed of at 5 am and 7 pm. Meanwhile, the Deli Plantation Research Institute (*Deli-Proefstation*) disposed its waste through the Baboera River which would eventually flow into the Deli River. For this activity, on 12th August 1922, the Controller of *Onderafdeeling Beneden Deli* urged the Mayor of Medan to follow up on the results of the investigation into the Deli River pollution. The discovery of these facts made the Mayor of Medan on 16th August 1922 assert the Director of the City Slaughterhouse and the Director of the City Public Works Department (*Gemeente Medan No. 112*, 1922, pp. 368-370).

On 5th September 1922, the Director of the City Slaughterhouse confirmed the disposal of wastes, namely (1) slaughtering waste such as animal blood and intestines, and (2) the entrails of cattle and buffalos. The abattoir waste had been processed and disposed of through *Parit Gloegoer*, which was 100 m away from the activities of residents in the Deli River, so it was considered not to disturb the population. The entrails of cows and buffaloes that were dumped into the Deli River amounted to approximately $\frac{3}{4}$ m³ per day. The Director also assured that this waste disposal activity into the Deli River did not pollute the river too much because the waste was fermented from food and had been naturally processed, which made them dissolve easily to the river water (*Gemeente Medan No. 112*, 1922, pp. 370-371).

On 11th September 1921, the Director of the City Public Works Department explained the problem of disposing household wastes (population faeces) into the Deli River. According to him, the Deli River was a household waste disposal channel originating from the eastern part of Medan and the western part of Medan. In fact, waste disposal had occurred from the upstream of the river before entering the Medan City area. Disposal of household wastes from the eastern part of Medan had been carried out through *Parit Gloegoer* since 1910. He argued that the disposal of household waste was not the cause of the residents' protests because it had

been going on for a long time. The disposal of rice husk waste by the Deli Plantation Company may have been the main cause of the protest (*Gemeente Medan No. 112*, 1922, pp. 371-372).

The Director of the City Slaughterhouse and the Director of the City Public Works Department shared the same view regarding the situation and habits of the *Bumiputra* people living on the riverbanks. The Director of the City Slaughterhouse considered that the livestock pens along the riverbanks dispose of more animal waste in the Deli River than the waste of entrails done by the government. Meanwhile, the Director of the City Public Works Department highlighted the daily habits of the *Bumiputra* residents such as bathing and washing, but at the same time throwing their faeces in the Deli River. Habits that had been going on for a long time were considered hard to change. The Director of the Public Works Department also voiced his astonishment at the *Bumiputra* residents refused to use the public baths and toilets built by the government. According to him, these habits should be banned because it endangered the health of the population. He suggested to the Mayor of Medan to prohibit the activities of residents in the river, especially at the specific sites of the city's waste disposal (*Gemeente Medan No. 112*, 1922, pp. 372-373).

Both the Director of the City Slaughterhouse and the Director of the City Public Works Department were of the view that the activities carried out were not the cause of complaints from *Bumiputra* residents who had health problems. They considered that the rivers flowing through the city of Medan acted as the main sewers of the city, and the waste disposal activities were normal and reasonable (*Gemeente Medan No. 112*, 1922, pp. 373). The utilisation of the rivers as the city's main sewer had occurred throughout the colonial period. The reason was the emergence of companies that dumped their waste into the rivers. In addition, the river also served as a channel or drainage of city wastes such as garbage and household wastes. The river had slowly shifted its function as the water source of the city population into a mere sewer that was polluted with unhealthy water to drink, which eventually made its existence to be unappreciated (Asnan, 2016, p. 136).

COUNTERMEASURES: PUBLIC BATHROOM AND SEWER SYSTEM PROJECT

The efforts of the Medan City Government in tackling urban sanitation problems were divided into two aspects, namely access to clean water and construction of city sewers. Clean water supply and a

sewer system had significant roles in improving the quality of hygiene and sanitation for urban residents. Health and hygiene problems from poor waste disposal cannot be solved simply by having an adequate source of clean water, because poor handling of household waste can increase the risk of environmental contamination (*Architecten-en Ingenieurs- Adviesbureau T.A.B.R.O.S.*, 1921, pp. 2-10). Overcoming this sanitation problem required cooperation between the city government and the central government of the Dutch East Indies. These institutions were interrelated because the health, hygiene and sanitation of the population were not only the responsibility of the city government but were in the public interest of the Dutch East Indies Government. This collaboration included technical issues, consultations, and especially financial assistance due to the limited financial resources of the city to carry out the construction of maximum sewerage (Stam, 1930, p. 125).

Since the existence of a definitive mayor in 1918, the Medan City Government had attempted to address the city's sanitation problems by submitting a work plan and budget to the Medan City Council. On 13th September 1919, a budget for a public bathroom project was proposed in the amount of f. 100,000,- and the budget for the construction of a closed sewerage system was f. 1.785.000,-. The amount of the budget proposed by the mayor was greater than the city's revenue in 1919 which only amounted to f. 510.465,- (*Verslag betreffende de Gemeente Medan over het Jaar 1919*, 1920, p. 13).

The need for a massive development financing prompted the Medan City Government to apply for a subsidy to the Dutch East Indies Government which had been carried out since mid-1919 (Gemeente Medan No. 129, 1920, p. 21). The subsidy application was inspired by the submission model made by the Semarang City and Bandung City Governments. They asked for assistance of 50% to the Dutch East Indies Government. Subsidies submitted by the City Government were estimated at f. 1,000,000 with the subsidy mechanism for 10 years (*Gemeente Medan No. 129*, 1920, pp. 6-7). Although the subsidy was never given by the Dutch East Indies government, the plan to build a sewerage system was still carried out. The poor condition of dense settlements was a factor in continuing the development. A request for assistance to the Dutch East Indies government was also made for the public bathroom project but was not given due to the unfavourable state financial condition (*Department van Burgerlijke Openbare Werken Archive No.*

7582).

Despite having a limited budget, a serious sewerage system development plan was carried out by collaborating with the Consulting Bureau of Architects and Technical Engineers Roosenburg-Op Ten Noort-Scheffer or TABROS (*Technische Advies-Bureau Roosenburg-Op Ten Noort-Scheffer*) (Gemeente Medan No. 21, 1920, p. 6). In addition, the Medan City Government established the Waste Sewerage Commission (*Rioleering Commissie*) in 1920. The TABROS Consulting Bureau was instructed to design the construction of a closed sewerage system (Van Ommen, 1934, p. 11). Drafting the plan was carried out from August 1919 to 1921. Discussions on planning and field research were carried out by various stakeholders, namely the Mayor of Medan, Representative from the Consultation Bureau TABROS, Technical Commissioner, Director of the City Public Works Department, Director of the Medan Pathology Laboratory, Chief Inspector of the Civil Health Service of Northern Sumatra, and a chemist from *Deli-Proefstation* (*Architecten-en Ingenieurs- Adviesbureau TABROS*, 1921, pp. 11-13).

The design of the municipal sewerage system considered several factors, namely the city's topography and geography, population density, land prices and units, rainfall, water use, capacity and level of pollution of the Deli River as the final disposal channel, as well as the existing waste disposal sewers. Indeed, since 1889 in the city of Medan, two large sewers had been built. These sewers were located along Huttenbach Road and Markt Road, both flowed into the Deli River (*Architecten-en Ingenieurs- Adviesbureau T.A.B.R.O.S.*, 1921, pp. 15-16). These two sewers drain water and household waste from the Chinese settlements in Kesawan and its surroundings (*Notulen Gemeente Medan*, 1934, p. 8).

Looking into the urgency of the construction, the city sewerage system was more intended for European residents and residential areas close to the European area, while the public bathroom project was built for the natives who resided in the villages. Indeed, public bathroom projects in several locations carried out by the Medan City Government stemmed from the situation and condition of the *Bumiputra* population (*Notulen Gemeente Medan*, 1923, p. 14). The housing conditions in the city centre that were dense and the poor condition in the suburban villages required adequate supply of clean water. Houses in narrow alleys lacked clean water due to dirty and polluted wells. In fact, access to water in some villages did not meet basic needs,

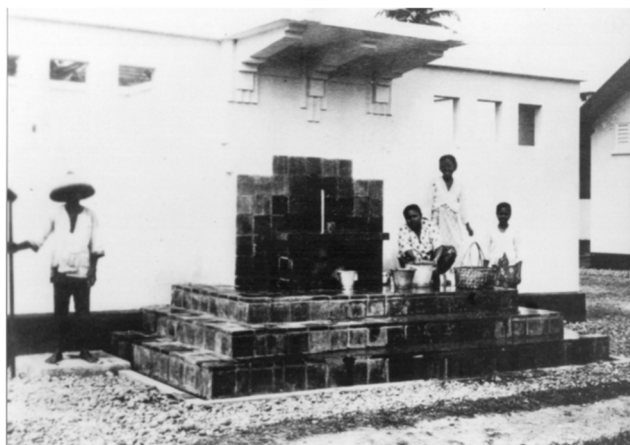


Figure 1. Public Bathroom in Medan
Source: Archive KIT Sumut No. 0534-023. ANRI.

hence actions were required to provide such access (*Gemeente Medan* No. 67, 1924, pp. 35-36). The condition of the villages that depended on river water was also a concern for the city government, especially the river which was used as a dumping ground for waste and sewage. In 1922, the Director of the City Public Works Department proposed to the Mayor of Medan to build a public bathroom in the village on the outskirts of the Deli River, namely Kampung Gloegoer. The reason was that residents in this village carried out bathing, washing and defaecating activities in the Deli River every day, hence the need of adequate facilities and access to clean water (*Gemeente Medan* No. 112, 1922, p. 373).

Access to clean water with public bathroom projects in suburban locations was an effort by the city government to improve the health of the native population. So far, residents had access to water through dirty rivers and wells with a high risk of pollution. Meanwhile, public bathrooms that had been built by the city government were located near the city centre, which made the residents living in suburban villages had difficult access to adequate water services (*Department van Burgerlijke Openbare Werken Archive* No. 7582).

The distribution of public bathroom construction projects was divided into the city centre areas and the downtown suburban villages. Some of these projects were also carried out in conjunction with public housing development projects. Public bathroom projects located near the city centre included those on the side of main roads such as Oranje Nassau Road, Paleis Road, Siak Road, Sei Rengas Road, Resident Road, Luitenants Road, and in the Old Market (*Oudemarkt*). Public bathroom projects built in villages on the outskirts of the city included Kampung Soekaradja, Kampung Darat, Kampung Pandau, and Kampung Tempel. Mean-

while, public bathroom projects in villages that were part of the development of public housing included Kampung Sekip, Kampung Djati Oeloe, Kampung Padang Loemba, and Kampung Sidodadi (*Verslag betreffende de Gemeente Medan over het Jaar 1919-1929, 1920-1930*).

The public bathroom project continued to be built from 1921 to 1925. In 1921, it was built in Kampung Sekip and Djati Oeloe. This facility could not only be used by the residents of the village, but also residents from the surrounding area (*Verslag betreffende de Gemeente Medan over het Jaar 1921, 1922*, p. 77). In 1922, the Medan City Government granted a permit for a public bathroom project in Kampung Darat and Pandau which was completed in October 1922 (*Verslag betreffende de Gemeente Medan over het Jaar 1922, 1923*, p. 94). On August 15, 1923, a public bathroom project was started in Kampung Tempel (*Verslag betreffende de Gemeente Medan over het Jaar 1923, 1924*, p. 86). Kampung Darat, Pandau and Tempel were areas on the outskirts of the city, precisely in the western and eastern parts of Medan. Meanwhile, from 1924 to 1925, public bathrooms were built in Kampung Padang Loemba and Sidodadi (*Verslag betreffende de Gemeente Medan over het Jaar 1924, 1925*, p. 115). The public bathroom projects in Kampung Sekip, Djati Oeloe, Padang Loemba, and Sidodadi were part of the Medan City public housing development project (Hogervorst, 1925).

While the public bathroom project was under construction, planning for the construction of a city sewer system was ongoing. In mid-May 1921, a draft paperwork and map of the construction of a municipal sewerage system was completed by the Consulting Bureau "TABROS". The area of Medan City that was included in the planning for the development of sewerage was within the boundaries of the Deli River, Mantri Road, Paleis Road, Smid Road, the Kampung Sultan area, Oranje Nassau Road, and Djati Road (*Verslag betreffende de Gemeente Medan over het Jaar 1921, 1922*, p. 87). The areas within these boundaries were divided into three development sections, namely Section A, Section B, and Section C. The length of the sewer to be constructed was 41,786 m, with a drain of 15,702 m in Section A, a drain length of 14,598 m in Section B, and an 11,486 m drain in Section C (*Architecten- Ingenieurs- Adviesbureau TABROS, 1921*, pp. 107-108).

Water and household waste were made to flow naturally from the drainage network built into the rivers within the city of Medan, including the Deli River, Baboera River, and the Kerah River. The



Figure 2. Design Construction of Medan City Sewerage System, 1920.

Source: Architecten- en Ingenieurs- Adviesbureau T.A.B.R.O.S. (1921). *Rioleeringsplan voor Medan 1921*.

discharge points for household waste from Parts A and B were located at Parit Gloegoer towards the Deli River, which was also the disposal channel for waste from the Slaughterhouse. Meanwhile, the discharge point of Part C was located around the bridge in Serdangweg towards Sungai Kerah. With the existence of this sewer points, a central wastewater treatment and purification installation must be built near the discharge point (*Architecten- en Ingenieurs- Adviesbureau T.A.B.R.O.S.*, 1921, p. 25).

The estimated cost of constructing this sewer system was quite large, namely f. 3,000,000. The division was that Part A was estimated to cost f. 830,000, Part B required a cost of f. 1,130,000, and Part C required a cost of f. 1,040,000. This fee was intended for sewerage work, repair of digging pits, road and gutter arrangements, road adjustments, replacement of water pipes and gas installations, planning, supervision and other unexpected costs (*Architecten- en Ingenieurs- Adviesbureau TABROS*, 1921, pp. 112-113).

This design needed to be realised especially in terms of cost. In the Medan City Council meeting, a plan to collect funds from sewer taxes was proposed. However, this idea requires the cooperation and compliance of the residents in paying and connecting the pipe network to their homes. The estimated cost for connecting the house pipe network

to the sewer was f. 300 per house. Apart from the sewerage tax, there was an idea of a mechanism for borrowing money at an interest rate of 7% that could be paid in instalments over a period of 50 years. From the calculation of the loan, it was necessary to allocate an average budget from the city treasury for the construction of this municipal sewerage of f. 84,000,- and a total of f. 11.000,- so that the total required amounted to f. 95.000,- every year (*Verslag betreffende de Gemeente Medan over het Jaar 1921, 1922*, pp. 87-88).

Until the 1925 budget discussion, plans for the construction of a city sewer system had not shown any progress. In mid-1925, the City Council discussed the 1926 budget. During the discussion, the Sewerage Commission proposed the construction of a small sewerage area in the Chinese settlement area. The poor hygienic conditions in this area every year were a prioritised consideration for the development of the city sewer system. The canal network to be built crosses Pacht Road, Nieuwe Markt, and Nienhuys Road. These canals will be connected to the large canal on Huttenbacht Road previously existed towards the Deli River as an emergency waste outlet (*Verslag betreffende de Gemeente Medan over het Jaar 1925, 1926*, pp. 104-105).

On 17th June 1926, the Medan City Government decided that the construction would be carried out immediately. Preparations were made by ordering construction materials from the Netherlands and other European countries as well as from local companies in the Dutch East Indies. Contractors and companies were commissioned to make trenches, walkways and sewer pipe construction. As for the division, the trenches were made by *Hollandsche Beton Maatschappij* from the Netherlands; sidewalks were built by Firm T. Buning from Cirebon; and the construction of supports and sewer rails by *Halbergerhutte* of Brebach, a German-based contracting company (*Verslag betreffende de Gemeente Medan over het Jaar 1926, 1927*, p. 80).

The first excavation work was carried out on 24th December 1926 but had to be postponed due to bad weather and heavy rains. The laying of the first stone for the construction of a new sewer could only be carried out on 13th January 1927. After the laying of the first stone, the work went smoothly. This made the Medan City Council enthusiastic to build another sewerage section (*Verslag betreffende de Gemeente Medan over het Jaar 1926, 1927*, pp. 80-81). After various discussions and debates at the Medan City Council, it was agreed that the focus of this sewerage construction was in the Chinese set-

tlement in Kesawan (city centre) and the Indian settlement in Kampung Keling. It was later proposed in 1927 that the construction of a sewerage channel in the Chinese settlement and around Kesawan which crossed Nienhuys Road, Spoor Road, Nieuwe Markt Road, Pacht Road, Tepekong Road, Markt Road and the Kesawan area. Developments in the Indian settlement were carried out on routes that passed through Kroesen Road, van der Plas Road, Rahder Road, Ballot Road, Park, Road and Resident Road (*Verslag betreffende de Gemeente Medan over het Jaar 1927, 1928*, pp. 103, 107).

Entering the year 1928, the Medan City Government planned to complete the construction of Part A of the sewerage design. The construction was carried out on the section that crossed by Nienhuys Road, Tepekong Road, Markt Road, Kerk Road, Spoor Road, Nieuwe Markt, Pach Road, Kesawan area, Cremer Road, Bool Road, and Jan van Oosten Road which led towards the Deli River (*Verslag betreffende de Gemeente Medan over het Jaar 1928, 1929*, pp. 79-80).

At a meeting on 29th April 1929, the City Council planned to allocate funds amounting to f. 300,000 to build the Part B city sewer, which crossed the Deli River to Hakka Road. This budget was allocated for the years 1930 and 1931. The contractor responsible for this construction was Semarangische Aannemings Mij. The selection of the contractor was based on the contractor's ability to use less budget. In 1930, the realised development budget was f. 214,800. This amount was used to build a 178 m long sewage disposal channel between Hakka Road and Luitenants Road (*Gemeente Medan No. 73, 1931*, pp. 147-148).

The construction of the city's waste disposal channel continued to be carried out by the Medan City Government. At the City Council meeting on 28th January 1931, the construction of the city's sewage disposal system was planned to continue in Kampung Keling (Indian settlement). In addition to the plan, the development plan would also continue in the Chinese settlement area, specifically at the east of the railway line. The development was intended to connect the drainage channel on Wilhelmina Road between Djati Road and Hakka Road of the Chinese settlement as well as Calcutta Road in Kampung Keling. The meeting also decided that the construction time be set for a maximum of one year. The construction of this development channel system was an effort by the Medan City Government to maintain good hygiene and sanitation conditions for the city's residents, especially in the city

Table 2. Sanitation Development Budget of Medan City, 1919–1930*

Year	Public Bathrooms and Toilets	Sewer System
1920	-	19.580,69
1921	1.550	4.411,07
1922	9.018,80	2.062,20
1923	10.139,25	-
1924	6.615,21	-
1925	2.392,9	-
1926	-	10.039,05
1927	-	125.297,87
1928	4.500	105.925,94
1929	-	16.466
1930	-	214.800
Total	34.216,16	498.582,82

*The amount currency is in guilders (*gulden*)

Source: compiled from *Verslag betreffende de Gemeente Medan over het Jaar 1919-1922, 1928, 1929*, Medan: TYP. Varekamp & Co., and *Gemeente Medan, Gemeentebblad II, afl. 7, No. 75, 1931* pp. 147-148.

centre (*Algemeene Secretarie Archive No. 5381*). Since the design of the sewer system in 1920 and its implementation from 1926 to 1930, the construction of this project used a larger budget compared to the public bathroom project. The following is a table of the total budget spent for the development of sanitation in Medan City during the period 1920 to 1930.

Based on Table 2, it can be seen that the ratio of the total budget for the public bathroom and toilet projects to the construction of a sewerage system is more than 10 times. The costs were borne entirely by the Medan City Government because until 1930 the application for subsidies to the central government had not been approved. The high cost of constructing sewerage was a common problem in the cities of the Dutch East Indies. With various budget constraints, until the early 1930s, the number of houses connected to the municipal sewerage network was 1,705 houses (Van Ommen, 1934, p. 12).

Until 1930, the project for the construction of public bathrooms and toilets with the provision of clean water was realised with the operation of 15 public bathrooms (private bathrooms and toilets). These facilities were supported by 32 water pipes or hydrants scattered throughout the city. The cost of providing this water was funded by the Medan City Government. The implementation of this policy was carried out as an effort to improve the village so that the *Bumiputra* residents were in good hygiene

conditions (Mackay, 1930, p. 387).

The sewer system in Medan City was the only development project outside Java that was funded by the city's own budget. In fact, the construction of sewers in Java was also only carried out in Bandung, Cirebon and Semarang. The development projects in Bandung and Semarang were financed by the city and central governments, while the projects in Cirebon City were built by the central government as a whole (*Notulen Gemeente Medan*, 1931, p. 10). In contrast to the three cities, the financing of the sewer system development using the city's own budget shows the seriousness of the Medan City Government then in improving the citizen's hygiene and efforts to overcome the city's sanitation problems.

CONCLUSION

Based on the narrative above, the sanitation conditions and problems that occurred were intertwined between the hygienic habits of the population, the activities of plantation companies and the city government which used the river as a sewer for the city's sewage and waste. Although, the river had long been a place of activity for residents, where washing, bathing, and drinking water supply were carried out, but at the same time it was also a place to dispose wastes. In other parts of the city, such as in the city centre, the dense population settlements caused the absence of sufficient space for the circulation of population activities to the surrounding environment. Residents were accustomed to throwing their garbage and household waste in open ditches, resulting in air pollution and strong odour. This sanitation problem haunted the population for years and posed risks to the health of the population.

Since the appointment of Baron D. Mackay as the Mayor of Medan in 1918, efforts to overcome sanitation problems had commenced. There were two main aspects that the city government focused on, namely the public bathroom project and the construction of a city sewer system. The public bathroom construction project involved facilities for clean water access that spread over the villages inhabited by the *Bumiputra* natives. Several public bathroom projects were also carried out in conjunction with the public housing development program. The construction of a city sewer system prioritised certain areas with high population density, high environmental pollution and close proximity to European settlements. These areas were the Chinese settlement in Kesawan and the Indian settlement in Kampung Keling. The limited budget owned by the city government made development impossible to

carry out as a whole, hence the government took action by prioritising certain areas only.

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REFERENCES

- Architecten- en Ingenieurs- Adviesbureau T.A.B.R.O.S. (1921). *Rioleeringsplan voor Medan 1921*.
- Archive Algemeene Secretarie Serie Grote Bundel Missive Gouvernements Secretaris, No. 5381. *De dienstwoning van de Gouvernementssecretaris Medan, 1931*. Jakarta: Arsip Nasional Republik Indonesia (ANRI).
- Archive Department van Burgerlijke Openbare Werken: Serie Grote Bundel 1854-1933, No. 7582. *Stukken betreffende aanvraag van de gemeente Medan om voorschot voor de verbetering de volkshuisvesting, 1924*. Jakarta: Arsip Nasional Republik Indonesia (ANRI).
- Archive KIT Sumut No. 0534-023. Jakarta: Arsip Nasional Republik Indonesia (ANRI).
- Asnan, G. (2016). *Sungai dan Sejarah Sumatra*. Yogyakarta: Ombak.
- Bashford, A. (2004). *Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health*. Basingstoke, Hampshire: Palgrave Macmillan.
- Bashford, A. and Sarah T. (2012). "Introduction: Modern Air, Water and Place", *Bulletin of the History of Medicine*, 86 (4): 495-503.
- Basundoro, P. (2016). *Pengantar Sejarah Kota*. Cet. II. Yogyakarta: Ombak.
- Breman, J. (1997). *Menjinakkan Sang Kuli Politik Kolonial, Tuan Kebun, dan Kuli di Sumatera Timur pada Awal Abad 20*, terj. Koesalah Soebagyo Toer. Jakarta: PT. Pustaka Utama Grafiti.
- Buiskool, D.A. (2005). "Medan: A Plantation City on the East Coast of Sumatra 1870-1942", in Freek Colombijn, et.al. (eds.). *Kota Lama, Kota Baru: Sejarah Kota-Kota di Indonesia Sebelum dan Setelah Kemerdekaan*. Yogyakarta: Ombak.
- Gedelte bevolking der Gemeente Medan 7 op 8 October 1930*, accessed from <http://colonialarchitecture.eu>
- Gemeente Medan (1920). *Gemeenteblad II*, afl. 15, No. 21.
- Gemeente Medan (1920). *Gemeenteblad II*, afl. 15, No. 129.
- Gemeente Medan (1922). *Gemeenteblad II*, afl. 32, No. 112.

- Gemeente Medan (1923). Gemeentebblad I, notulen Gemeente Medan 1923, Vergadering 19-12-1923 No. 14.
- Gemeente Medan (1924). Gemeentebblad II, afl. 6a. *Kampoengrapport (Samengesteld ingevolge Gemeenteraadsbesluit 1922 No. 67)*, Medan: TYP. Varekamp & Co.
- Gemeente Medan (1931). Gemeentebblad I, notulen Gemeente Medan 1931, Vergadering 27-5-1931 No. 10.
- Gemeente Medan (1931). Gemeentebblad II, afl. 7, No. 75.
- Gemeente Medan (1934). Gemeentebblad I, notulen Gemeente Medan 1934, Vergadering 15-8-1934 No. 8.
- Halewijn, E.A. (1875). *Geographische en Ethnographische gegevens betreffende het rijk van Deli (Oostkust van Sumatra)*.
- Hamdani, N. (2013). *Komunitas Cina di Medan Dalam Lintasan Tiga Kekuasaan 1930-1960*. Jakarta: LIPI Press.
- Hanley, J.G. (2000). Melosi, M.V. *The Sanitary: Urban Infrastructure in America from Colonial Times to the Present*, *Urban History Review*, 29 (1): 75-76. DOI: <https://doi.org/10.7202/1016437ar>
- Hartono, S. (2005). "Medan: The Challenges in the Heritage Conservation of a Metropolis", in Freek Colombijn, et.al. (eds.). *Kota Lama, Kota Baru: Sejarah Kota-Kota di Indonesia Sebelum dan Setelah Kemerdekaan*. Yogyakarta: Ombak.
- Hogervorst, J. (1925). *De Volkhuysvesting te Medan*. url: <http://colonialarchitecture.eu>
- Hygienisch Medan. (1917, 23 November). *De Sumatra Post*.
- Hudiyanto, R. (2012). "Mengungkap Unsur Air dalam Sejarah Kota Malang: Pengelolaan Assainering dan Gorong-Gorong Kota 1914-1940", *Mozaik Jurnal Ilmu Humaniora*, 12 (2): 157-166.
- Jaelani, G.A. (2017). "La question de l'hygiène aux Indes-Néerlandaises: Les enjeux médicaux, culturels et sociaux", *Disertasi*. Paris: Ecole des Hautes Etudes en Sciences Sociales.
- Kooy, M. and Karen B. (2015). "(Post) Colonial Pipes Urban Water Supply in Colonial and Contemporary Jakarta", in Freek Colombijn and Joost Cote (eds.), *Cars, Conduits, and Kampongs the Modernization of the Indonesian City, 1920-1960*. Leiden: Brill.
- Kotoran. (1918, 17 April). *Benih Mardeka*.
- Loedin, A.A. (2005). *Sejarah Kedokteran di Bumi Indonesia*. Jakarta: Pustaka Utama Grafiti.
- Mackay, B.D. (1930). "Gemeente Medan", in F.W.M. Kerchman (ed.). *25 Jaren Decentralisatie in Nederlandsch-Indie 1905-1930*. Semarang: Vereeniging voor Locale Belangen.
- Mededeelingen en Rapporten van het Departement der Burgerlijke Openbare Werken. (1919). *Drinkwaterleiding te Medan*, Deel I: Tekst. Batavia: Landsdrukkerij.
- Melosi, M. (2008). *The Sanitary City: Environmental Services in Urban America from Colonial Times to the Present*. University of Pittsburgh Press.
- Nasution, J. (2018). "Transformasi Modernitas di Kota Medan: Dari Kampung Medan Putri Hingga Gemeente Medan", *Jurnal Sejarah*, I (2): 65-68, DOI: <https://doi.org/10.26639/js.v1i2.83>
- Pelly, U, Ratna and S. Kartadarmadja (1984). *Sejarah Sosial Daerah Sumatra Utara Kotamadya Medan*. Jakarta: Depdikbud.
- Pelzer, K.J. (1985). *Toeian Keboen dan Petani Politik Kolonial dan Perjuangan Agraria*. Jakarta: Pustaka Sinar Harapan.
- Pols, H. (2019). *Merawat Bangsa Sejarah Pergerakan Para Dokter Indonesia*. Jakarta: PT Kompas Media Nusantara.
- Prasad, S. (2015). *Cultural politics of hygiene in India, 1890-1940: Contagion of Feeling*. Basingstoke, Hampshire: Palgrave Macmillan.
- Sciortino, R. (2007). *Menuju Kesehatan Madani*. Yogyakarta: Gadjah Mada University Press.
- Sinar, T.L. (1991). *Sejarah Medan Tempo Doeloe*. Medan: Lembaga Penelitian Budaya Melayu Medan.
- Stam, A.H. (1930). "De Verzorging der Stadshygiene door Land en Gemeente", in F.W.M. Kerchman (ed.). *25 Jaren Decentralisatie in Nederlandsch-Indie 1905-1930*. Semarang: Vereeniging voor Locale Belangen.
- Stibbe, D.G., F.J.W.H. Sandbergen and E.M. Uhlenbeck (1935). *Encyclopaedie van Nederlandsch-Indie*. Tweede Druk, Zevende Deel. 's-Gravenhage: Martinus Nijhoff.
- Suriani and Syaiful A. (2015). "Gemeente Medan Awal Abad ke-20: Sebuah Eksistensi Kota Kolonial dalam Pengelolaan Suplai Air Bersih dan Saluran Pembuangan", *Majalah Ilmiah Tabuah Ta'limat, Budaya, Agama dan Humaniora*, 23 (1): 27-33. DOI: <https://doi.org/10.15548/tabuah.v23i1.89>
- Thee, W.K. (1977). *Plantation Agriculture and Export Growth: An Economic History of East Sumatra, 1863-1942*. Jakarta: LEKNAS-LIPI.
- Tillema, H.F. (1923). "Kromoblanda". *Deel Tropische handelwaren en tropische ellende*. Den Haag: N.V. "Adi-Poestaka".
- Van Dijk, K. and Jean G.T. (eds.) (2011). *Cleanliness and Culture Indonesian histories*. Leiden: KITLV Press.
- Van Ommen, W. (1934). "Technische Diensten", in *Gemeente Medan 1909-1934*. Medan: Drukkerij Deli Courant.
- Verslag betreffende de Gemeente Medan over het Jaar 1919-1929*, Medan: TYP. Varekamp & Co.
- Winckel, L.J. (1934) "Eenige aanteekeningen uit de Geschiedenis der Gemeente Medan", in *Gemeente Medan 1909-1934*, Medan: Drukkerij Deli Courant.