

Distribution Pattern and Geological Factor Review in the Construction of Office Buildings in the City of Bandung During Dutch East Indies Colonial Era

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Abstract: Geologically, the city of Bandung is built on a former large lake known as the Ancient Bandung Lake and when the water recedes it forms a topography in the form of a basin known as the Bandung Basin. The interesting thing is that when the Dutch East Indies Colonial government built Jalan Raya Pos and office buildings they tended to choose the northern part of the basin over the southern part. This study aims to determine the pattern of distribution of office buildings along Jalan Raya Pos during the Dutch East Indies Colonial era and review geological factors that influenced it. This research was conducted by studying the distribution pattern of the building through the nearest neighbor analysis method and its location from Jalan Raya Pos and the geological map of the Bandung Basin. The results of this study show that office buildings built during the Dutch East Indies Colonial were dominantly concentrated in the northern part of Jalan Raya Pos which were randomly distributed, located in the northern part of the Bandung Basin with an altitude between 704 – 725 m sea level, dry plains, and stable soil conditions with topography relatively flat. Meanwhile, in the southern part, the topography continues to decline until the bottom of the Basin which has an average elevation of 600 m sea level. The main rocks in the northern part of the Bandung Basin are volcanic products, while the southern part is lake deposits so the soil surface in the southern part has a wetter and unstable condition because the constituent rocks are the clay. This also has implications for the available groundwater potential, in the northern part relatively having a character with much better quantity and quality than the southern part. This condition made the Dutch East Indies Colonial government prefer the north side of Jalan Raya Pos and the northern part of Bandung Basin in constructing office buildings which are randomly distributed more in the north of Jalan Raya Pos, which is 87%, while in the south 13% in the period from 1810 – 1940.

Keywords: Distribution of Office Buildings, Dutch East Indies Era, City of Bandung, Geological Factor

1. Introduction

In the past, the Bandung area used to be just a village

called Kampung Bandong [12]. In the middle of Bandung today, initially there was only one road in the form of a footpath which was a connecting road between Bandung

which was located at the confluence of the Tjikapoendoeng river and the Tjitaroem river with Tjipaganti which was located upstream of the Tjipagantie river [13]. In the sixteenth century this village was part of the Islamic Mataram Kingdom. During the colonial period, the name Bandung could be seen, among others, on a Portuguese map in 1755, an English map in 1817, and a Dutch map in 1818, 1840, and 1920 [9]. Meanwhile, during the Portuguese period, Jalan Raya Pos was not yet visible on a Java map [25]. Jalan Raya Pos which was built in 1810 by the Dutch East Indies Colonial government began to be seen on British maps in 1817 and Dutch maps in 1818, 1840, and 1920. Since 1840 the city of Bandung has continued to grow rapidly following other cities in Java that have developed such as Batavia, Semarang, and Surabaya [15]. Even the Dutch East Indies Colonial government at that time planned to move the capital from Batavia to Bandung. Along with this, many office buildings were built along Jalan Raya Pos which stretches between Cimahi – Ujung Berung [10]. From a number of office buildings and city parks, there is a tendency for the Dutch Colonial government to prioritize development in the northern part of Bandung City, especially in the northern part of Jalan Raya Pos [18]. Considering that there were no geologists at that time, it is interesting to know the possible reason why the Dutch East Indies colonial government tended to build the northern part compared to the southern part in relation to the condition of the Bandung basin at that time, which geologically was a basin formed from the former ancient Bandung Lake which drained around 16000 years ago [5]. As an approach to know the distribution pattern of office buildings in Dutch East Indies colonial era in Bandung City, the closest neighbor method and geological conditions were used.

2. Discussion

2.1. Office Buildings Around Jalan Raya Pos

In general, office buildings in the city of Bandung were built between 1812 and 1940 and are centered around the zero-kilometer point of Bandung. Of the 31 office buildings built during the Dutch East Indies colonial era, most of them are located in the northern part of Jalan Raya Pos, which was built by General Daendels, as many as 27 buildings (87%), and a small portion are in the southern part of 4 buildings (13%). This is not without reason, considering that the northern part is intended as the official of the Dutch East Indies colonial government, while the southern part is intended as the center of government and the residence of the indigenous population. Meanwhile, based on the year of construction (Figure 1), the number of office buildings built during the colonial period can be divided into the following periods.

- 1) In the 1810 – 1850 period (the initial period after Jalan Raya Pos was built) only 1 office building was built, namely the Bandung Regent's government building in the southern part.
- 2) In the period 1850 – 1900, 3 office buildings were built, i.e. two in the northern part and one in the southern part.
- 3) In the 1900 – 1910 period, only 1 office building was built in the north, namely Bank N. I. Escompto Mij.
- 4) In the 1910 – 1920 period, 15 office buildings were built, i.e. fourteen in the northern part and one in the southern part.
- 5) In the 1920 – 1930 period, 7 office buildings were built, i.e. six in the northern part and one in the southern part.
- 6) In the 1930 – 1940 period, built as many as 4 office buildings and all of them in the northern part.

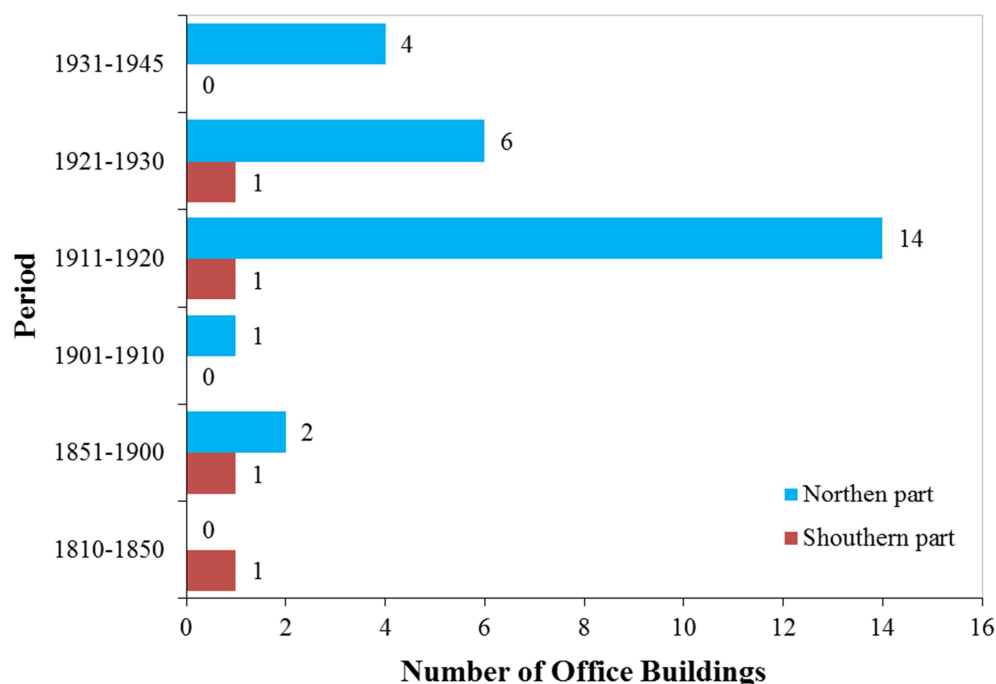


Figure 1. Graph of the development of office buildings during the Dutch East Indies colonial era.

From Figure 1 it can be seen that in general the construction of office buildings in the Bandung city during the Dutch East Indies colonial period was slow, especially at the beginning of the construction period until 1910, but increased sharply in the period 1910 – 1920 in line with the plan to move the center of government and the military from Batavia to Bandung [24]. After that, from 1930 the construction of offices in Bandung City experienced a decline in line with the monetary depression that hit the world and the entry of Japanese colonial in Indonesia, especially to Bandung city [11]. As a result, the plan to move the capital from Batavia to Bandung finally failed.

During the Dutch East Indies colonial period, the distribution of office building developments was centered around the zero-kilometer point in Bandung city or around Jalan Asia Afrika. The zero kilometer point itself is the beginning of development and development in the Bandung city, since the Governor General of the Dutch East Indies named William Daendels (1808 – 1811) stuck a wooden stick at that point at the beginning of the construction of Jalan

Raya Pos Anyer – Panarukan (Grote Postweg) which crossed the city of Bandung. At that time, September 25, 1810 Daendels accompanied by the Regent of Bandung Regency, Wiranatakusumah II (1794 – 1826) stuck a wooden stick and said: "zorg, dat als ik terug kom hier een staad is gebouwd" which means: try if I come back here, in this area a city has been built [20]. Currently the zero-kilometer point is right in front of the West Java Province Highways Office.

Furthermore, Table 1 below shows the distribution of office building locations and their descriptions [7]. Until 1940, the development and distribution of office buildings starting from the zero-kilometer point were mostly dominant in the north direction from Jalan Raya Pos, while in the southern part there were only 4 office buildings as can be seen in Figure 2. the land in the southern part, at that time there were still many swamps and most of the soil was traces of mud from the remnants of the Bandung Ancient sediments so that it did not provide bearing capacity for foundations and building construction.

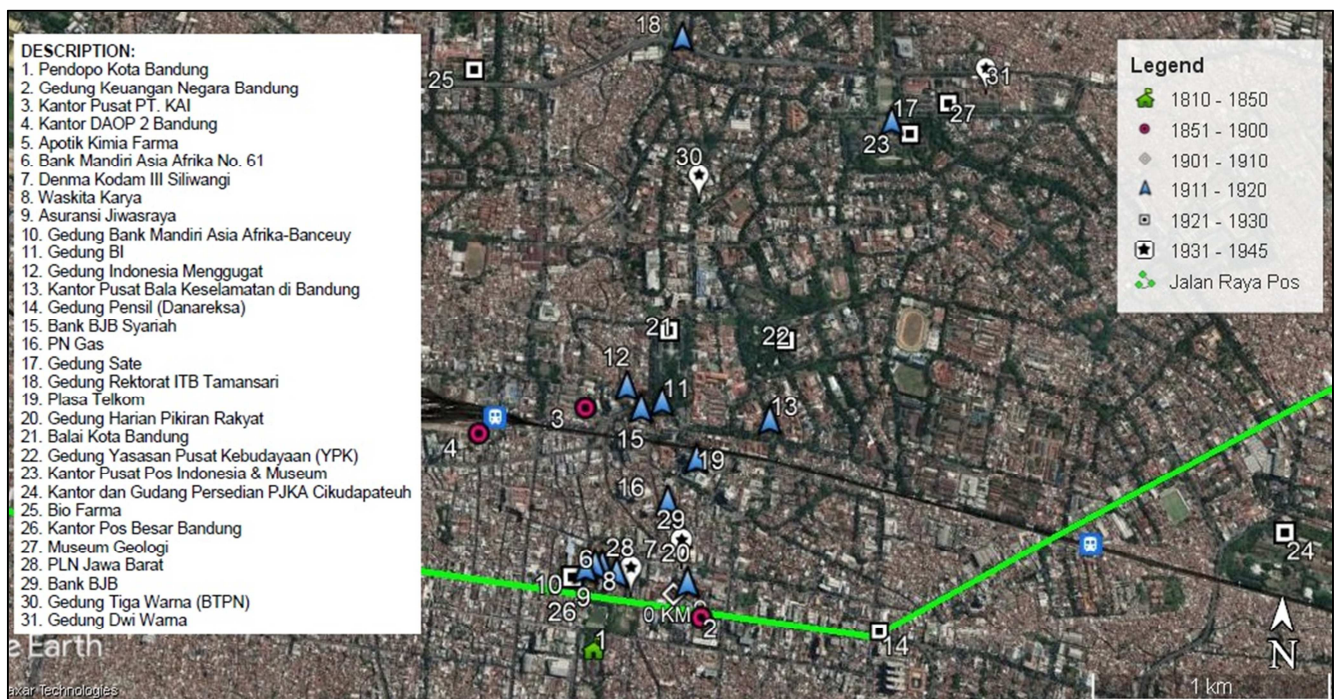


Figure 2. Map of the distribution of office buildings during the Dutch East Indies Colonial era.

Table 1. List of office buildings during the Dutch East Indies Colonial era in Bandung city.

No.	Current Building Name	Previous name	Year built	Location	Elevation (masl)	North/South of Jalan Raya Pos
1	Pendopo Kota Bandung	Kantor Bupati Kab. Bandung	1812	Jl. Dalem Kaum No. 56	710	South
2	Gedung Keuangan Negara Bandung	Residentiekantoor	1867	Jl. Asia-Afrika No. 114	707	South
3	Kantor Pusat PT. KAI	Staatssporwegen (SS)	1884	Jl. Perintis Kemerdekaan No. 1	709	North
4	Kantor DAOP 2 Bandung	Bureau Staatsspoorwegen	1900	Jl. Stasiun Selatan No. 25	709	North
5	Apotik Kimia Farma	Bank N. I. Escompto Mij, N. V. Chemicalienhandel Rathkamp & Co.	1902	Jl. Braga No. 2-4-6	707	North

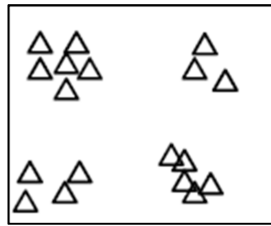
No.	Current Building Name	Previous name	Year built	Location	Elevation (masl)	North/South of Jalan Raya Pos
6	Bank Mandiri Asia Afrika No. 61	Nederlandsche Handel-Maatschappij te Bandoeng (asli) / Bank Ekspor Impor (1960)	1912	Jl. Asia Afrika No. 61	710	North
7	Denma Kodam III Siliwangi	Departement van Oorlog	1913	Jl. Kalimantan No. 14	720	North
8	Waskita Karya	Volker Aannemings Maatschappij NV	1913	Jl. Asia Afrika No. 55	711	North
9	Asuransi Jiwasraya	Nederlandsch Indische Levensverzekering en Liffrente Maatschappij van 1859	1914	Jl. Asia Afrika No. 53	711	North
10	Gedung Bank Mandiri Asia Afrika-Banceuy	Netherlandsc Indische Escompto Maatschappij (NIEM), Bank Escompto, Bank Dagang Negara (1960)	1915	Jl. Asia Afrika-Banceuy	711	North
11	Gedung BI	Javaasche Bank	1915	Jl. Braga No. 108	717	North
12	Gedung Indonesia Menggugat	Landraad	1917	Jl. Perintis Kemerdekaan No. 5	713	North
13	Kantor Pusat Bala Keselamatan di Bandung	Hoofdkwartier van het Leger des Heils te Bandoeng	1917	Jl. Jawa No. 18-20	710	North
14	Gedung Pensil (Danareksa)	Handel Mij Groote, Scholtz	1918	Jl. Ahmad Yani No. 1	702	South
15	Bank BJB Syariah	Residentiekantoor Afd. Priangan, Landskas, Algemeen Ontvanger en Landsvendukantoor Bandoeng; NV Oliefabrieken Insulinde (asli)	1918-1921	Jl. Braga No. 135	716	North
16	PN Gas	N. V. Nederlandsch-Indische Gasmaatschappij (NIGM), Showroom en kantoor; Becker en Co (asli)	1919	Jl. Braga No. 38	708	North
17	Gedung Sate	Department van Gouvernementsbedrijven te Bandung	1920	Jl. Diponegoro No. 22	738	North
18	Gedung Rektorat ITB Tamansari	Gemeente Secretarie	1920	Jl. Tamansari No. 64	745	North
19	Plasa Telkom	Telefoonkantoor	1920	Jl. Lembong No. 11	710	North
20	Gedung Harian Pikiran Rakyat	Kantor de Kock, Sparkes & Co	1920	Jl. Asia Afrika No. 77	707	North
21	Balai Kota Bandung	Huis van de asisten-residen, <i>Asisten der Koffijkultuur</i>	1927	Jl. Wastukancana No. 2	726	North
22	Gedung Yayasan Pusat Kebudayaan (YPK)	Kantor badan hukum N. V. Javaansche Boekhandel en Drukkerij en handel in schrijfbehoeften. N. V atau badan hukum pertama N. V pribumi sekaligus N. V pers pertama	1930	Jl. Naripan No. 7-9	710	North
23	Kantor Pusat Pos Indonesia & Museum	Post-Telegraaf en Telefoondienst	1920-1931	Jl. Cilaki No. 73	738	North
24	Kantor dan Gudang Persedian PJKA Cikudapateuh	—	1925	Jl. Sukabumi No. 20	691	South
25	Bio Farma	Instituut Pasteur	1926	Jl. Pasteur No. 28	748	North
26	Kantor Pos Besar Bandung	Post- en Telegraafkantoor	1928-1931	Jl. Asia-Afrika No. 49	710	North
27	Museum Geologi	Laboratorium Geologisch	1928	Jl. Diponegoro No. 57	734	North
28	PLN Jawa Barat	Gemeenschappelijk Electriciteitsbedrijf Bandoeng en Omstreken (GEBEO)	1933	Jl. Asia-Afrika No. 63	708	North
29	Bank BJB	DENIS De Eerste Nederlandsch - Indische Spaarkas, Bank Karya Pembangunan	1935	Jl. Naripan No. 12 - 14	709	North
30	Gedung Tiga Warna (BTPN)	Driekleur	1937	Jl. Sultan Agung No. 1	735	North
31	Gedung Dwi Warna	Indische Pensioen Fondsen	1940	Jl. Diponegoro No. 59	730	North

2.2. Office Buildings Distribution Pattern

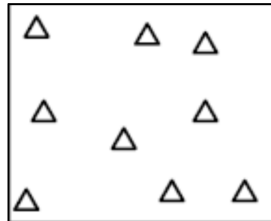
$$T = \frac{ju}{jh}$$

The distribution pattern of office buildings in the city of Bandung during the Dutch East Indies Colonial was calculated using the nearest neighbor analysis method. In applying this method, first, the closest distance between one building and another is calculated. The nearest neighboring buildings and their distance can be seen in Table 2 for the northern part and Table 3 for the southern part. By taking into account the area and number of buildings, an index number will be obtained that describes the spatial distribution pattern [21]. The T value of the nearest neighbor distribution index itself is obtained through the following formula.

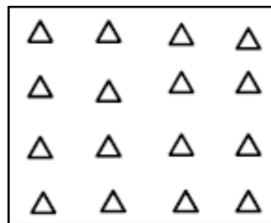
Where: T: nearest neighbor distribution index
 ju: the average distance between one building and its nearest neighbor
 jh: the average distance obtained if all points have a random pattern = $\frac{1}{2\sqrt{p}}$ p: building density per $\text{km}^2 = \frac{N}{A}$
 N: number of buildings
 A: region area (km^2)
 The pattern of distribution of office buildings in the Bandung city during the Dutch East Indies Colonial period can be determined through the following criteria for the T index value [17].



$T = 0 - 0,7$ clustered or clumped pattern



$T = 0,71 - 1,42$ random or unevenly distributed pattern



$T = 1,43 - 2,14$ pattern is evenly distributed or uniform

Figure 3. Illustration of distribution patterns.

2.2.1. Northern Part Distribution

The area of Bandung during the Dutch East Indies Colonial (1906 – 1949): $A = 900$ hectares = 9 km^2

Number of northern part office buildings: $N = 27$.

$$j_u = J/N = 0,28$$

$$p = N/A = 3,00$$

$$j_h = 1/(2\sqrt{p}) = 0,29$$

$$T = j_u/j_h = 0,98$$

The calculation results obtain a T of 0.98 or are in the range $T = 0.71 - 1.42$ which means that the distribution pattern of office buildings in the Bandung city during the Dutch East Indies Colonial era spread randomly or spread unevenly.

Table 2. The distance between the closest office buildings to the north of Jalan Raya Pos in Bandung city during the Dutch East Indies Colonial era.

No.	Neighbors of the nearest building (according to the serial number of the building)	Distance (meters)
1	20 – 5	65
2	5 – 29	138
3	5 – 28	185
4	28 – 6	60
5	6 – 8	70
6	8 – 9	30
7	9 – 10	37
8	10 – 26	50
9	29 – 7	50
10	7 – 16	147
11	16 – 19	220
12	19 – 11	290
13	11 – 15	96

No.	Neighbors of the nearest building (according to the serial number of the building)	Distance (meters)
14	15 – 12	115
15	12 – 3	177
16	3 – 4	480
17	12 – 21	377
18	21 – 30	626
19	30 – 18	720
20	18 – 25	970
21	30 – 17	955
22	17 – 23	80
23	23 – 27	240
24	27 – 31	168
25	19 – 13	364
26	13 – 22	440
27	22 – 21	520
$J = \text{Total distance between neighboring buildings} =$		7670 km

2.2.2. Southern Part Distribution

The area of Bandung during the Dutch East Indies Colonial (1906 – 1949): $A = 900$ hectares = 9 km^2

Number of southern part office buildings: $N = 4$.

$$j_u = J/N = 0,77$$

$$p = N/A = 0,44$$

$$j_h = 1/(2\sqrt{p}) = 0,75$$

$$T = j_u/j_h = 1,02$$

With a T result of 1.02, the distribution pattern of office buildings in the southern part of Bandung city during the Dutch East Indies Colonial spread randomly.

Table 3. The distance between the closest office buildings to the south of Jalan Raya Pos in Bandung city during the Dutch East Indies Colonial era.

No.	Total distance between neighboring buildings (according to the serial number of the building)	Distance (meters)
1	1 – 2	490
2	2 – 14	755
3	14 – 24	1820
$J = \text{Total distance between neighboring buildings} =$		3065 km

2.3. Geological Factor Review

Office buildings built during the Dutch East Indies Colonial era, geologically, are above the Bandung Basin. The Bandung Basin itself is a land formed from a former large lake known as the Ancient Bandung Lake which receded about 16000 years ago or during the last ice age, then formed a topography in the form of a basin [3]. The Bandung city, which is located in the basin, generally has an elevation of more than 700 meters above sea level (masl). The location with the highest elevation is located in Ledeng Village, Cidadap District with an elevation of 892 masl and the lowest elevation is located in Rancanumpang Village, Gedebage District with an elevation of 666 masl [4].

In the era of the Dutch East Indies Colonial government, the southern part of Bandung city of Jalan Raya Pos was still mostly mud soil (some of which was used as rice fields), many swamps and lakes, even when the capital city of Bandung Regency was moved from Dayeuh Kolot to the outskirts of the Cikapundung River which is in the southern part of Jalan Raya Pos, the natural conditions were still the same. The swamps that are located south of the Regent's

Office, then made a large pond (Sundanese: pond = balong) so that the term Balonggede emerged and is now the name of a village in Bandung City. Meanwhile, from Tegallea to the south, west and east, the area is still in the form of swamps. The abundance of swamps, lakes and mudflats in the southern part of Bandung cannot be separated from the archaeological traces left behind from the former Ancient Bandung Lake in the past [1, 16]. It is not surprising that in the southern area of Bandung city there are many place names that are preceded or accompanied by the words "situ" (small lake) and "ranca" (Sundanese: ranca = swamp). According to Bachtiar and Syafriani, 2010, in their book, Danau Bandung Purba, there are 18 place names that use the word situ and 96 place names that use the word ranca. Places that used to be there or planned have more unstable soil conditions so that they are less suitable to be used as residential or office areas. The condition of the soil in the southern part of Jalan Raya Pos, which has lots of lakes and swamps, is likely to be a consideration for Herman Wilem Daendels who prefers the northern part to open the road.

Daendels probably got the information from his main assistant, namely Andries de Wilde, the first landowner in the Priangan region who controlled and knew the conditions in the area [6]. Andries de Wilde himself was not a geologist, but a surgeon in the Dutch East Indies army artillery troops. The real geologist, namely Van Bemmelen who was born in Jakarta in 1904, just appeared and wrote a book on the Geology of Indonesia after independence, namely in 1949 with his book entitled *The Geology of Indonesia*. However, if it looks at the geological map of the Bandung Basin (Figure 4), it turns out that the rock layers in the southern part of Jalan Raya Pos and the office buildings are former deposits of Ancient Bandung Lake [19], meanwhile, the soil layer in the northern part is relatively more stable, because the conditions are drier than the muddy in southern part. Thus, the selection of Jalan Raya Pos in the northern part of the Bandung Basin along with its buildings that Daendels and Andries de Wilde had made was in accordance with the geological conditions which were only discovered at a later date after the independence of Indonesia.

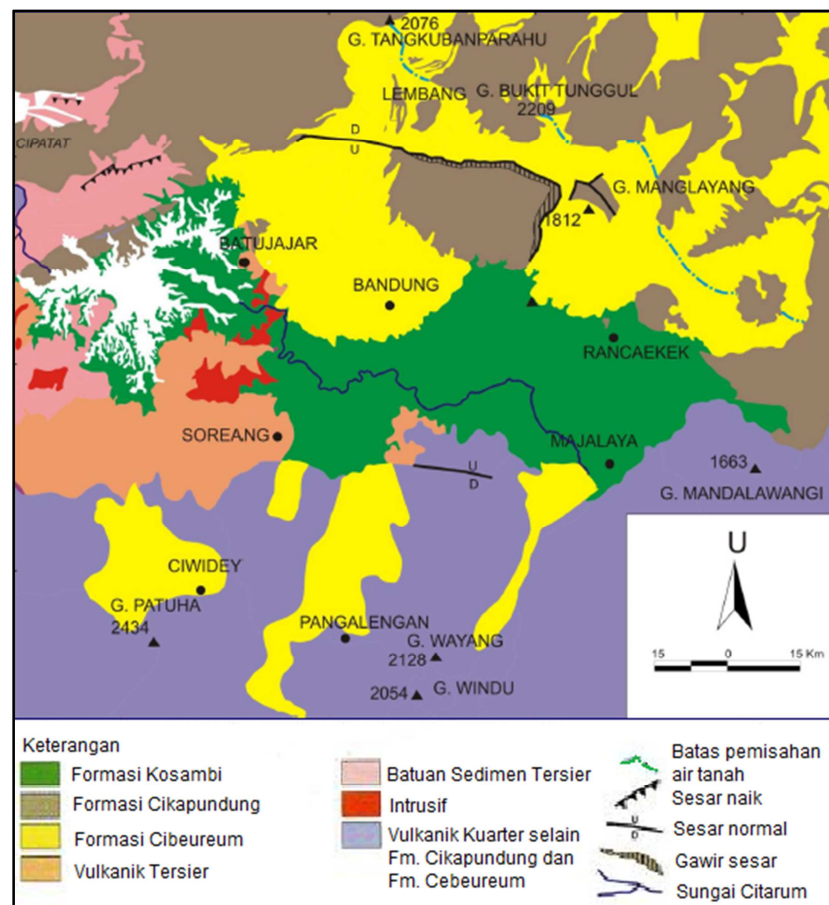


Figure 4. Geological map of Bandung Basin, green color: ancient Bandung Lake deposits, (Ramdhan and Hutasoit, 2020).

Based on the geological map, it can be seen that the Bandung plain is broadly composed of two rock formations, namely the Kosambi Formation and the Cibereum Formation. The Kosambi Formation or known as the Lake deposits are composed of tuffaceous claystone, tuffaceous siltstone, and tuffaceous sandstone with a thickness ranging

from 10 – 125 m [22, 14]. The Cibereum Formation is composed of volcanic product rocks in the form of volcanic breccia to tuff which can reach a thickness of about 80 m [22]. This geological condition is not only related to the rocks that make up the Cibereum Formation which is in the north more stable than the rocks that make up the Kosambi

Formation, which is in the south, but also has implications for its hydrogeological conditions or groundwater. The rocks that make up the Cibereum Formation are generally good groundwater carriers or act as aquifers, so that the potential for groundwater, both quality and quantity, is relatively better. The Kosambi Formation which contains a lot of layers of clay and mud will certainly have implications for the relatively low groundwater potential, both in quantity and quality. This is explained in the results of research conducted by Soekiban (1983) and Iwaco-Waseco (1990) which explain that the northern part which is composed of rocks of the Cibereum Formation is an area with high productive groundwater, while in the southern part which is composed of the Kosambi Formation is an area with moderate

productive groundwater [8, 23]. This of course makes a separate consideration for the pattern of settlement development considering that groundwater as a source of water for daily needs is a basic need that must be met.

Another thing that Daendels might consider in determining road routes in the Bandung area is the topography. The northern part of the Bandung basin and the northern part of Jalan Raya Pos are on a higher slope than the southern part as can be seen in Figure 5. In the north-central part of the basin has a relatively flat topography. But after that, further south to the Citarum River, the slope of the land surface decreases with a maximum slope of 12.8% or about 7.3 degrees as can be seen in Figure 6. If the road route is chosen too south, there will be a high risk of possible flooding, and unstable soil conditions.

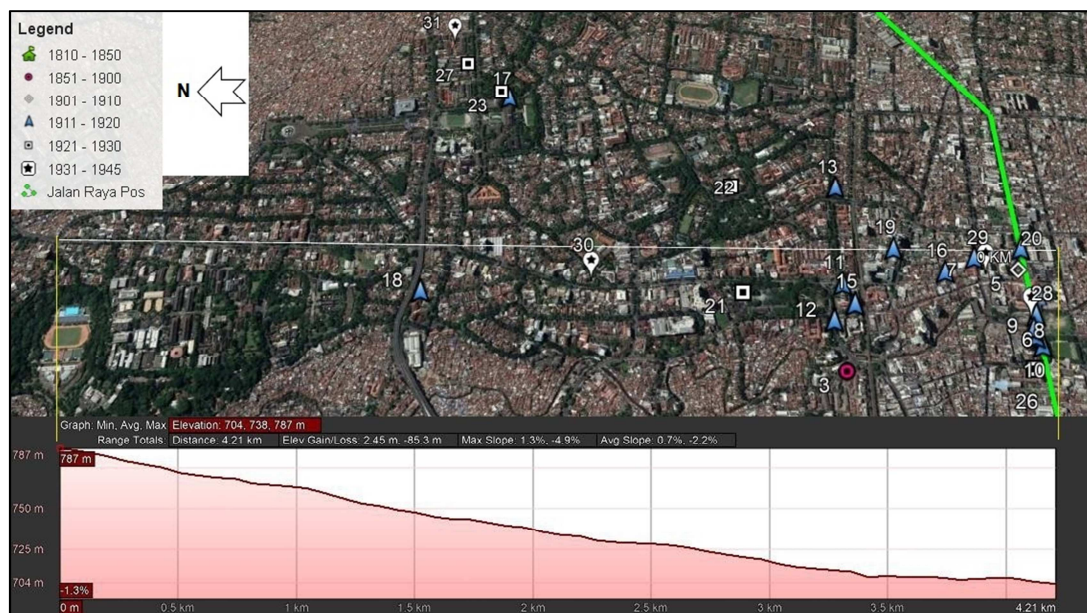


Figure 5. Map of the slope of the northern part of Jalan Raya Pos.

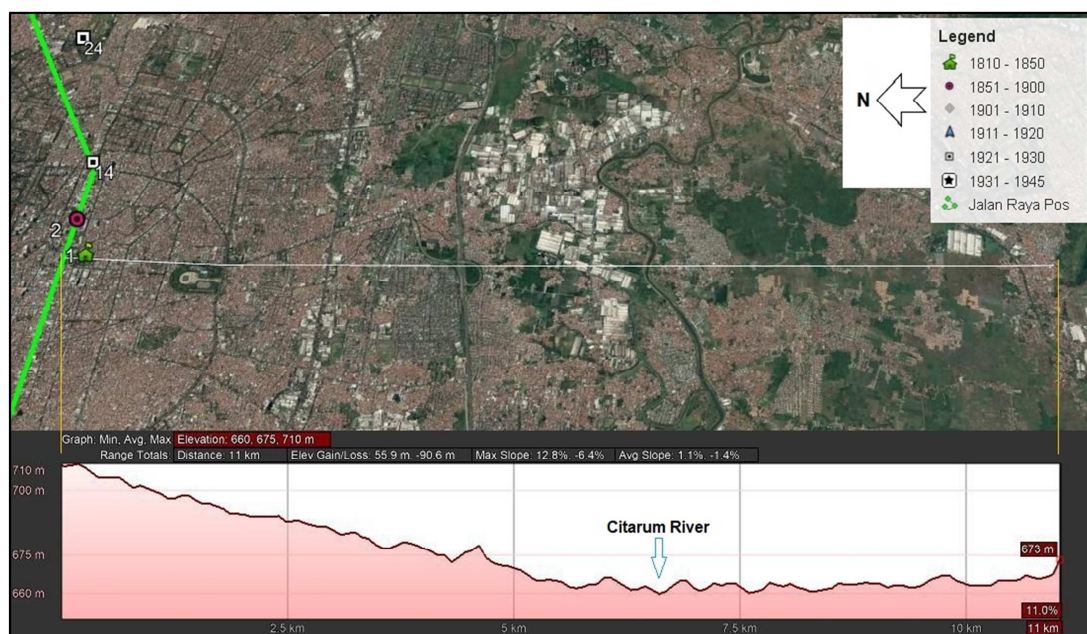


Figure 6. Map of the slope of the southern part of Jalan Raya Pos.

3. Conclusions

Based on the discussion above, the following conclusions can be drawn.

Since Jalan Raya Pos was built in 1810 by the Governor General of the Dutch East Indies Colonial named William Daendels, the city of Bandung has continued to grow with the growth of government and private buildings along Jalan Raya Pos. Along with the construction of Jalan Raya Pos, office buildings were also built along the highway. The development of office buildings in the city of Bandung, since the construction of Jalan Raya Pos (1810) until 1910 has been slow. During that time, there were only 5 office buildings. However, after 1910 to 1920 it increased sharply with the plan to move the center of government (capital) and military from Batavia to Bandung. After that, from 1930 the construction of office buildings in Bandung City experienced a decline in line with the monetary depression that hit the world and the entry of Japanese colonialism in Indonesia, resulting in the failure of Bandung City to become the capital of government. The distribution pattern of 31 office buildings in Bandung during the Dutch East Indies Colonial period was random and most of them were located in the north of Jalan Raya Pos, which was 27 buildings (87%), while the others were in the southern part of 4 buildings (13%).

Geologically, the location along Jalan Raya Pos as well as the buildings built during the reign of the Indies are on the north side of the Bandung Basin which is the former ancient Bandung Lake which dried up about 16000 years ago. The rock layers on the north side of Jalan Raya Pos which are volcanic products are more stable than those on the south which are clayey. While the remnants of ancient Bandung Lake deposits in the form of mud, swamps and lakes in the southern region, during the Dutch East Indies Colonial administration, it was likely that the construction of office buildings in the south was less than in the north of Jalan Raya Pos. These geological conditions also affect the hydrogeological conditions or groundwater of the Bandung Basin, namely the northern part is composed of water-bearing rocks (aquifers) which are highly productive, while the southern part is moderately productive. This of course also influenced the pattern of development during the reign of the Dutch East Indies Colonial.

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