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Developing Transport Infrastructure in Seoul:

Planning Implications on Jakarta, Manila, and Ho Chi Minh City

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01 Developing Transport Infrastructure in Seoul

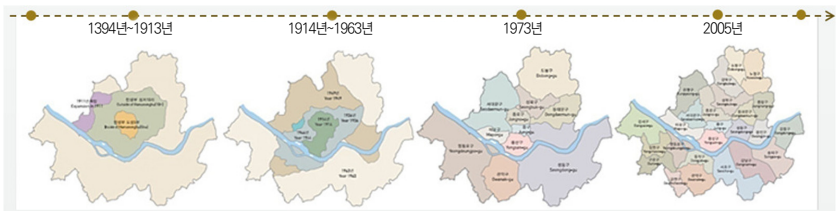
1. Setting the Stage for Seoul: the Rapid Growth after the Korean War

The last fifty years of Korea was a period of great transition to industrialization and democratization, which the Western society has been going through for the last 200 years. With the national income increasing from USD 80 to 20,000, the country grew into the 10th largest economy in the world. The country also achieved urbanization successfully. In 1960, city dwellers accounted for 28.3% of total population but their numbers increased to 93% in 2010. Professor Richard Meier once noted that there has been no country in human history that has experienced as rapid urbanization as Korea has.

During the period of Japanese colonial rule, Seoul experienced drastic population growth. For 300 years of the late Joseon Dynasty, the city's population was in the range of 200,000 to 300,000. It increased five-fold to around 1 million during the 35 years of Japanese imperialism, leading to an extreme shortage of housing. After gaining independence of from Japanese colonial rule in 1945, expatriate Koreans returned to their home country and a large number of refugees from North Korea migrated to Seoul. Thus, Seoul experienced a massive influx of population. The first national census in 1949 showed that the city's population had increased by 650,000 from 1 million in 1944. Half of the increase was owing to the Koreans who came back from foreign countries while the other half comprised of those came from rural areas to escape from poverty.

The size of Seoul expanded as well. In 1949, urban planning area increased almost twice to 269.8km^2 from 135.4km^2. The city authority gave building permits to migrants on the condition that when the authorities demanded demolition for an urban planning project, the building would be removed without any compensation. As part of the reforms in farmland, the land was redistributed as small plots for farming. As much as one eighth of the total city area could have been utilized for

urban planning. However, it was almost impossible to secure land for urban facilities and thereby carry out a planned urban development.



Source: http://urban.seoul.go.kr/4DUPIS/sub2/sub2_1.jsp

[Figure 1] Changes in Urban Planning Area

In the latter half of the 1950s, Korea was in turmoil after the Korean War and partition. The country was suffering from severe poverty due to the Korean War and social turbulence. Seoul was packed with refugees from the North who settled in South Korea, discharged soldiers, and farmers who came to find jobs. Unauthorized shacks jutted into public land and roads. Irregularity was prevalent in the properties that the Japanese had left behind after independence. To alleviate housing shortage, the government built houses for the poor using foreign loans. However, civil servants of the Seoul Metropolitan Government (SMG) were extremely corrupt. Bribery was prevalent. Foreign aid was not properly spent. South Korea had less industrial infrastructure than North Korea, which became even worse after division of the Korean peninsula. As war refugees from North Korea concentrated to Seoul, the city suffered from lack of jobs and unemployment problems.

It was a period of social turbulence—gaining independence in 1945 and the subsequent Korean War from 1950 to 1953. After the independence, the US army military government was temporarily established in Korea. Due to the war, Seoul experienced a sharp decrease and a subsequent increase in population. A quarter of the city area was severely destroyed.

The city area remained largely confined to the northern area (Gangbuk) as it had been during the Japanese colonial rule, as there was no improvement in

transportation. The buildings which were not destroyed in the war were severely dilapidated, degrading the general housing environment of the city. The city center was congested with population and traffic influx. Hill areas around the city center and streams teemed with unauthorized shacks. The SMG established the city restoration plan in 1952 after the war, which went in vain due to lack of finance. It was urgent to restore the city because one fourth of the city area was destroyed during the war.

[Table 1] shows the population, numbers of houses and national income of Seoul after 1950. The per capita income was below $100 in 1950. The city experienced a rapid economic growth thanks to industrialization in the 1960s and 70s. The population of the city doubled to 5 million in 1970, from 2.5 million in 1960.

[Table 1] The Rapid Growth after the Korean War

Year	Population	Household	Housing (unit)	Housing Shortage (percent)	Illegal Units	GNP/capita (US$)
1926	306,363	68,682	64,889	5.8		
1935	636,995	131,239	101,767	22.5		
1939	930,547	154,223	-	-		
1944	1,078,178	220,938	132,000	40.3		
1950	1.693.224	318.673	-	-	-	67
1960	2,445,402	446,874	275,436		40,000	79
1970	5,433,198	1,096,871	600,367		200,000	253
1980	8,364,379	1,849,324	968,133		-	1,597
1990	10,612,577	2,820,292	1,430,981		94,974	5,833
1995	10,595,943	3,448,466	1,863,466		73,500	10,037

Right after the Korean War, there was no concept of “urban planning” in Korea. Without planning experts and base maps, it was impossible to establish any plans. Only linear developments along the major arterial roads and special purpose areas were carried out at the time. The city was unprepared for urbanization, but had to deal with a dramatic population increase of one million in five years. However, the

central government did not take active measures to restrain population growth. The SMG could not undertake projects for urban development, transportation, water supply and sewer. Seoul's urban planning was just not functioning.

In the 1960s, the city expanded further to 605km^2 with the population of three million. As the southern area of the Han River was included within the city boundaries in this period, the total area of Seoul was comparable to what it is today. The 1960s was an important period in the history of Korean urban planning. In the 1960s, the government first introduced an urban planning system and established the first urban master plan on its own. During this period, the government strived to establish a comprehensive urban plan to solve urban problems as well as deal with the ever-increasing population. The city boundaries were expanded due to the increasing population. Seoul began to form today's city framework and infrastructure.

Source: https://www.seoulsolution.kr

[Figure 2] A Road in the 1960s

Indeed, several things began to change in the 1960s and as a result of the national policy to promote industrialization, the number of workers in manufacturing was on

the rise. By the mid-1960s when the first 5-year economic development plan was completed, the country was able to free itself from the clutches of poverty. The population increase continued in the 1960s as did the economic growth and there was massive migration from rural areas. The population of Seoul doubled from 2.68 million in 1961 to 5.54 million in 1970, to 9 million in 1982 and 10.9 million in 1992. Since then the population has been maintained at around 10 million.

The average rate of annual population increase in the latter half of the 1960s was much higher than the first half. As shown in [Table 2], the population increase rate was 7.3% from 1961 to 1966 with 224,996 persons, while from 1966 to 1970, the rate went up to 9.8% with 432,739 persons.

[Table 2] The Average Rate and Number of Annual Population Increase in the 1960s

(%, Persons)

Period	The average rate of annual population increase	The number of annual population increase
1961~1966	7.3	224,996
1966~1970	9.8	432,739
1961~1970	8.4	317,326

The massive migration from rural areas intensified the population concentration in Seoul. The city's population accounted for 10.3% of the total population of Korea in 1961 and increased to 17.5% in 1970. Therefore, the city needed to restrain the population concentration.

Most of the migrants were poor, under-skilled workers. The pace of population growth exceeded the economic growth, leading to another social problem. At the time, the old city areas were occupied by unauthorized shacks. Slums came up near urban streams and hill areas. Infrastructure improvement lagged behind. The accumulated urban problems before the 1960s and new urban problems due to a sharp increase in population caused housing shortage, traffic congestion, water shortage, sanitation problem and a worsening public order.

Primarily, the transport infrastructure was not sufficient. By 1961, the road ratio to the city area on an average was only 8%, which was far lower than advanced countries. The road ratios were only 4 to 5% in areas other than the city center. The roads in the old city center were relatively in good condition, but others were too narrow and were also unpaved. The existing arterial roads in the old city center also needed expansion. However, it required an enormous budget for land acquisition, which, in effect, halted the project. Moreover, roads for evacuation, which began to be built at the end of the World War II, were occupied by unauthorized shacks and lost its usability.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.133. Print

[Figure 3] Unauthorized Shacks in Seobu-ichon-dong

The means of transportation in the 1960s were limited to buses and trams, which accounted for 50% and 20% of traffic respectively. During that time, suburban areas were underdeveloped and most of the population was concentrated in the city center. Public transit was inconvenient to use because of poor road conditions and the lack of trams and buses. During the morning and evening rush hours, buses and

trams were overly crowded, carrying two to three times of their normal passenger carrying capacity. Traffic congestion was severe during the peak hours.

In the early 1970s, tram lost its competitive edge to bus. Buses were the only public transit available in Seoul in the 1970s. Taxi was another important means of transportation for citizens. Private cars were not popular and were used only by the privileged class of people. Therefore, buses played a crucial role in urban expansion. When a residential area was created, bus routes were connected to the area subsequently.

Overall, with the population growth that Seoul experienced, urban traffic demand tends to increase exponentially. It has been extremely difficult for the SMG to solve transportation problems because Seoul was not developed based on a comprehensive master plan. In essence, the city area remained same as it had been under the Japanese rule because of underdevelopment of transportation infrastructure. Without adequate infrastructure, the city just sprawled out, undergoing rapid urbanization. Most of all, Seoul had poor transport infrastructure. Indeed, transportation has been at the top of the agenda for the SMG. In fact, urban transportation is a common issue that many cities around the world have struggled to tackle. A modern city inevitably produces high traffic demand because of vigorous economic activity, industrialization and expansion of city boundaries. However, Seoul had another unique characteristic- an unprecedentedly rapid urbanization. Indeed, the city grew into a modernized city with a population of 10 million in a matter of half a century while it took one to two centuries for Western cities for a similar transformation.

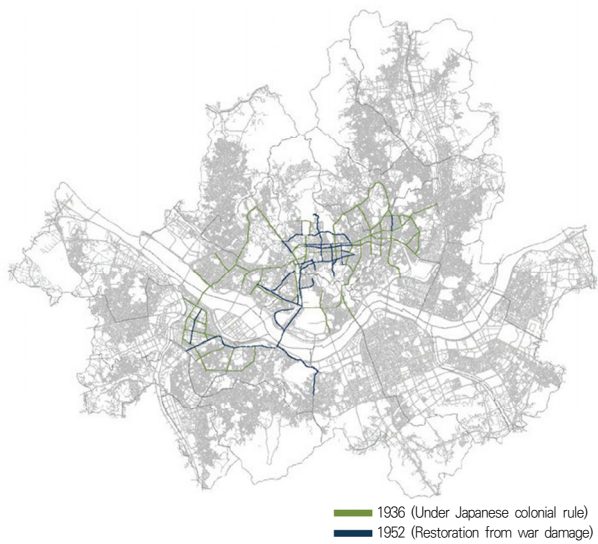
Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.22. Print

[Figure 4] Road Expansion in front of Seoul Citizen Hall

2. An Early Plan for Transport Infrastructure

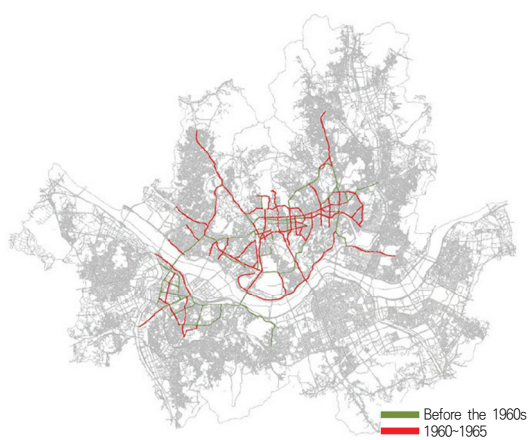
There was an effort from the Japanese colonial government to introduce roadway infrastructure in Seoul. In 1936, 34 road sections were created with the combined length of 64,810m. In 1936, there was a plan for building a road system. After the Korean War, road expansion projects were actively conducted in the city center as a part of restoration from war damage. By 1952, 26 road sections were created or changed, with the combined length of 54,600m and nine sections were expanded in width. In essence, road construction at city level was only limited to a small area. Indeed, the road system of this period was similar to that of 1936. The following map shows the areas where road changes were significant.

In the early 1960s, 14 road sections were newly constructed or changed with the extended combined length of 42,986m and 10 sections were expanded in width. The outcomes of this period were less than those of 1936 and 1952. However, the road expansion plans were implemented all across the city at this time. The seemingly low outcomes were because most of the projects in this period were focused on expanding widths of the existing roads, rather than building new roads.



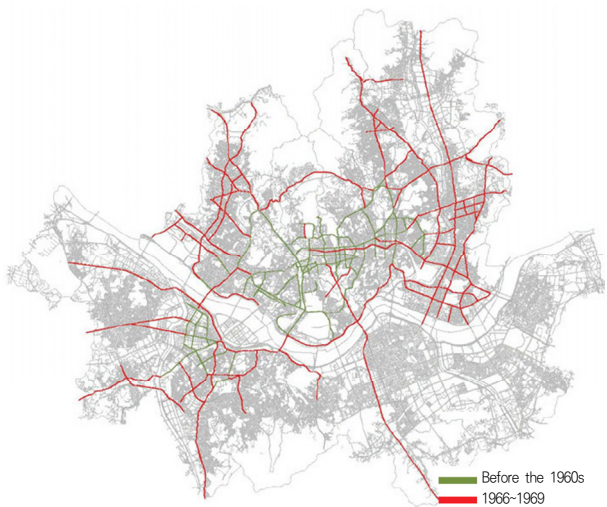
Source: 권영덕, The Issues and Policies in Urban Planning of Seoul in the 1960s, The Seoul Institute, 2013, pp.114. Print

[Figure 5] Outcomes of Road Expansion Projects in 1936 and 1952



Source: 권영덕, The Issues and Policies in Urban Planning of Seoul in the 1960s, The Seoul Institute, 2013, pp.117. Print

[Figure 6] Outcomes of Road Expansion Projects in the Early 1960s



Source: 권영덕, The Issues and Policies in Urban Planning of Seoul in the 1960s, The Seoul Institute, 201, pp.119. Print

[Figure 7] Outcomes of Road Expansion Projects in the Late 1960s

3. Building Roadways like Crazy—the Legacy of Kim Hyun-ok

With the increasing population influx to Seoul, the effort to cope with increasing transport demand and to build new transport infrastructure before the 1960s was not sufficient enough. It was in the late 1960s that the SMG focused on transport infrastructure. When it comes to building transport infrastructure in Seoul, we should discuss the impact of an important man: Mayor Kim Hyun-ok (1966~1970). Mayor Kim, a former member of the military, did not fully understand the theories and policies about urbanization when he took office. However, he was considered a self-made man with initiative and drive and was appointed by the President of Korea as the youngest Mayor of Seoul.

In military, Mayor Kim was in charge of transportation. He also served as Mayor of Busan, successfully tearing down illegal structures and unauthorized shacks around the port. In part, that was a main reason why he was appointed as the mayor

of Seoul at the age of 40 and was considered a well-qualified person who could resolve the transportation and other urban problems. Mayor Kim was a field commander committed to the “battle of urbanization”. The mayor, true to his nickname “Bulldozer”, was a strong leader who spearheaded the rapid urbanization in the 1960s. During his term, Seoul was constantly under construction. He was a symbolic figure of the development era and was highly appraised by the then President and citizens. The 1960s was the time when the institutions were not set up. Rather this was the time when an ambitious man could have a far greater impact on people’s lives than one could imagine.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울 I , Seoul Museum of History: 강홍빈, 2013, pp.20. Print

[Figure 8] Mayor Kim at the Groundbreaking Ceremony of the Underpass in Gwanghwamun Street

The year of 1966, when Mayor Kim first took office, marked the end of the first 5-year national economic development plan. The country experienced rapid economic growth, with the national income almost tripling from 1961 to 1966. The economic growth led to the rapid expansion and growth of Seoul. As noted, there

was massive influx into the city. The population reached 3.79 million in 1966, increasing by 300,000 for three years. Per capita income was USD 115.

However, the city was not prepared for such an explosive population growth as it lacked infrastructure and jobs. It was inevitable that a number of urban problems were existent, such as housing, transportation, water supply and drainage problems. The pace of infrastructure development had, since long, lagged behind the growth of population. In 1963, the city boundaries were expanded to include the current Gangnam (southern area) and northeast areas. As a result, the size of urban area had doubled, but there was no urban planning for the newly included areas.

Under these circumstances, Mayor Kim pushed forward various infrastructure development projects to solve the long-standing problems and make the city be a pioneering force in the modernization of the country. Mayor Kim proposed administrative slogans every year to encourage the city officials. For example, the 1966 slogan was “City officials work as servants of citizens to repay them”; for 1967, “Rush Construction”; and for 1968, “The Year of Rebuilding the Han River”. He also showed the progress of each project in quantitative manner. Mayor Kim announced quantitative objectives to push forward various policies. In an interview, he said such objectives were to leave “great evidence” of his administration. He frequently used the phrase “great evidence”, indicating that be it construction or development, the progress made needed to be supported by evidence. This is a clear evidence that Mayor Kim prioritized tangible outcomes over processes and actions over words.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History, 강홍빈, 2013, pp.34. Print

[Figure 9] Seosomun Elevated Highway

To secure financial resources for his project, the SMG often made indeliberate decisions. For instance, the SMG decided to sell public children's parks in high-priced plots of land. These kinds of decisions normally require careful consideration with a well-organized long term plan. However, the city did not have any plan or such a due process. What the mayor needed was a long-term master plan that could justify the aggressive urban development projects that he had in mind.

The First Urban Master Plan for Seoul

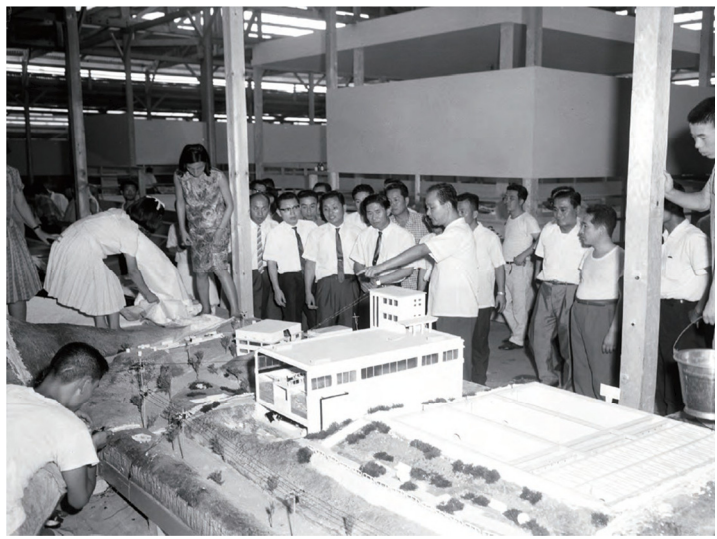
The mayor asked the Korea Planners Association to draft the urban master plan. The city officials at the Department of Urban Planning were in charge of this. On August 15, 1966, the first city planning exhibition was held at the plaza in front of the city hall building. It was the first time that the official urban planning map was revealed to the public. The purpose of the exhibition was to garner public opinion

about city planning and encourage citizen participation. The official urban planning map drawn for the exhibition also served as an opportunity to complete the map of all the lots in the urban planning areas of Seoul. The exhibition received great attention from the public. At the time, land prices were skyrocketing without any preventive measures against real estate speculation in Seoul. In fact, the land price of Seoul went up 200 times on average between 1966 and 1969. The exhibition was the best opportunity to get information about property for both general citizens and speculators.

[Figure 10] Seoul Urban Master Plan

The 1966 Urban Master Plan played a significant role in deciding today's spatial structure of Seoul. Despite numerous subsequent modifications, the plan was considered a groundwork for planning road network and land use. The master plan recognized an urgent task for the SMG to disperse the population from city center and find a long term solution to the transportation problems. The master plan included a plan for the road network across the urbanized area. In this plan, four beltways and 13 radial roads were planned as the backbone of today's road network. The 13 radial roads have played the role of a frame of the road system, greatly influencing the formation of the existing spatial structure of Seoul. A plan of four subway lines was established at this time as well. The SMG planned to build secondary city centers in outer regions of Seoul, connecting them through arterial roads and subways. To decentralize the functions of the city center, the SMG planned to relocate an express bus terminal, an intercity bus terminal and cargo terminals to outer regions. The 1966 master plan was the blueprint of a modern city with the population of 5 million in 20 years as the center of politics, economy and culture as well as serving as the capital of Korea[1].

[1] At the request of the SMG, the United States Operations Mission (USOM), a U.S. aid agency, sent Aaron B. Horwitz, a former professor at University of California, Berkeley, as an advisor for the master plan. When Horwitz came to Seoul, the draft of the Urban Master Plan was almost completed by the Korea Planners Association. He was not familiar with the state of affairs in Seoul and Korean urban planners were not prepared for working with a foreign expert. Horwitz left Korea in March 1967, leaving his opinions and suggestions about the Master Plan of Seoul. Horwitz pointed out that the target population of 5 million for 1985 was extremely unrealistic. In the early 1970s, the population of Seoul exceeded 5 million. Population of Seoul in the 1980s, the target period for the master plan, was more than 8 million.



Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.10. Print

[Figure 11] Seoul City Planning Exhibition

The SMG in 1966 deserves credit for its efforts to respond to a rapid population increase through urban spatial planning in the 1960s by taking into consideration the future population and demand. The Korea Planners Association and urban planners played a crucial role in establishing the urban spatial plans, studying the cases of advanced foreign cities. It was a right decision to give priority to road construction. This task was essential for dispersing population and functions of the city center into suburban areas, when the rapid population growth was factored in.

Apparently, a major element of the master plan was a plan to alleviate traffic congestion in Seoul. The objective was to reduce traffic congestion by 30%. The major transportation modes in the city were trams and buses. The tram routes went through only a small portion of the city with the maximum speed of 20km/h. Buses carried passengers to the outer regions on roads whose widths were only 8 to 10m. The roads were narrow and originally built for pedestrian traffic, with flat intersections and no traffic signals. The number of buses operated was about 1,300

and the interval between buses was long. Given that there were no other transportation, morning and evening peak hours were described as “hell on earth”. Public transportation of the city was only by means of trams, buses and remodeled trucks of the U.S. Army used as a kind of minibus. The trams, which had operated as the main transportation mode for about 70 years since 1899, were not competitive anymore, compared to buses. Trams, which were regarded as an obstruction to traffic flow, were abolished to improve traffic flow.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.14. Print

[Figure 12] Demolition of Tram Tracks

When the plan was drafted, the number of motor vehicles in the city was under 50,000 but a great increase was expected. The number increased more than 10 times to 530,000 in 1980. The first major transportation plan stated that roads are an important element of a city, forming the framework of Seoul and therefore, a road system plan was of utmost importance. Under this plan, major arterial roads connecting the city center and the outskirts were newly constructed or expanded during this term. Six major underpasses and 144 pedestrian overpasses were also newly built and the widths of existing major arterials were expanded from 8m to 35m as well.

With this plan, Seoul, which was contained in the Gangbuk (northern) area at the

time, was constantly in construction mode. The priority was given to building and expanding the major arterials from the old city center to the outskirts. Thanks to such road constructions, the border of Seoul was stretched further. The roadway projects contributed to alleviating traffic congestion as well as facilitating expansion of city boundaries. Detached houses were built along new roads. At a time when the number of vehicles stood at a mere 50,000, the city was already being transformed into a motor-friendly environment. Elevated expressways, underpasses and interchanges were constructed in congested areas to improve traffic flow. Especially, elevated highways were considered to symbolize development of Seoul and Korea. To sum up, the major part of Mayor Kim's term was dedicated to preparing for a car-oriented city, along with construction of transportation infrastructure. During his term, the road expansion projects were conducted in 45 sections, which were newly constructed or changed. The outcome was about four times more than those of the early 1960s, and exceeded all the outcomes from 1936 to the early 1960s combined (See [Table 3]). This was the result of Mayor Kim's initiatives in road construction. His projects vastly changed the urban landscape. The landscape of Seoul was flat in the 1960s. However, transportation facilities such as underpasses, overpasses, interchanges and elevated highways made the city look vertical.

[Table 3] The Average Rate and Number of Annual Population Increase in the 1960s

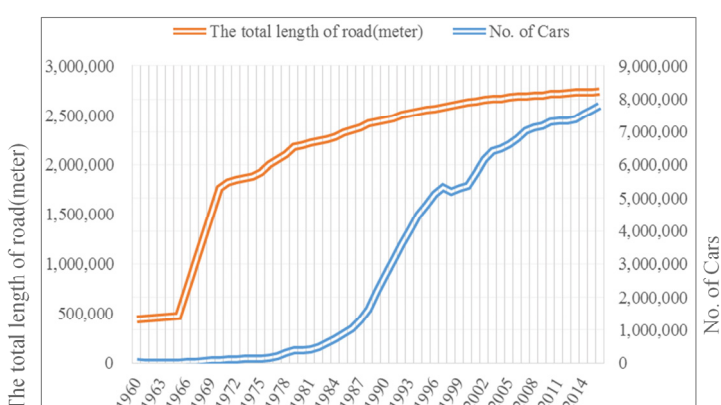
	New Construction/Change	Expansion
The Late 1960s	45 sections (217.828m)	2 sections
The Early 1960s	14 sections (42,986m)	10 sections
1952	26 sections (54,600m)	9 sections
1936	34 sections (Newly constructed) (64,810m)	-

*Based on the data of the late 1960s: Based on a plan for wide road and boulevard, and plan notices of each year

We can speculate how much emphasis was put on building transport infrastructure in the 1960s through analyzing the approved official documents (or

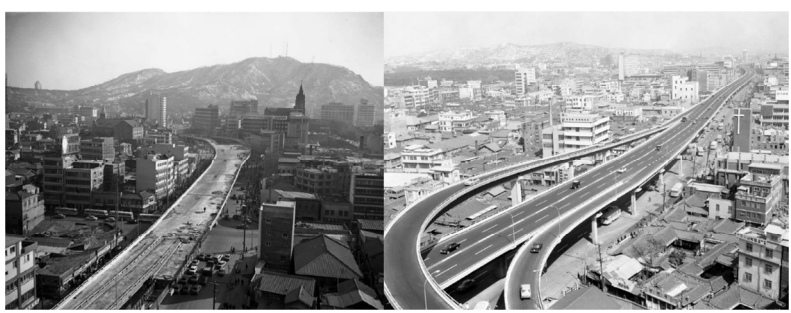
memorandum) in the SMG administrative processes that dealt with urban planning issues. The documents about transportation facilities were the most, 2,321 cases in total. To look at the detailed categories, documents about road were 1,974 cases (85.1%); interchanges had 110 cases (4.7%); underpasses had 102 cases (4.4%); pedestrian overpasses had 76 cases (3.3%) and tunnels had 59 cases (2.5%). Most of the tunnels, underpasses, pedestrian overpasses, and interchanges were built in the 1960s. Documents about road accounted for 39.3% of total official documents. As much as 56.9% of the roads were built in the 1960s. This indicates that the policy priority of Mayor Kim Hyun-ok was given to building roads at the time.

[Figure 13] suggests that when roadways were being built in the 1960s, the trend of car-ownership did not go upward. No one expected to see the sharp increase in car-ownership in the 1960s. It was not until the 1980s that a geometrical increase was observed in car-ownership. One might ask why Mayor Kim focused on building transport infrastructure, especially roadways. Of course, traffic congestion was a real problem back then. It was also partly because building roads could produce the most visible outcomes that might be helpful for his political career. Most administrators at all levels were eager to expand and construct roads at the time.



[Figure 13] The Total Length of Road Compared with No. of Cars

Cheonggyecheon elevated highway, which was built in his term, is an illustrative example. Urban streams functioned as a wash place and held a playground for children as well as a sewer. Most streams were severely polluted and bad smells emanated, especially in summer. The streams were the main culprit behind infectious diseases after floods in summer. What was worse, the urban poor gathered and built unauthorized shacks around the streams. Covering the streams with a plan to build roadways was a magic solution for such problems. It gave feasible solutions to a large number of city problems that plagued Seoul at that time. The odors of the streams disappeared. The authorities were able to demolish the illegal shacks lawfully and improve the urban environment. The covered streams could be utilized as roadways, relieving transportation problems. Most of the covered streams were turned into major roadways.



Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.14. Print

[Figure 14] Cheoggyecheon Elevated Highway

The riverside urban highway is another example. In 1966, Mayor Kim ordered to devise a plan to build a road connecting to the Kimpo International Airport traversing the banks of the Han River. At the time, the number of cars in Seoul was only 20,638. This means that whether such a road was necessary was controversial. However, the intention of the mayor was to impress then-President Park Chung-hee. Mayor Kim was eager to show off his projects to the public and more importantly, to President Park. He gave a press conference every Tuesday and

frequently held meetings with citizens to promote the SMG's policies.

The riverbank expressway was comprised of nine parts, whose total length was 74km. The plan for the road construction was not established after a feasibility study or a thorough planning process. Even a basic topographic investigation was not carried out at the time. The SMG officers simply calculated the size of land parcels that would be available after the roadway was built. It was approximately 2.3 million m^2.They believed, naively, that the budget for the road could be covered by selling each lot to individuals or construction companies when each part of the road was completed. The SMG's idea was to build the road using the city budget first and then earn revenue by selling the readjusted land parcels for the road construction. However, the estimated size of land parcels was not accurate. There was no guarantee either that the lots would be sold as intended.

On March 17, 1967, construction of the first part of the road along the Han River, with a width of 20m and length of 3,720m, began. The road was unique for three reasons: First, it was for motor vehicles only. It was unprecedented in Seoul. Second, to prevent flood, the road was built on a riverbank whose height was 15m, higher than the flood water level. The development of the riverside areas was to reclaim the river and sell the land lots. Third, the road was planned as a toll road to cover the expenses. The road was indeed operated as a toll road at first. Theoretically, a road can be used by both vehicles and pedestrians. However, a motorway is only beneficial for drivers, which meant that it should not be built using tax-payers' money. Building such a roadway was not rational in the 1960s when private cars were rare. It would have been fair for drivers to shoulder the burden of the expenses. Nonetheless, the scheme was scrapped in 1974 because of the public complaints and the central government's order.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.112~113. Print

[Figure 15] Riverside Toll Expressway 1, 2

As the riverside highways opened, the city now got the impetus to build a road network connecting the south to the north and the west to the east. This road system was expected to reduce travel time between cities and induce intercity/intracity migration. After the riverside highways on both sides of the Han River were completed, numerous bridges were built to link both sides of the river. Most of the existing bridges on the Han River were constructed in the 1970s and 80s.

The riverside expressways received mixed reviews. Without the road, Seoul might have experienced more severe traffic congestion today. However, citizens were deprived of access to the river. To respond to the criticism, the SMG created riverside parks for citizens to enjoy leisure in the 1980s. The riverside highways provided a momentum for creating a viable link between the northern and southern areas. It subsequently affected urban development in the southern area (Gangnam). Large apartment complexes were built in the riverside areas that were reclaimed by changing the waterway of the Han River. With numerous large apartment complexes and road networks constructed, the Gangnam became an emerging residential area in the 1970s. The outskirts of the city, which used to be predominantly rural areas, were mostly turned into residential purposes.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.14. Print

[Figure 16] Completion of Gwanghui Interchange

In a nutshell, the 1960s and the 1970s were a period for roadways. By 1969, the total length of roads was 5,132km, with the road ratio of 8.8%. Thanks to the continuous construction of arterial roads in the 1970s, this number increased to 11.08% by 1974. Most areas of Seoul, in the late 1970s, became urbanized, with large-scale apartment complexes. The arterial road system built during the 1960s and 70s was the project that determined the spatial frame of Seoul.

The road constructions in the late 1960s were actively conducted for various purposes. First, as noted, some roads were constructed to cover urban streams as part of urban modernization. At that time, the streams were unsanitary places which were filled with unauthorized shacks, which adversely affected the general aesthetic view of the city. Moreover, given that traffic congestion was severe in the crowded city center, the authorities needed to provide more roads but it was impossible to secure enough space. Therefore, covering the streams and building roads on them was considered the most feasible way to expand roads in the city.

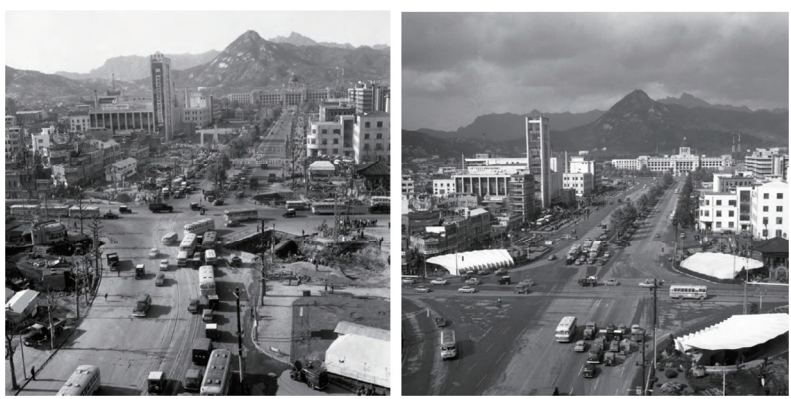
Second, there were roads constructed for military purpose. In January 1968, North Korean spies infiltrated into Seoul, which prompted the central government and the SMG to devise a plan to fortify the city in 1969. As part of the plan, tunnels, underpasses and ring roads were constructed.

Third, elevated highways, underpasses and overpasses were built to create a multidimensional urban space. To facilitate traffic flow in the city center, the SMG

built a number of underpasses and elevated expressways. Pedestrian overpasses and underpasses were provided to separate pedestrians and vehicles.

Fourth, roads were built along the Han River to prevent floods. The authorities constructed banks along the river and constructed roads over them under the Comprehensive Han River Development Plan (1968).

Fifth, a road network was created to connect the city center and newly incorporated areas . The project was to disperse population and functions of the city center into the outskirts. The road construction was essential for a project to develop land for housing in suburban areas to disperse population and urban functions of the city center. The road system constructed in the late 1960s greatly influenced the current road and city framework.



Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울Ⅰ, Seoul Museum of History: 강홍빈, 2013, pp.21, 27. Print

[Figure 17] Gwanghwamun Street

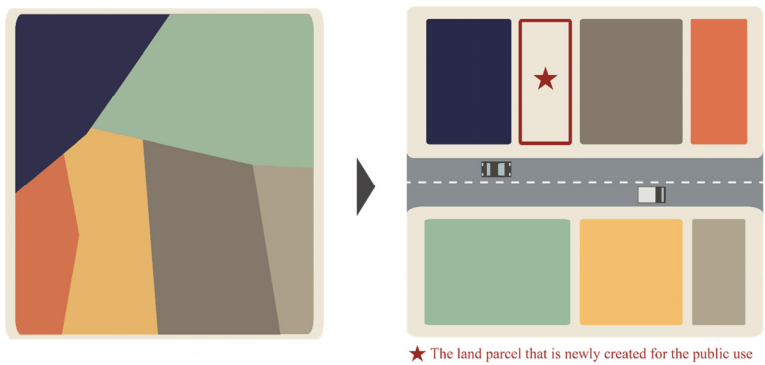
4. Funding Infrastructure Projects from New Developments

The SMG's road construction produced significant outcomes. However, the city was not rich at the time. There was no sufficient tax base. One might wonder: where did the money come from to build all these roadways? Despite budget shortages, roadway projects were possible thanks to private investment. There were several

projects largely supported by private capital. For example, a project to cover Cheonggyecheon stream was planned to raise private capitals, which accounted for 40% of total budget. In this way, the SMG expected that it would be able to reduce the expenses by KRW 1.4 billion. The same was applied to other road constructions in the city center and old city areas. However, this was not a profitable investment as far as the private sector was concerned.

Another example shows how dependent the SMG was on private capital. Shop owners in traditional markets requested to open fire lanes in the region. The SMG was supposed to secure land parcels to build fire lanes and compensate the original landowners, but it had no budget to carry out this activity. The fire lane construction was carried out thanks to the financial sacrifice from the landowners. This shows that the local road improvement projects had to be supported by private capital back then. No wonder, it was unsustainable.

Other than private capital, the land parcel readjustment program provided a major funding opportunity to build roadways in Seoul. Using this approach, the city government assembled private land lots. The SMG then rezones and reshapes the land parcels to make them suitable for urban development. This way, roads, open spaces, buildings and public infrastructure can be planned. In this process, the reshaped land lots suitable for new urban development are returned to the original landowners, but with smaller sizes. In other words, when the land was redistributed to the owners, the size of redistributed land parcels was smaller than the original land. However, there was no backlash from the original owners because they could expect a sharp increase in the property value thanks to new roadways. In this process, a new additional land parcel is created. The city government then sells this lot to finance this scheme. [Figure 18] shows how the land parcel readjustment program worked in the 1960s.



[Figure 18] How the Land Parcel Readjustment Program Works

In the early 1960s, the SMG attempted to reorganize the urban areas through the land parcel readjustment program. Under the 10-year plan, the SMG pushed forward construction of roads using this program. In the late 1960s, the program was then already implemented in the outskirts of the city for building radial and ring roads. In fact, land readjustment was the only possible way to secure land parcels for infrastructure and housing so that the city could respond to rapid population growth, considering the weak financial position of the SMG. This method would be useful for underdeveloped countries that have a weak financial base.

The SMG planned to redevelop the old city center. Most of the target areas were low-rise, low-density areas with decrepit buildings. The redevelopment zones were designated based on “Super Block”, which was encircled by arterial roads. The project was conducted as a joint development to combine the existing land parcels. It was a clever strategy by the government to use a land parcel readjustment method, through which the government secured lots for roads, parks and parking lots and redistributed the rest of the land to the original owners. A massive land parcel readjustment program was conducted in the Gangbuk and Gangnam areas. More than 80% of the readjustment in this period was completed in the latter half of the 1960s. The purpose was to disperse population and urban functions from the city center by developing the suburban areas.

The program was a main tool for Mayor Kim Hyun-ok. Through this program, multipurpose buildings were built along new major thoroughfares by attracting investment from the private sector. To secure land for development projects, the SMG directly involved in collecting land properties from owners through the land parcel readjustment program. In particular, this program was useful in building bridges on the Han River and developing the southern area of the river (Gangnam). As mentioned, the SMG devised a plan to build bridges that link the north (Gangbuk) and the south (Gangnam) of the Han River, essentially connecting the highway between Seoul and Busan. It was inevitable to readjust the shape of land parcels near the Han River to build the bridges and attract urban developments. To secure a budget for the plan, the SMG took over the rights of properties from the original owners of the target land.

Source: Seoul Museum of History, 두더지시장 양택식Ⅱ, Seoul Museum of History: 강홍빈, 2015, pp.24 Print

[Figure 19] Extended Samgakji Interchange

Generally, a land parcel readjustment program requires financial support from the central or local government. However, in the case of Gangnam, the project was only possible thanks to the landowners. For instance, the original landowners

agreed to receive only 50% of the original land parcel size because the land price skyrocketed thanks to the road development. Thus, the land necessary for inter-regional highways, arterial roads, and urban expressways were secured, thanks to the private landowners. It was a win-win situation for both the SMG and the property owners.

In general, building urban highways, bridges, and tunnels requires an astronomical amount of money. Even with the land parcel readjustment program, construction of more than 100 underpasses and pedestrian overpasses in the era of Mayor Kim left the SMG's coffers empty. Still it was necessary for the SMG to undertake large-scale projects such as development of the Han River areas and construction of apartment complexes. This pushed the SMG into further financial trouble, drowning it in debt. Fortunately, in the mid-1970s, the Korean economy was gearing up for another great leap forward after the first oil shock in 1973. In late 1974, GNP per capita was USD 540, increasing annually to USD 590 in 1975, USD 797 in 1976, USD 1,000 in 1977, and USD 1,392 in 1978. Such a rapid economic growth led to large investment in real estate and a subsequent construction boom. The property market began to revive after a long stagnation since 1970. Consequently, the SMG witnessed a great increase in tax revenues, because its main sources were the property tax and the property acquisition/registration tax. The rapid economic growth of the late 1970s, skyrocketing real estate prices and property speculation contributed greatly to finances of the SMG. In some areas, the standard value of real estate for tax imposition increased by more than 100%. In 1974, the general budget account of the SMG was KRW 64.9 billion, increasing to KRW 101.5 billion in 1975 and to KRW 302.3 billion in 1978. It is assumed that growing revenues from taxes regarding real estate contributed most to such a great increase. With a sufficient tax base, the SMG was able to pursue transportation infrastructure projects.

Source: Seoul Museum of History, 돌격 건설! 김현옥 시장의 서울 I, Seoul Museum of History: 강홍빈, 2013, pp.24. Print

[Figure 20] Construction of Sejongno Underpass

5. A City Created for Private Mobility

Road construction was continued after the tenure of Mayor Kim. During the incumbency of Mayor Gu Ja-chun (1974~1978), the SMG built 39 roads (as long as 78.2km), expanded the 40 existing roads (as long as 45.6km), and paved 94 dirt roads (as large as 3.11km^2). A number of new bridges and parking lots were constructed as well. Although these projects placed a great burden on the SMG, there was good reason for Mayor Gu to carry forward these projects. Korea had mainly produced light industry goods such as textiles, wigs and toys for export, but this reached its limit in the 1970s. The Korean government seriously considered converting its export strategies to produce complete automobiles. In 1977, the government announced a comprehensive plan to foster automobile industry as a major export for the country. Mayor Gu envisioned that an era of cars would come in the 1980s and wanted to be prepared for an explosive increase of vehicles in Seoul.

In 1973, the number of registered cars in Seoul was around 70,000. Motor vehicles were not popularized before the 1980s. However, the SMG planned to create a city where driving was easy and convenient as was reflected in the 1966 plan and the subsequent roadway projects. As noted, the SMG built bridges that

connected the north and south of the Han River and constructed an arterial road system within the city as well as a ring road system circulating the outskirts. The arterial road system was expanded to cover a broader area. The radial roads starting from the old city center were connected to the inner and outer ring roads of the city.

Such changes encouraged more people to own private vehicles, causing a transformation of Seoul transportation system. With the development of Gangnam areas, roads with ten lanes as well as the riverside freeway were constructed within the city, thereby readying itself for the automobile era. Along with these internal structural changes, private vehicles began to increase in the late 1970s and became one of the major means of transport in the 1980s. In the 1980s, major streets of Seoul became saturated with automobiles, causing severe traffic congestion. The city experienced severe traffic congestion regardless of time and location, partly because of a bottleneck phenomenon caused by structural problems of the streets. In essence, Seoul was not a planned city. The traffic congestion was at its peak before the 1997 Asia financial crisis.

As part of an effort to resolve the problem, roads were continuously expanded and newly built to facilitate traffic flow within the city. The SMG implemented carpooling initiatives in 1988 and from 1966, it has imposed congestion charges on cars coming into the city center. This policy was evaluated to be successful at the early stage, but its effectiveness is currently in question.

Even though the rate of increase in car-ownership slowed down in the 1990s, the number of registered vehicles in Seoul had been on the rise. In 1990, the number of registered cars had already exceeded one million, 69% of which, or 823,731 cars, were privately owned vehicles. This means the number of citizens per motor vehicle in the city was 12.9. In 1992, the number of registered vehicles was increased by 36.8%, 71.8% of which were privately owned cars. The ratio of citizens to motor vehicles was 9.7:1. This shows that private vehicles had become popular among citizens and were being utilized as a major means of transportation. Back in the 1980s, the city failed to expect the explosive increase in the number of automobiles. Consequently, shortage of parking space became a persistent problem. The SMG

has implemented various measures such as a one-way traffic system in narrow alleys and a residential parking permit program. Still, the problem remained to be an on-going task for the authorities.

Source: Seoul Museum of History, 두더지시장 양택식 I, Seoul Museum of History: 강홍빈, 2015, pp.105. Print

[Figure 21] Construction of Jamsil Bridge

6. Preparing for the Seoul Olympics

After the 1970s, the SMG started proposing various transportation policy solutions. Building roadways was still an on-going effort in the 1980s and 1990s, but a new roadway was not considered a panacea to all ills anymore.

The history of transportation in Seoul can be divided into three phases: the first phase until 1981, the second phase from 1982 to the late 1980s and the third phase after the 1988 Olympics. In 1981, the arterial road network of the city consisted of 19 radial roads that connected the city center and outskirt areas and had insufficient capacity. The bridges that connected the northern and southern parts of Seoul could not afford the annual traffic increase that ranged 20 to 30%. There was neither adequate road management system nor effective traffic signal and sign systems.

On September 30, 1981, Seoul was chosen to host the 1988 Olympics. There were mixed responses. Some welcomed the news, but others expressed concerns

over whether the country could hold the event successfully for two reasons: security and transportation. Because Korea was still a country at war in a technical sense, it was natural that many raised questions about security. What was worse, Seoul was one of the cities notorious for extreme traffic congestion at the time. The IOC members were particularly concerned about the transportation problems. Indeed, back in 1981, transportation infrastructure of Seoul was not adequate to hold such a big event. There was only one subway line in service. Despite a number of bus routes and vehicles, the buses were extremely congested during the rush hours, carrying 190% of passenger capacity, that too without air conditioning. About 29,800 taxis were in operation, but most of them were small-sized vehicles. Moreover, experts anticipated that the number of vehicles would exceed 750,000 by 1988, which would have caused extreme traffic congestion all day. Furthermore, the traffic accident rate of Seoul was the highest among the host cities of the Olympics of all times. Transportation culture was far from civilized, with recklessly speeding taxis and an immature civic awareness.

Source: Seoul Museum of History, 두더지시장 양택식Ⅰ, Seoul Museum of History: 강홍빈, 2015, pp.94. Print

[Figure 22] Severe Traffic Congestion in Seoul

In preparation for the 1988 Olympics, the SMG attempted to improve its transportation infrastructure and system. The city saw the absence of a beltway system as a major problem for traffic flow of Seoul. The then mayor, Goh Kun (1988~1990), suggested that the SMG build an inner-ring road bypassing the city center. He also suggested that the central government should construct an outer beltway circulating the outskirts of Seoul. Planning the outer beltway was relatively simple because the areas where the road would be built were greenbelt areas. On the other hand, it was a challenging task to plan the routes of the internal ring road because the road needed to bypass the city center. Demolishing buildings and houses in the way was inevitable. The SMG made part of the ring road traverse the banks of the Han River and the other part go above the tributaries of the river. That means the SMG did not have to demolish buildings or compensate private landowners because land near streams was public land. The construction of the 40.6km-long inner-ring road, named Naebu Expressway, began in 1990.

The SMG also increased efficiency of the existing road network, improved the signal system and strengthened connectivity with the public transit system by building more secondary roads. The urban highway network in Seoul had its basic frame completed during the preparation for the Olympics. Today's urban expressways were mostly completed in the 1990s.

7. Transportation Policies Diversified in the 1990s

The SMG's transportation policy after the Olympics was not only about building roadways. Transportation planners proposed various solutions to the persistent transportation problem of the day. A major project then was to build interchanges. A mid-term plan for this project was devised in 1992, targeting the main road and its crossroads with more than six lanes and four lanes respectively. To improve the traffic capacity of intersections, street corners that impeded traffic flow were rounded and the road width was expanded to reduce traffic bottleneck. The traffic

signal cycle and real time control system at intersections were introduced and optimized for smooth traffic flow.

Moreover, because of rapid increase in population and motor vehicles in the 1990s, development of satellite cities and growing importance of the Gangnam area, Seoul still faced a demand for more bridges connecting the north to the south. By the late 1990s, a number of new bridges were constructed and existing bridges were expanded.

Express city buses were increased. Most city buses were equipped with air conditioning. More support was provided for bus companies in the form of tax benefits and bus garages. Initiatives for the mobility disadvantaged such as introducing low-floor buses were strengthened. The bus routes were modified to provide better service to peripheral areas. A plan to build large bus garages in green belt areas was also drafted at the time.

Transportation System Management (TSM), introduced in 1983 with the support of International Bank for Reconstruction and Development (IBRD), was expanded to all street networks in the city. Local TSM projects in small scales were implemented. The traffic signal system was changed to electronic signal and real time control systems. To prevent traffic bottleneck, the roads were expanded and their signal system was improved. Seoul Traffic Broadcasting System (TBS) was established in June 1990.

To secure more parking spaces, the government revised the related laws to allow the private sector to build parking lots in streets, in the basement of parks, and in the covered areas of urban streams. As part of the efforts to reduce parking demand, the SMG allowed attached parking lots of buildings to be operated as paid parking space and imposed parking restrictions. In March 1990, the central government devised a ten-year comprehensive parking management plan. Under this plan, the municipal governments as well as the police were empowered to regulate illegal parking. About 50 private tow companies were hired to curb illegal parking. This plan also improved parking standards for individual and public housing to resolve parking shortage in the residential areas. The roads in neighborhoods became

one-way streets and a residential parking permit program was implemented. To curb parking demand in congested areas, the authorities restricted establishment of parking facilities by revising related laws.

Traffic demand management was another axis of urban transportation policy in the 1990s. It was impossible to fulfill the ever-increasing traffic demand merely with measures to supply infrastructure. Therefore, the authority restricted buildings that might cause massive traffic congestion. Before the 1990s, it was the taxpayers who had to shoulder the burden of the adverse traffic effects from new developments. Indeed, traffic congestion and pollution incur high social cost. It increases logistics cost and consequently harms the economy. The traffic impact assessment system introduced in the 1990s made the major contributors to transportation problems take responsibility for the expenses. This encouraged careful planning for both the public and private sectors. Later, the period of traffic impact assessment was extended to 10 years from 5 years. The congestion charges were also imposed on vehicles coming through the tunnels to the city center.

Measures to improve transport safety and order were also strengthened. School zones were first to be designated at this time. Intensive improvement was conducted for areas where traffic accidents frequently occurred. The driver's license system was improved by tightening aptitude and driving tests. Spike tires were banned to reduce accident rates of buses. Moreover, Children's Transportation Park was first opened to instill knowledge about the importance of transport safety. There were many plans unrealized at the time: a light railway system, an integrated fare system of buses and subways, and a transportation card system.

8. The Decline of Bus & the Rise of Subway

Development of the transportation system for Seoul can be analyzed in terms of the changes in major means of transport. Until the mid-1990s before subway connection was insufficient, a bus was the most popular mode of transportation in

Seoul. Such popularity was unprecedented, given that the city's bus system was run by private bus companies. As the city expanded and new satellite cities were developed, new bus routes were added, connecting city centers and the outskirts. In the 1960s and 70s, the modal share of buses was as high as 90%. Essentially, the public transportation system in Seoul was solely dependent on bus.

Source: Seoul Museum of Histor, 돌격 건설! 김현옥 시장의 서울 I, Seoul Museum of History: 강홍빈, 2013, pp.45. Print

[Figure 23] City-run Bus Service in the 1960s

In the 1980s, it was obvious that the ever-increasing numbers of buses, bus routes, taxies, and private cars overwhelmed the road capacity of the city. Traffic congestion became one of the worst transportation problems even though construction and expansion of elevated highways, underpasses and roadways were built across the city. This led to plans for a new transit system that can carry a number of passengers more safely and swiftly: a subway system, which started its operation in 1974.

Shovel-ready for building the Subway Line 1

Discussions on building subway system started in the mid-1960s when the ten-year master plan was announced. In the 1960s, increasing numbers of buses, taxis and private vehicles caused severe traffic congestion, overwhelming road capacity. After trams were demolished in 1968, buses accounted for 80% of the modal share, accounting for heavy traffic. Even continuous expansion of road networks failed to lessen traffic congestion. The city was in urgent need of a new transit system that could carry a large number of passengers in a safe and swift manner. The subway system was proposed as the most feasible alternative. Subway construction was one of the long-cherished projects of the SMG in the late 1960s.

(Seoul Station-Cheongnyangni, 7.8km)

[Figure 24] Subway Service on Line 1

Although the SMG had already conceived the idea of subway construction in 1965, it was delayed due to lack of finance and technology. In May 1970, the President ordered to devise measures to alleviate severe traffic congestion in Seoul.

Then-Mayor Yang Taeksik (1970~1974) proposed a subway construction plan to the President in a month and gained his approval. The Headquarter of Subway Construction was launched in 1970. The construction began in 1971 and went on through day and night. Even though the project was led by Mayor Yang, the construction was a national project receiving government subsidies. The SMG partially received financial and technical support from Japan, but civil engineering was done by Korean engineers. It was a large project that took 40 months and cost KRW 33 billion. The progress of the construction was regularly reported to the President. Conflicts between departments were resolved by the central government.

In 1973, a trial run of the subway train was started in partially completed sections. In 1974, the line was finally completed. The subway system in Seoul is an urban electric railway in which a subway train consisting of 4 to 10 cars travel through exclusive underground rails, connecting town centers. The city's first subway line was completed in three years and four months, which held the record of being the world's shortest construction period at the time. The total length of the first line was 9.54km. The line was later connected with other cities, preparing the ground for the metropolitan railway system. In 1974, when the first subway line was opened, buses accounted for 81.3% of trips while taxis made up 17.6% and subways, 1.1%. This was because the line covered only a fraction of the city area and citizens lacked awareness of the subway system. However, the number of subway users kept increasing after 1974. By 1976, buses carried 80.4% of the passenger load of Seoul, still functioning as the major public transportation mode of the city. However, the share decreased to 72.5% in 1978, showing a slight increase in 1980 but dropping thereafter to 69.9% in 1984 and 61.1% in 1986. Such decreases resulted from the increasing role of the subway rather than taxis. The modal share of taxis was around 20% after 1978.

Source: Seoul Museum of History, 두더지시장 양택식II, Seoul Museum of History: 강홍빈, 2015, pp.33. Print

[Figure 25] Construction of Subway Line 1

The Circular Subway Line 2 and its Impact

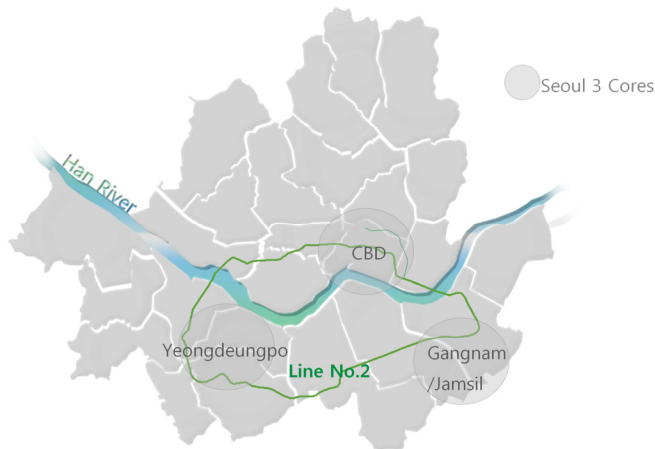
Subway Line 2 started its service in 1984. It has the longest track, as long as 54.2km, that circles the city. What is interesting was that it was a circled line around the city of Seoul. Normally the major transport network for the city is designed as a radial pattern at the initial stage. Due to geographical characteristics of Seoul, it was also natural to build a radial subway system first and then a circular one. However, that was not what happened.

Subway routes are important for nearby residents and local communities. Therefore, all the processes of subway construction should be carefully determined based on a thorough planning and in agreement with citizens. In 1971 when the route for Line 1 was determined, the authorities also planned routes for Line 2, 3, 4, and 5 based on traffic demand surveys. The routes for Line 1 to 5 were initially confirmed by the SMG Headquarter of Subway Construction and the Japanese Association Railway Technics Surveys (JARTS) and finalized at the cabinet meeting. Initially the Line 2 was not planned as a circle line. It was to be built as a line completing radial subway network.

However, the then Mayor Gu had a different idea. He strongly wanted to make a Seoul with three growth centers. To him, the current Seoul with a single city center was not a good platform for encouraging urban growth for the future. He believed that there should be new growth magnets in the southern area of the Han River. A new subway line was going to be a strong catalyst to create new growth centers. Perhaps because his belief was so strong, an earlier decision with such a principle or due process was not important for the mayor. The only important thing to him was his decision and President's approval. In 1974, then-mayor of Seoul decided to build a circular rail network to realize the vision of three-nucleus city. A circled subway Line 2 would penetrate the three new growth centers, including two in the south. It was a total modification of the central government's initial subway plan.

There was an obstacle, however. To build a new subway line, it was essential to receive consent from the investigators of JARTS sent by the Japanese government on the route of Line 2. As mentioned above, JARTS deeply involved in plans for the subway lines in 1971. The SMG needed to acquire a loan from Japan for Line 2 construction. JARTS expressed its reluctance to approve the plan for a circular line. They thought the radial subway system should be completed first. The Mayor, however, was adamant about the circular route.

In 1977, the President finally approved the construction of the circular Line 2, which would be financed by issuing subway construction bonds without Japanese assistance. An ordinance on subway construction bond was promulgated at the end of the same year. Still, financing was a major problem for the project. In 1978 when the construction began, per capita income was USD 1,100. The SMG was already deep in debt due to the construction of Line 1, whose total length was 9.5km. Line 2, a total length of 54.2km, was far beyond the SMG's financial capacity. The total investment reached KRW 877.1 billion. Of this, the SMG's own fund including the government subsidy was KRW 328 billion, only accounting for 37.4%. The rest was covered by the subway construction bonds and bank loans.



Source: Seoul Institute

[Figure 26] Subway Service on Line 2 (Inner circular line)

Subway Line 2 brought about enormous changes to the city. First, the population concentrated in the Gangbuk areas was dispersed to the Gangnam areas. In the late 1977, the total population of Seoul was about 7.52 million, with 4.89 million in the Gangbuk areas and 2.63 million in the Gangnam areas. However, in 1985, after Line 2 was in full service, the total population was 9.64 million, with 5.22 million in Gangbuk and 4.42 million in Gangnam. The population ratio of Gangbuk to Gangnam changed from 65:35 in 1977 to 54:46 in 1985. High-rise office buildings began to appear in areas adjacent to Line 2 during and after the construction.

After the opening of Line 2, the modal share of subway continued to increase, recording 7.3% in 1984 and soaring to 15.3% in 1986 with Line 2, 3, and 4 in full operation. As mentioned, the SMG strived to improve its transportation infrastructure before the Seoul Olympics. The priority was given to the subway system. The SMG made sure to complete the construction of Line 2, 3 and 4 as scheduled. Consequently, as Line 2 was completed in 1984 followed by Line 3 and 4 in 1985, total length of all the subway lines reached 183km. The subways were able to carry 2 million passengers to the city center within 40 minutes.

Building More Subway to handle Increasing Car Ownership

With the boom bought in by the 1988 Seoul Olympics, population growth in Seoul led to an ever-increasing demand for housing. Land for housing in Seoul was being exhausted. As more people wanted to buy their own houses, apartment prices skyrocketed, causing socioeconomic and political dissatisfaction. The SMG developed the outer areas of the city as residential areas and planned to build new towns within its metropolitan area. By 1988, the city's population exceeded 10 million. As household income rose in Seoul, the city was facing an explosive demand for private cars. The number of cars exceeded one million. Traffic congestion and parking space shortage had been exacerbated in the late 1980s.

Thus, four lines of subway were not sufficient to handle the increasing travel demand. In 1988 when the 22nd appointed mayor of Seoul, Goh Kun, took office, the mayor considered the transportation problem as more urgent than any other issues. He held a public debate to garner opinions from the public and experts. He argued that as the number of vehicles exceeded one million, the city needed more subways. Obviously, the existing subway lines (Line 1 to 4) were not enough to meet the increasing travel demand. The degree of congestion[2] for the existing subway lines exceeded 300%, meaning that the number of actual passengers was three times of the base capacity. To reduce the congestion to at least 200%, the SMG made further improvements in the existing subway system. The number of subway vehicles was increased from 700 to 1,500. Vehicles for subway were equipped with air conditioning facilities. In spite of such investment, increasing transport demand was too high to be handled with only an incremental improvement.

The SMG made official announcement to build four additional subway lines (Line 5 to 8) to the current subway system. After numerous debates and meetings, the SMG proposed it at a cabinet meeting in 1989. The SMG requested a budget for

[2] The degree of congestion for a subway train is calculated by comparing the actual number of passengers to the base capacity of 100 passengers.

subway construction to the central government and secured 25% of the total construction expenses after long negotiations. The construction finally began in 1990. The total length of the four lines was 10km longer than that of Line 1, 2, 3 and 4 combined. In the 1990s, the status of subway was further strengthened as the existing lines were extended as well as new lines were opened. By then, new line 5, 6, 7 and 8, operated by Urban Railroad Corporation had started their service.

Funding was always problematic for building the subway. There are gaps between the constructions of subway lines. Four years after the completion of Line 1, Line 2 began its construction. Line 3 and 4 were constructed six years after completion of Line 2. The construction of Line 5 to 8 began five years after the completion of Line 3 and 4. The major reason for this was financial problems. In cities in other countries, the central government supports 70 to 80% of the construction expenses. However, the Korean government provided only 2.7% of the expenses for Line 1 to 4. The government support increased for Line 5 to 8, but was still low at 20.3%. Despite the increased rate, it was difficult for the SMG to bear the burden of all construction expenses. Therefore, the SMG adopted privately financed construction of additional subway lines. It took KRW 2.34 trillion to build Lines 2, 3 and 4. About 70% of the expenses were provided by issuing bonds, making the Seoul Metro, the operator of Line 1 to 4, operate at a loss for a long time.

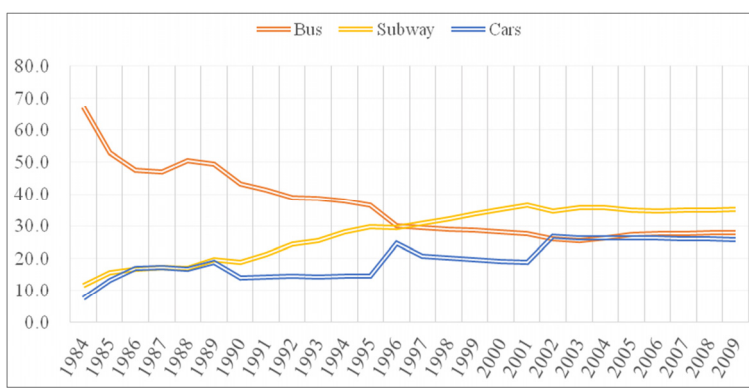
Bus Hit Hard by the Subway System

With the subway system in full operation, the bus system was directly hit by a more competitive transit system. In 1990, the modal share of buses was 43.3%, still holding a dominant position among other means of transportation. Before 1997, when the Asian financial crisis hit the country, bus riders in Seoul had to suffer from severe traffic congestion. Almost all the roads in the city experienced traffic congestion all day long, not only during rush hours. The bus share dropped to 38.9% in 1992 and to 30.1% in 1996 and not much different with the share of subways,

29.5%. Moreover, 31.5% of the passenger traffic was carried by taxis and privately owned vehicles. In 1990, subways accounted for 18.8%, increasing to 24.6% in 1992 and showing continuous growth thereafter. In 1998, the share recorded 32.3%, making the subway system the No. 1 public transit service in Seoul, while the modal share of buses decreased to 29.8%, yielding the top position to subways. In 1999, subways carried 33.8% of the passenger traffic while the modal share of buses stood at 28.8%. Since 1968, buses had had a great influence on growth of the city as its No. 1 transportation mode. The period of domination for bus was coming to an end.

The decrease in the bus share was, in part carefully planned by the SMG. The SMG adjusted the existing bus routes when the subway system was introduced. In the sections where the bus routes and subway lines overlapped, the number of the routes was reduced to minimum but the starting point of bus routes was not changed.

In the late 20th century, buses, which practically lost its competitive edge to subways, finally became reduced to a supplementary role for the subway system. The heyday of buses has long gone. With the expansion of the subway system, subways were then the most preferred transport option by citizens than any other public transit services. [Figure 27] shows the daily modal share by transportation mode in the 1990s.



[Figure 27] The Modal Share, 1984~2009

The increase in the subway modal share was partly because traffic congestion was exacerbated by a fast-growing number of cars, which exceeded the road capacity. Moreover, road conditions had deteriorated due to relentless subway constructions, making it difficult to use surface transportation. This proves that citizens recognized subways as the most reliable mode of transportation that also provided punctual service.

Source: Seoul Museum of History, 두더지시장 양택식Ⅱ, Seoul Museum of History: 강홍빈, 2015, pp.48. Print

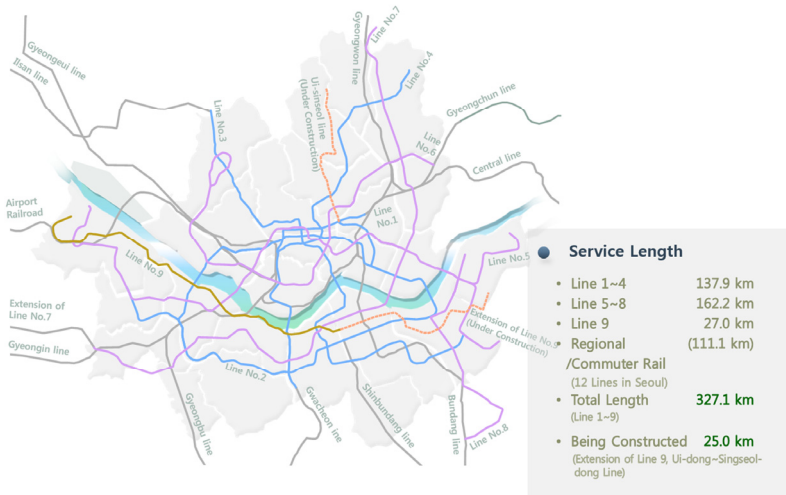
[Figure 28] Metropolitan Subway Opened in 1974

Since the mid-1980s, when the subway system emerged as the major public transportation mode in Seoul, bus companies provided various types of buses and improved their service to regain passengers. Despite such efforts, the number of bus users kept on decreasing due to severe traffic congestion. In addition, the bus-only lane, first introduced in 1995, definitely improved convenience for bus users, but did not enable buses to compete with subways in terms of convenience, speed and

efficiency. This indicates that the citizens highly appreciated the convenience of subway and that the means of transportation started to diversify. The 1997 Asian financial crisis also made citizens use public transit rather than driving their own cars and most of them preferred subways to buses. Therefore, the increased number of subway passengers in the mid-1990s can be attributed to drivers, bus passengers or taxi users. It also proves that the SMG's policy to build the subway system was a right decision.

In summary, trams that run on tracks along public streets marked the start the 20th century but subways that run underground railways marked the end. Indeed, the subway system is one of the most important public transportation in Seoul, carrying more than one-third of the citizens every day. Along with the popularity of the system, areas near subway stations emerged as new commercial districts, transforming the internal spatial structure of Seoul. For example, department stores and shopping centers were built in locations adjacent to subway stations. Some stations were designed to reflect the geographical or historical characteristics, functioning as a cultural space. There were flourishing underground shopping centers that were connected to subway stations. Park-and-ride facilities were made around subway stations in peripheral areas of the city. Today, people usually give directions to places based on subway stations. Besides, proximity to subway stations became one of the most important location requirements.

The subway system had an impact on metropolitan areas as well. Seoul, Incheon, and Suwon were connected in a subway line. The subway system contributed to the emergence of satellite cities and sub-central areas in the metropolitan region encompassing Seoul and its outskirt areas beyond the green belt, thereby decentralizing the urban population.



Source: Seoul Institute

[Figure 29] The Subway System of Seoul

9. Revival of Bus: Seoul Bus Reform in 2004

Nowadays, more than 30 million trips occur in a day in Seoul. Since the 1990s, the SMG has been firmly pushing through a mass transit oriented policy. As a result, the modal share of subways steadily increased from 29.4% in 1996 to 35.6% in 2003. More than 60% of these trips use public transportation. The modal share of public transit was as high as 65.8% in 2015 (Subway 39.3% and Bus 26.5%) and was one of the highest in the world. Now Seoul has 9 subway lines (302 stations, 327.1km in total), carrying more than 5,000,000 passengers per day. Seoul also has a high bus usage with 394 bus lines and more than 7,000 buses operated. This, however, was not always the case. As noted, bus share in the past had declined, as the efficiency of subway system was highly recognized by citizens. Throughout the latter half of the 1990s, the bus industry was beset with numerous problems such as frequent strikes, increased fares, and deteriorating services. All these problems originated from the fact that it was losing its competitive edge to the subway.

Source: Seoul Institute

[Figure 30] Bus Service in the Past

The whole bus system of Seoul was left to the private market. More than 60 private bus companies were operating the system. These companies competed with each other to attract passengers. Over a profitable bus route, more than one bus company operated their buses, creating a cutthroat competition. Citizens complained about poor bus service. Among those, irregular intervals, aggressive driving, passing stations without stopping were common complaints from citizens. Furthermore, buses were suffering from heavy traffic congestion. Rapid urbanization and strong economic growth throughout the 1980s led to an increase in the number of vehicles to 1.19 million in 1990 (Currently, there are about 3 million cars in Seoul). In addition, the rise of traffic influx into Seoul from the surrounding metropolitan areas made the traffic situation even worse. The city had to do something for bus transport improvement.

In 2002, the SMG formed the "Task Force for the Activation of Mass Transportation" to search for effective solutions to improve the bus system. The "Citizens' Committee for Bus Reform" was formed to garner the opinions of various interest groups. It arrived at a consensus for the reform of Seoul's bus system. The fundamental philosophy of the reform was to find a way in which the entire bus service network served the public good in an efficient and fair manner while still maintaining the bus companies as private entities. The goal was not only to reduce congestion but also to find a fair system for citizens who had varying degrees of access to public transportation.

The Quasi-Public Bus Operation System

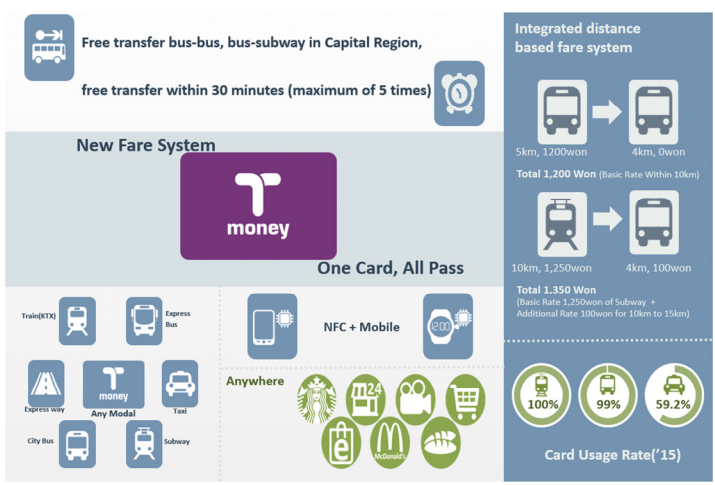
To solve the bus problem, the SMG proposed the idea of a "quasi-public" bus operation system. The SMG officials entertained the possibility of "joint management of fare revenue". In 2004, a revenue sharing system was devised. The joint transportation revenue system collects all bus transport revenues and redistributes the profits according to the performance of each bus company. The performance is measured by the SMG. Korea Smart Card Company (KSCC) was set up to manage and redistribute fare revenues in a transparent manner. Then the SMG compensates for any deficits incurred by bus companies that have abided by the guidelines of the system. Moreover, bus companies are guaranteed with a certain rate of profit. With this sort of system, bus companies did not have to worry about competing for passengers revenues. Through the quasi-public operation system, financial assistance was provided to struggling bus companies. Without financial difficulties, bus companies could focus on providing more efficient and safer mass transit service. Because the SMG covered all the operating cost, new bus routes were introduced in areas of poor access as well.

Integrated Fare System

Before 2004, the bus and the subway operated separate fare systems. An additional fare had to be paid for every transfer. The SMG introduced an integrated public transportation fare system that waives off the fare on transfer from bus to bus, bus to subway. This system minimizes the burden of fare on the citizens by applying a "distance scale system" that combines a single continuous trip into a single fare. The distance scale system applies a uniform rate to each bus/subway trip of 10km or less. There is an additional charge of 100 KRW (less than 10 US cents) for every additional 5km in case the trip is over 10km.

Integrated Smart Card System

In 2004, taking advantage of the consolidated bus networks, a new smart card system was introduced. Payment is made when a smart "T-money" card is read at a bus, taxi, or subway entrances. Credit cards are also accepted with a mode of payment. T-money terminals then shares all travel information with the SMG. If a bus reaches a given distance from the garage, transaction information is sent to the collection system by wireless access points. The revenue information transmitted to the traffic card management system would process all calculations from 2:00 am to around 7:00 am the next day. This system, the first of its kind, has made taking transit easier. Citizens did not have to carry cash to take transit and no one needed to take the exact change when boarding.

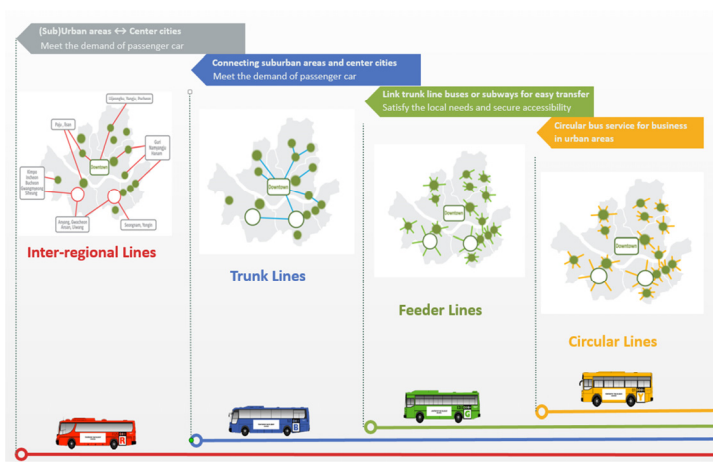


Source: Seoul Metropolitan Government

[Figure 31] A New Fare System: T-money

Bus Speed guaranteed by the Median Bus Only Lanes

To address the problem of fierce competition between companies over the same routes and unexpected detours, a new bus routing system was implemented. The system has four types of buses: Red, Blue, Green and Yellow. The main line buses consist of a regional bus (red) and a city bus (blue). The red bus runs between the outskirts of the city and the downtown areas. The blue bus runs between downtown and sub-centers or between sub-centers. The green bus connects blue bus stops with the subway stations. Finally, the yellow bus takes charge of a short-distance travel within the downtown and sub-centers. The different bus colors allow users to identify what buses to take with much more ease.



Source: Seoul Metropolitan Government

[Figure 32] Four Types of Buses in Seoul

Exclusive median bus only lanes were newly installed to improve bus speed and let buses escape from traffic congestion. By 2002 64 lines with a combined length of 219.1km were operating as exclusive bus lanes. However, most of them were shoulder lanes on the street side. To improve bus speed and to increase punctuality,

115.3km of exclusive median bus only lanes were installed by 2012. This has enhanced bus speed from 17.2km/h in 2003 to 19.5km/h in 2011. Furthermore, the SMG has created smart transfer centers at key points in the downtown area.

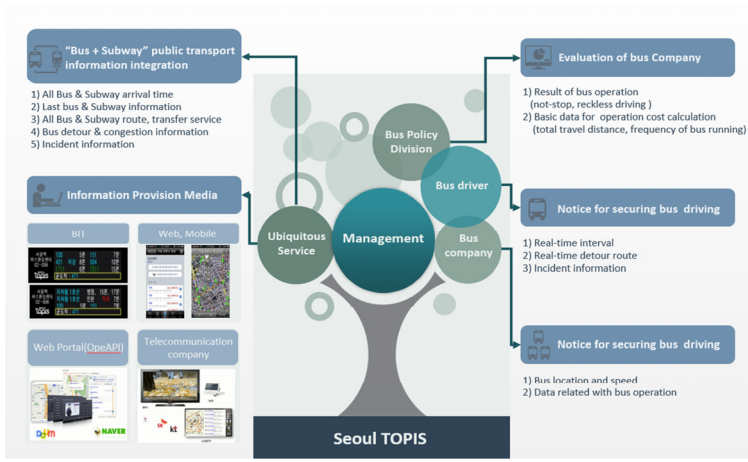
Source: Seoul Institute

[Figure 33] Exclusive Median Bus Only Lane

State-of-the-Art Information System: TOPIS

With the reform of Seoul's mass transportation system, it was possible to build an information network that managed Seoul's overall traffic. In 2003, Seoul initiated TOPIS (Transport Operation and Information Service), a state-of-the-art traffic information system with a high-tech information headquarters. TOPIS collects and manages traffic information provided by taxis, the Bus Management System, the Smart Card System, unmanned traffic enforcement systems, Traffic Broadcasting, the National Police Agency, Korea Expressway Corporation and other related agencies. Based on the collected information, TOPIS informs bus drivers of real-time bus intervals, allowing bus drivers to adjust the intervals between services. TOPIS also provide information on emergencies and accidents. The device installed at each bus station provides bus arrival information as well as real-time subway schedules. Exclusive median bus lane stops are equipped with

real-time bus arrival information as well. Moreover, TOPIS saves all the transportation data such as bus intervals and average stopping time so that bus companies can adjust their dispatch plans. The information can also be used by the city to improve its bus operation even further.



Source: Seoul Institute

[Figure 34] TOPIS

Bus System Regionally Integrated

In 2007, through extensive discussions and coordination with Gyeonggi-do Provincial Government, the SMG integrated its transfer system with Gyeonggi-do and the Korea Railroad Corporation. The integrated transfer system with Gyeonggi-do allowed its residents to benefit from Seoul's fare system and transfer discounts. After the introduction of the integrated transfer discount, the number of bus users increased by approximately 40%. Mass transportation use expanded and private vehicle influx into Seoul reduced drastically too. With the Incheon Metropolitan City joining the integrated transfer system in 2009, the metropolitan area's integrated transfer system was complete, serving half of Korea's population.

Implementing New Bus System with Citizen Participation

The Seoul Metropolitan Government recognized that transportation policy was not limited to an issue of relieving congestion and was fundamentally an issue of fair governance, sustainability and competitiveness. Hence, "the Task Force for the Activation of Mass Transportation", a body of experts and citizen groups from different backgrounds, sought an overall reform that went beyond technical factors of traffic. When a new bus system was proposed, there was an intense discussion among the citizens. Despite public consensus on the need for a reform, diverse interest groups—namely local residents, bus companies, drivers and traffic police stations—had conflicting viewpoints. Civic groups emphasized the necessity of a voluntary body that could enable people to participate in finding a common ground. The Citizens' Committee for Bus Reform performed the critical role of persuading the various interest groups to agree on specific reforms.

In the first passenger satisfaction surveys starting in 2006, the satisfaction levels increased from 59.2 points (on a scale of 0 to 100) in 2006 to 74.3 points in 2012. The item that garnered the highest points in the satisfaction survey was the transfer discount system. Significant improvement in terms of comfort, compliance with traffic regulations and services for the mobility-impaired were also acknowledged by the survey participants. Most of all, citizens were satisfied with the faster bus service. The average traffic speed of Seoul improved from 22.4km/h in 2003 to 24.0km/h in 2010. For the same period, the average speed in the downtown area rose by 1.1km/h, from 15.5km/h to 16.6km/h. Despite the 200,000 additional cars registered between 2003 and 2010, there was a great improvement in traffic speed thanks to the new bus system. The new system brought about other benefits as well, such as environmental quality improvement. Seoul's fine dust density during the period 2001~2003 was 69~70μg/m^3.This figure decreased to 61μg/m^3 after the 2004 bus reforms. In 2012, the air quality has further improved to 41μg/m^3. Though it is difficult to argue that this environmental improvement came solely from the bus reform, it is undeniable that the reform contributed to the environmental improvement by relieving traffic congestion to some degree.

10. Seoul: Its Past and the Different Future

To summarize the experience of Seoul in developing transport infrastructure, it is safe to say that Seoul has responded well to explosive transport demand in difficult circumstances. The main arterial road networks, tunnels, bridges and highways constructed in the 1960s are still in use, comprising the base of Seoul's skeletal infrastructure. With the city growing, the infrastructure was expanded and improved. The basic road system built 30~40 years ago remains perfectly functional. This implies that it is essential to have a long-term view and a thorough urban planning for constructing transport infrastructure.

The land parcel readjustment program in the 1960s was an effective approach to provide land lots for housing and commercial developments. It had a great influence on how today's city space has shaped up. Most of all, it provided an effective funding mechanism for financing roadway networks. Most of the road networks and public facilities created based on this program have remained to this day. With the basic framework remaining intact over time, buildings have been redeveloped or remodeled, showing changes in shape, building use and density.

Changes in the transportation system of a city do not always entail the changes in the urban spatial structure. However, Seoul experienced such changes. Rapid urbanization, triggered by a rapid population growth in Seoul, development of new residential areas and large apartment complexes, transformed the structure of the city. This led to building bridges on the Han River and new road networks, as well as development of the public transit system, including subways. Notably, areas near subway stations emerged as commercial centers. As private car ownership was on the rise, new residential areas began to form outside of the public transit routes. Thus, changes in the transportation system were caused by the city's socioeconomic changes, subsequently affecting the urban spatial structure. To sum up, economic growth brought about urbanization and suburbanization with newly built transport infrastructure. This, in turn, led to changes in the internal spatial structure of the city, such as expansion of residential areas.

However, currently, it seems that citizens want a different future. Elevated highways were built to relieve traffic congestion and modernize the city. However, most of them started to be demolished in the late 2000s because they were considered an eyesore for the city. Pedestrian overpasses along with urban highways were built to facilitate traffic flow in the 1960s. Nevertheless, as pedestrian-friendly policies and cityscape improvement projects were implemented in the 2000s, many of the overpasses were torn down all over the city. These have become outdated. Citizens recognize that now is the time to focus on improving quality of urban space rather than quantitative growth.

Recently, it has come to our attention that cities in developing nations are increasingly interested in Seoul's experience in developing transport infrastructure. People visiting Seoul from developing nations are often amazed to see the extent of transport network and IT system. Especially we believe that the experience from Seoul have meaningful implication on cities in the Southeast nations such as Indonesia, Philippines, and Vietnam. Cities in those countries suffered from the lack of transport infrastructure for decades. City officials in such cities have keen desire to improve their transportation systems. This report selects to review Jakarta, Manila, and Ho Chi Minh City and discuss how the experience in developing transport infrastructure in Seoul could be transferred to them. The next chapters examine the state of transport infrastructure and overall economic growth in the three Southeastern cities since it is essential to fully understand the current status of the cities. Theoretical discussion and conclusion follow after the review.

02 Jakarta, Indonesia

1. Growing Economies and Sprawling Developments

With abundant natural resources, labor and a large domestic market, Indonesia is the largest economy in the ASEAN region. It is also the only Southeast Asian country in the G20, the international forum of the world's major economies. As of 2013, Indonesia attracted USD 28.5 billion in foreign direct investment (FDI) and enjoyed an economic growth of 5.78%. Between 2006 and 2008, Indonesia was selected as a non-permanent member of the United Nations Security Council, increasingly voicing its opinions on the international stage. The country occupies an area nine times the size of the Korean peninsula. It is the eighth largest trading partner for South Korea, while South Korea is Indonesia's seventh, meaning that the two enjoy close trade relations. As the largest oil producer in the Southeast Asia (with an oil reserve of 4.2 billion barrels, or 0.3% of global reserves) and the second largest natural gas (LNG) exporter in the world, Indonesia is rich in natural resources, including wood pulp, coal, tin and nickel.

Jakarta is the capital and the political/economic center of the Republic of Indonesia. The urban area is 661km^2. As of 2010, the population is about 9,600,000 based on which population density is calculated as 14,464 persons per square kilometer. Its Gross Domestic Product (GDP) for Jakarta is USD 71 billion with GDP per Capita of $11,000 in 2010. Indonesia's urban growth since the 1960s is the result of the capital's population growth. Between 1961 and 1971, Jakarta's urban population nearly doubled from 2.9 million to 4.6 million. The annual rate of growth was 5.8% in that period. In 2010, there are about 10 million people live in Jakarta.

- Area : 661km^2 (Seoul : 605km^2)
- Populations : 10,187,595 (2011)
- Population Density : 15,342/km^2(2011)
- GDP : $ 71,000 million(2010)
- GDP per Capita : $ 11,000 (2010)
- Language : Bahasa Indonesia)
- Religion : Muslim(86%), Christian(6%), Catholic(3%), Hindu(2%), etc(3%)

In general, population growth is achieved by natural means, such as higher birthrate or reduced death rate, or through migration. In the Jakarta region called “Jabodetabek” with a population of about 27 million in 2010, domestic migration has been best manifested. As of 2010, migrants from outside Jabodetabek accounted for 14.56% of the total population of the region. This indicates the concentration of economic opportunities in the Jakarta region. The high concentration of population in the region and the resultant high population density of Jabodetabek continues to this day. In 1981, the population sizes of Jakarta and Bodetabek began to reverse(엄은희, 2016).

[Table 4] Demographic Changes in Jabodetabek (1961~2010)

Year	DKI Jakarta	Jabodetabek	The Seoul Metropolitan Area
1961	2,904,533	2,794,712	5,699,245
1971	4,546,492	3,483,537	8,030,029
1980	6,503,449	5,413,271	11,916,720
1990	7,259,257	8,878,256	16,137,513
2000	8,347,083	12,842,626	21,189,709
2010	9,607,787	17,839,240	27,447,027

Source: BPS, 2010 [Cited in Winarso, et al., 2015:224]

[Table 5] Percentage of Migrants in the Jabodetabek Population Migrants from Outside Jabodetabek

Region	Population	Immigrants from the areas other than Jabodetabek	
		Persons	%
Jakarta	9,556,049	1,427,933	14.94
Bodetabek	18,320,530	2,630,119	14.36
Jabodetabek	27,876,579	4,058,052	14.56

Source: Indonesia Cities Open Data Census, 2010 [Cited in BPS, 2010: Rustiadi, et al., 2015: 430]

By Indonesia's administrative divisions, Jakarta is not a city but a region comprised of five autonomous administrative cities (officially called kota) and one administrative regency of the Thousand Islands. The administrative cities include Central (political and administrative center), West (concentrated with small businesses), South (serves as a satellite city), East (concentrated with factories) and North (ports and medium/large industrial complexes). Jakarta is officially known as Daerah Khusus Ibukota Jakarta (DKI Jakarta)-the Special Capital Region of Jakarta. Its capital area is referred to as "Jabodetabek", which includes the surrounding areas of Bogor, Depok, Tangerang, and Bekasi. The population of Jabodetabek is 16,610,837 persons, living on 4,936km^2, based on which the population density is measured at 2,966 persons per square kilometer. Jakarta has four major administrative divisions: province, city/regency, sub district, and village.

[Table 6] Five Administrative Regions of Jakarta (Kota Administrasi/Kotamadya)

District	Area(km^2)	Population (2010)	population density (person/km^2, 2010)
Central Jakarta (Jakarta Pusat)	47.9	898,883	18,676
West Jakarta (Jakarta Barat)	126.15	2,278,825	17,592
South Jakarta (Jakarta Selatan)	145.73	2,057,080	14,561
East Jakarta (Jakarta Timur)	187.73	2,687,027	14,290
North Jakarta (Jakarta Utara)	142.2	1,645,312	11,219

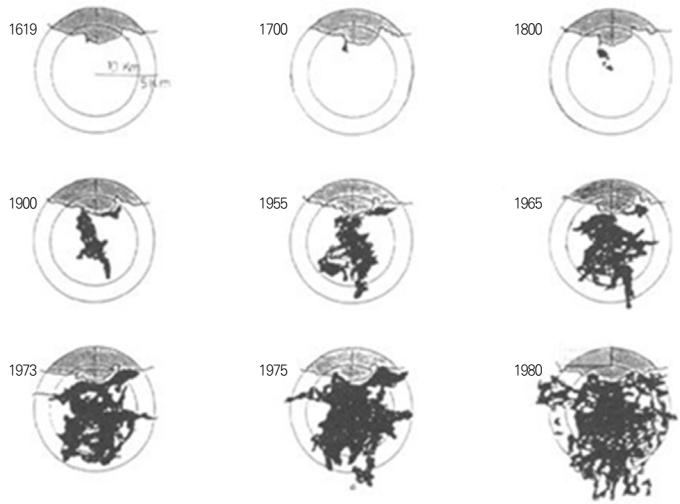
Five Administrative regions have the following characteristics:

- Central Jakarta (Jakarta Pusat): This is Jakarta's smallest city in area but serves as the administrative and political center with large parks and buildings from the Dutch colonial era.
- West Jakarta (Jakarta Barat): Home to Jakarta's small industries.
- South Jakarta (Jakarta Selatan): Originally planned as a satellite city, it is now home to the wealthiest residential neighborhoods.
- East Jakarta (Jakarta Timur): East Jakarta has extensive industrial sites.
- North Jakarta (Jakarta Utara): This is the only city with a beach in Jakarta, with sea ports and mid-sized and large industries. (장지인, 2013)

Jakarta witnessed the first of its urban changes in 1598, when the Dutch landed on the coast of Java. For the next three and half centuries, the capital's urban areas have expanded. From 1942 to the end of the Second World War, the Japanese took over and broadened the city. Throughout the 1960s, Jakarta's urban development was carried out pursuant to the 1965 Master Plan. However, development according to the plan soon reached its limit in the early 1970s, necessitating a new development plan covering the Jakarta Metropolitan Region. Later, in the 1970s, the urban development that followed was focused on industrial parks and suburban residential areas in accordance with public policies which had been seeking foreign investment for urban development. At the time, the scope of urbanization was confined to the 15-kilometer area from the Jakarta center. By 1972, the urban areas were limited to a 65km^2 area, most of which were focused in Jakarta.

Then, by 1980, the population of Jabodetabek had reached 11.9 million, stretching the urban scope to a 20-kilometer radius and transforming Jabodetabek into the largest administrative unit in Southeast Asia. Between the late 1980s and early 1990s, the Jakarta government aggressively pursued policies to encourage housing development in the private sector by infusing overseas capital. After 1987, the housing supply by the private sector began to exceed that of the public sector substantially. During this period, the physical boundary stretched out to a 30~45 kilometer radius from the center. In 1983, the urban areas had expanded to 120km^2. The existing woodlands and fields had mainly been turned into paddies and dryland. Urban expansion continued into the 1990s, transforming most dry land, woodland and green fields into urban areas. In the next two decades, the development of built-up areas continued to spread, largely along highways. What accelerated the trend even more was the general population growth, as noted, that resulted in the development of residential areas and the necessary facilities. In 1995, the greater Jabodetabek area-Bogor, Depok, Tangerang, and Bekasi-became part of the expansion. It was during this period that urbanization of almost all of Jakarta was completed. According to a comprehensive analysis of built-up areas between 1972 and 2012, 1,520km^2 of woodlands and fields-71% of the entire Jabodetabek region-disappeared. Dryland receded as well to 31% (710km^2) whereas built-up areas grew to 1,950km^2 (Rustiadi et al., 2015: 435~436). In the Jakarta region, development was vigorous, accompanied by changes to the intended land use.

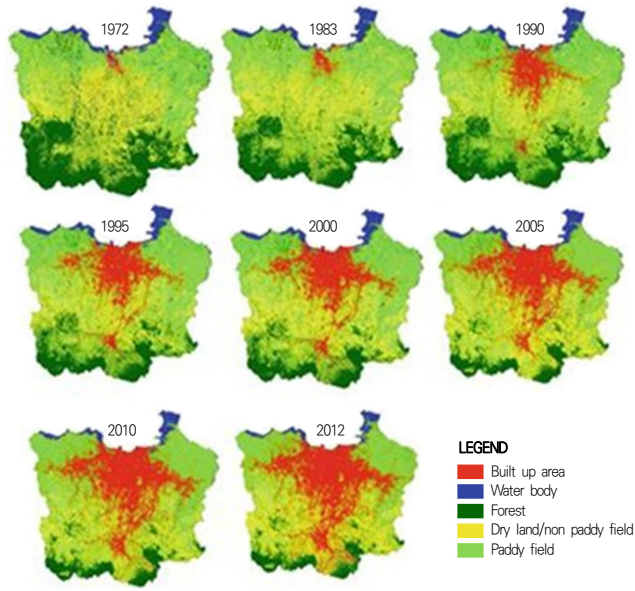
For the thirteen years between 1992 and 2005, undeveloped areas were scaled down by 60%, from 179km^2 to 71km^2 in 2005. According to a World Bank report, between 1980 and 2002, a quarter of the farmland, wetland and waterfront areas were converted to urban areas for industrial, commercial and residential purposes (World Bank, 2011). The motive to seek higher financial value led to a continued increase in land prices as well as created growing pressure to include green spaces for new development. Following [Figures 35 and 36] show expanding development pattern of Jakarta over time.



Source: Purnomohadi, Ning, 1994, Green open space to improve air quality in metropolitan Jakarta

[Figure 35] Expanding Development Pattern of Jakarta (1619~1980)

Sprawled urban development was concentrated on the outskirts of Jabodetabek due to the shortage of affordable housing and inefficient development regulations inside the built-up areas. From the perspective of developers, the development options available on the outskirts are more financially reasonable than urban infill development. Moreover, middle- and upper-class households moved to the suburbs in search of quality residential environments when new towns and extensive residential areas were built along elements of the transport network such as on the highway stretching from east to west. In the meantime, the growth of shopping malls and commercial establishments generated greater use of private transport, dramatically multiplying traffic going to and from outer Jabodetabek and the central Jakarta.



Source: Rustiadi et al., 2015 Greater Jakarta (Jabodetabek) Megacity: From City Development Toward Urban Complex Management System", R. B. Singh (Ed.). Urban Development Challenges, Risks and Resilience in Asian Mega Cities, pp.435

[Figure 36] Expanding Development Pattern of Jakarta (1972~2012)

2. Suffering from the Lack of Infrastructure

Apparently, Jabodetabek plays the most substantial economic role in Indonesia. In 1993, Indonesia's GDP was IDR 296.7 trillion, 17.4% of which came from Jabodetabek. In 1997, Jabodetabek was hardest hit by the Asian Financial Crisis. On the world stage, Jakarta fell from the ranks of 'global city' to a 'city in crisis'. However, the Jakarta and Jabodetabek economy have recovered. Between 1993 and 2008, Jabodetabek's economy showed a distinct growth, especially in finance (World Bank, 2012). As on 2008, the GDP of Jabodetabek accounted for 29.4% of national GDP (IDR 1.936 quadrillion).

In spite of its strong economic recovery, the Jakarta region suffers from the lack

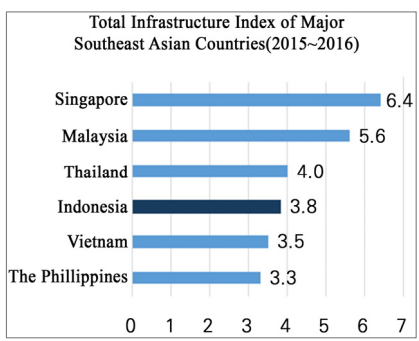
of transport infrastructure. As mentioned, the Jakarta citizens witnessed haphazard development and suburban sprawl was concentrated in the outskirts of Jakarta. As of 2011, the percentage of Indonesians living in developed areas was 51% and was expected to increase to 68% by 2025 (United Nations, 2009). This is higher than its neighbors: Thailand (33.7%), Vietnam (30.4%), Philippines (48.6%) and China (49.2%) although it was lower than the urbanization rate of advanced countries: Singapore (100%), Japan (90.5%), USA (82.1%) and Germany (73.8%), At this rate, its urbanization population is expected to rise to 68% by 2025.

Despite population growth and high degree of urbanization, Indonesia's investment in infrastructure has fallen short of the levels prior to the Asian financial crisis of 1997 (World Bank, 2013). Since the crisis from 1997 to 2013, the average infrastructure investment remained at 3~4% of GDP. Indonesia's overall infrastructure falls far short of its competitors in Southeast Asia. The figure is lower than Thailand and Vietnam, which stand at 7%. This is a main reason why Indonesia is losing its competitive edge each year. The Global Competitive Index Report by the World Economic Forum indicates that Indonesia's infrastructure ranking fell from 44th in 2010 to 46th in 2011.

By 2020, Indonesia's infrastructure market is expected to be worth USD 91.7 billion and grow at an annual estimated rate of 6~7%. The Indonesian infrastructure market is characterized by its size-the largest in Southeast Asia. There is indeed a high demand for infrastructure development. The Indonesian infrastructure market is characterized by fierce competition among global companies despite the less-than-average investment climate. Chinese companies are pursuing a massive project via all-out funding that does not require government guarantees while Japan has created a comprehensive development plan, providing low-interest loans and offering opportunities for Japanese companies to participate in major infrastructure projects. However, such international effort has not come to fruition yet. Indonesia's vulnerable infrastructure continues to impose restraints on its economic growth. Despite being the world's 16th largest economy, Indonesia is a lower-middle income nation, with a per-capita income of USD 3,500. Its overall

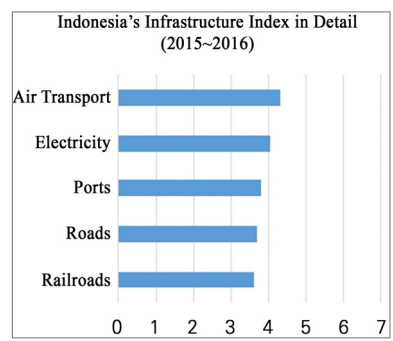
infrastructure is far less developed than of its Southeast Asian competitors. Investment on the infrastructure has been sluggish since the Asian financial crisis in 1997. In particular, the inadequacy of transport infrastructure seriously limits the opportunity of manufacturing industries to flourish. It puts a limit on promoting vigorous industrialization and prevents foreign investment. It is imperative that substantial investments are made to upgrade the country's transport infrastructure.

The Global Competitiveness Report for 2015~2016 scored Indonesia's overall infrastructure at 3.8 out of 7. It is the 81st out of 140 countries. Singapore scored 6.4 points, putting it in 4th place, Malaysia 5.6 points, putting it in 16th place and Thailand 4 points, ranking it a little higher than Indonesia at 71st place. Indonesia scored between 3.5 and 4.4-half the full score-in all infrastructure items: air transport, electricity, airline, roads and railroads.



Note: 140 countries; Infrastructure score is 7 out of 7
Source: World Economic Forum, 2015, pp.10~11

[Figure 37] Total Infrastructure Index of Major Southeast Asian Countries (2015~2016)



Note: Infrastructure score is 7 out of 7
Source: World Economic Forum, 2015, pp.203

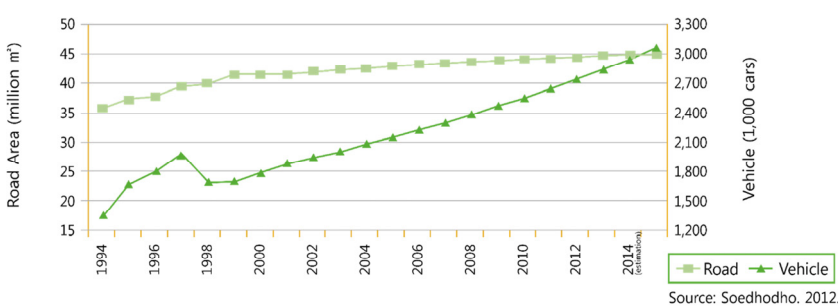
[Figure 38] Indonesia's Infrastructure Index in Detail (2015~2016)

Insufficient Transport Infrastructure while Growing Travel Demand

Despite the shortage of necessary infrastructure, travel demand keeps increasing in Indonesia, not to mention Jakarta. Since 2012, the number of automobiles sold on an annual basis in Indonesia has exceeded one million, 70% of which were sold in Jakarta and nearby Jabodetabek. Car sales are growing at 9% per annum. Perhaps reflecting the demand for private mobility, Indonesia's major transport infrastructure consists of roadways. Total length has only increased from 350,000km in 2000 to 520,000km in 2014.

Currently the number of motorized vehicles is about 5.5 million. On each day, 7.98 million vehicles are reported to be on the roads 98.5% of which are private cars and motorcycles. The rate of modal share for private vehicles is 44%. Every day 4 million people commute to Jakarta from surrounding areas (approximately 40% of the city's population). The increase in the number of private vehicles is expected to overwhelm road capacity by 2020 (MRT Jakarta, 2013).

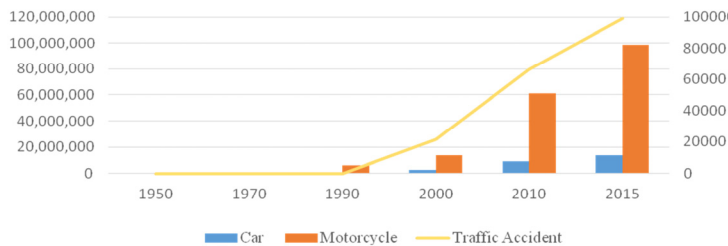
In Jakarta, the total length of the road network is 7,650km, spanning an area of 40.1km^2. It is just 6.2% of the total area of Jabodetabek which is smaller than 14% in Seoul and 12% in Singapore.



[Figure 39] Changes in Road Area and Vehicle Number in Jakarta

Within Jakarta, on an average, 256 new cars and 1,200 new motorcycles are added on roads everyday (excluding Jabodetabek). As a result, traffic congestion is

being exacerbated by cars coming from outside of the center (Saragih, 2012). It has been reported that Jabodetabek issues 2,400 new vehicle registrations each day. Among them, 2000 are motorcycles. They create not only traffic congestion and air pollution, but also pose a major safety hazard.

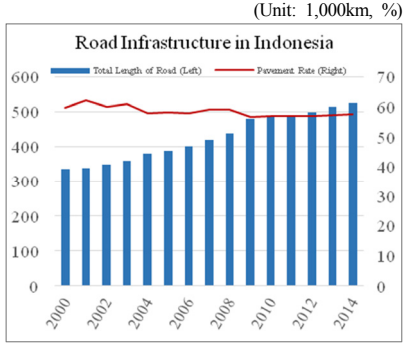


Source: Statics Indonesia (https://www.bps.go.id/)

[Figure 40] Changes in Numbers of Vehicles & Traffic Accident Cases

Furthermore, the rate of growth in improving road pavement has rarely seen any improvement. From 2000 to 2014, the road network has been extended, with annual total length growing 2.9% on average. However, road paving is insufficient and has been on a decline since 2000 when it stood at 58.4%, falling to 57.2% in 2014.

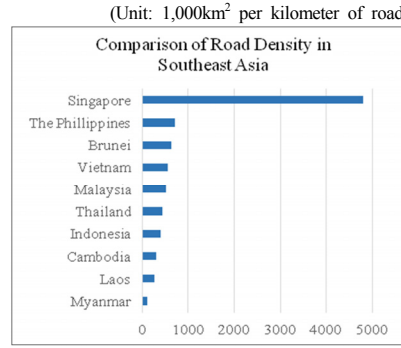
(Unit: 1,000km, %)



Source: Statistics Indonesia (Date of Search: June 30th, 2017)

[Figure 41] Road Infrastructure in Indonesia

(Unit: 1,000km^2 per kilometer of road)

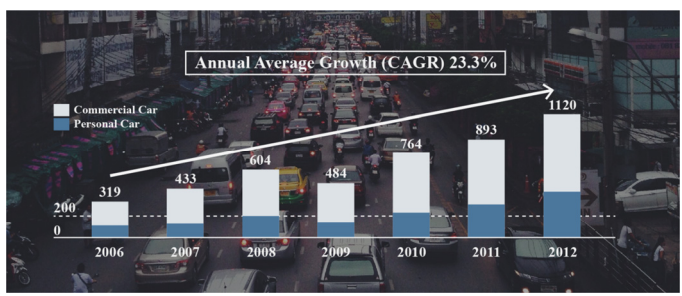


Source: UNESCAP (Date of Search: April 5th, 2016)

[Figure 42] Comparison of Road Density in Southeast Asia

Furthermore, other important transport features such as traffic signals have seen nearly no improvement in the last decade. Most importantly, roads in Jakarta are narrow. In the narrow road space, cars and motorcycles are crammed together, creating severe congestion nearly all day. The state even earned the nickname, “the moving parking lot” (박경서, 2015). Thus, there is an urgent need to improve the transport infrastructure in Jakarta and Indonesia as a whole.

It is also limited in its administrative capabilities, unable to effectively expand the constricted roads or build new ones. It was only in 2012 that the domain law was passed opening a way to build new roadways aggressively. Nonetheless, the government has failed to secure land for building roads in many cases due to the difficulty getting an agreement in a complex political environment.



Source: 박경서, July, 2015, Chindia Plus, Vol.82, POSCO Research Institute

[Figure 43] Car Sales Trend in Indonesia (Unit: 1,000 Cars)

Public transit such as buses and taxis are scarce in Indonesia. Jakarta has a poor public transit system. A commuter living in the suburbs needs two or more modes of transport to reach the urbanized area for work. The cost of transport eats up more than 30% of monthly earnings on average households (Infrastructure Market Trend in Indonesia, Third Quarter, 2016: Ministry of Foreign Affairs). Analyses indicate that the current urban transportation network, apart from the fact that it is insufficient, focuses on private modes of transport. Public transit system is just inadequate for more than 20 million residents of Jabodetabek. Some 110,000 buses run to and from Jakarta and Jabodetabek but account for only 2% of all vehicles in

operation. The modal share for buses amounts to 56% and they carry beyond their intended capacity.

Source: Soehodho, 2011

[Figure 44] Buses Traveling to/from Jakarta Suburbs

Most citizens prefer private transportation modes to public. There are also many different kinds of semi-public transport modes in Jakarta. For instance, Bajaj is traditional transportation means in Indonesia. Bajaj is a three-wheeled motor vehicle, which is widely used in Jakarta and other parts of Indonesia. There are two colors of Bajaj, the orange and blue. The capacity of passenger is two to four people. Bajaj is known for their noisy engine sound and fumes. There are no fixed fares for Bajaj.

Source: https://witaworld.wordpress.com/2015/03/18/public-transports-in-jakarta-indonesia-transjakartabusway/

[Figure 45] Bis in Jakarta

Bis is the most common transportation mode in Jakarta serving many routes in Jakarta. There's few type of Bis such as Metro Mini, Kopaja, Kopami and air conditioned bus like Mayasari and Patas AC. All the buses have fixed routes and fixed fare, while there are no designated stop locations and fixed schedules.

Therefore, passengers need wait for long hours. Buses stop wherever passengers can be picked up even in the middle of the road or even on a busy intersection.

Source: https://witaworld.wordpress.com/2015/03/18/public-transports-in-jakarta-indonesia-transjakartabusway/

[Figure 46] Mikrolet in Jakarta

Mikrolet is another common semi-public transport in Jakarta and Indonesia. Mikrolets are smaller vans or mini-buses without set routes. Mickrolet stops anywhere where they can take or drop off passengers. This is a main reason why Mikrolet is often held responsible for traffic congestion. The fares for Mikrolet vary depending on the distance traveled. In other parts of Indonesia, this type of vehicle is called Angkot.

Source: http://www.aktual.com/dishubtrans-dki-gojek-sudah-langgar-uu-dan-tantang-pemerintah/

[Figure 47] Gojek in Jakarta

Gojek is motorcycle taxis serving from main roads into housing complex, which usually was not served by other transportation. Because of traffic in Jakarta, Gojek is often known as the fastest form of transport. There is no specific place to take Gojek, but usually there is a lot of Gojek in intersections. As for the fares, you had better bargain before you get in. It can be arranged on-line beforehand.

Source: https://witaworld.wordpress.com/2015/03/18/public-transports-in-jakarta-indonesia-transjakartabusway/

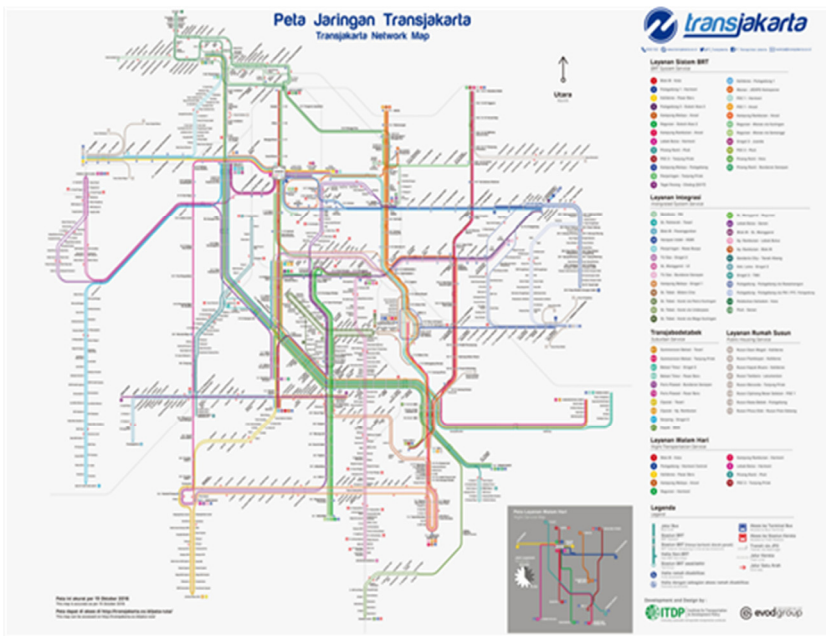
[Figure 48] Ojek in Jakarta

With insufficient public transit infrastructure and various semi-public transport modes, Jakarta has the worst traffic congestion in the world (BBC, 2012).

Economic loss from traffic congestion is severe. According to the MRT Jakarta, Jakarta expects a loss of IDR 65 billion from congestion by 2020 (MRT Jakarta, 2013). SITRAMP (2002) estimates the loss at IDR 8.3 trillion per year for all of Jabodetabek (Bappenas and JICA, 2004). The fundamental cause of traffic woes is its inadequate transport system, which has been designed to cater to personal mobility options such as motorcycles.

Only Viable Public Transit in Jakarta: Transjakarta

Today, the only viable mass public transit in Jakarta is 'Transjakarta'. With 13 routes, Transjakarta connects Jakarta with surrounding suburbs and has access to bus-only lanes.



Source: Transjakarta (https://transjakarta.co.id/)

[Figure 49] Transjakarta Network Map

Similar to those in Seoul, Jakarta's bus-only lanes for Transjakarta are also located at the center of the road. Users take a footbridge or crosswalk to reach the stations located on islands at the center of the road.

Source: (Left) MRT Jakarta, 2013, (Right) Soehodho, 2012

[Figure 50] Transjakarta Busway

Dedicated Transjakarta Busway lanes were first opened in 2004, modeled after the bus-only lane system in Bogota, Colombia. The 'tram-like bus' system had eight routes. Seven new routes were added. Air-conditioned buses run on the dedicated busway. Physical barriers are installed on dedicated lanes to set bus lanes apart from other lanes. A bus timetable and fare system has been adopted to ensure that buses make designated stops. The buses run on biodiesel that emits lower amounts of carbon dioxide. Exclusive bus lane is 143.45km, one of the longest in the world. The number of passengers has been increased that 307 million trips has been recorded by the 2010 since its inception. There are 142 bus shelters placed one kilometer from each other with 402 buses being operated.

Unlike taxis, Transjakarta is able to travel at an adequate speed despite the notorious congestion. If someone were to take a taxi from Jakarta Utara (North Jakarta) to Jakarta Selatan (South Jakarta) during peak hours, it would take an hour or two, or even longer. By Transjakarta, however, it would take only half an hour.

One of the most fascinating aspects about Transjakarta is the fare. As of March 2014, the bus fare was IDR 3,500 (approximately KRW 350). This is very affordable in light of the base fare (IDR 7,000) for Bluebird taxis, most commonly seen in Jakarta. For that reason, Transjakarta is a transport mode that is the most preferred by residents. By 2010, the bus only lanes served 307 million trips. To take the bus, users purchase tickets with cash from a ticket booth at shelters. Alternatively, they can use a credit card on the vehicles. There are no restrictions on

transfers to all bus routes and transfers are available in all directions. The transit shelter is connected by footbridges that can be crossed in approximately five minutes. Air quality benefit has been observed as well. According to the Institute for Transportation and Development Policy (ITDP), Transjakarta reduced emission of NOx by 155 ton and CO_2 by 20,000 ton per year. Additionally, it appears that creating the Bus Rapid Transit system is also cost effective (ULI and Ernst & Young, 2013): USD 4 million/km as compared to USD 50 million/km for light rail or subway.

There still are unresolved issues. First, it does not provide reliable service. Buses arrive at unpredictable times and since only some of the buses use the bus-only lanes for the entire routes, buses fall victim to Jakarta's traffic congestion (South Korean Ministry of Land, 2014). Exclusive bus only lane is in reality not exclusively used for buses. About 14% of bus lane user was used private cars in 2004. It shows that the public sector lacks administrative capability to enforce the rules.

Travel Demand Management being Tried, but Not Yet Fruitful

Traffic congestion is worsening year after year in Indonesia, especially in Jakarta. The government has adopted a variety of countermeasures to reduce traffic congestion. Under the impression that increasing transit ridership is the answer for the current transportation problem of Jakarta, travel demand management has been initiated to discourage private mobility over the years. For instance, recently there was a 10% hike in parking fees and highway toll rates had been increased. However, motorcycles create even more serious problems than private cars. As noted, a large part of private vehicles in the Jakarta region is comprised of motorcycles, many of them used as Gojeks.

Motorcycle share programs by Grab, Uber, GoJek and other such vehicle sharing services are popular due to their affordability. These services provide transport at

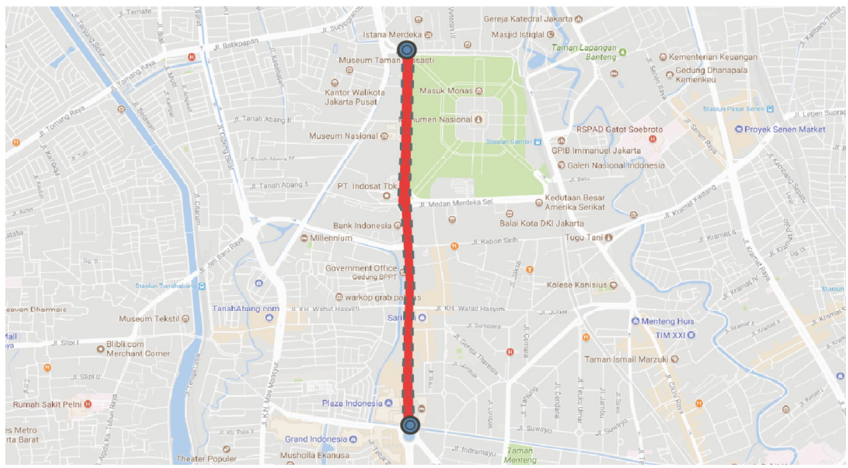
relatively faster speeds than the other modes. As on 2016, GoJek motorcyclists numbered approximately 200,000, with their services used 260,000 times a day. Such increase in the use of motorcycles, including the use of these sharing services, has led to a number of issues, such as worsening air pollution and an increase in traffic accidents caused by traffic violations.

[Table 7] Growth of Transport Modes & Consequent Traffic Accidents in Indonesia (1950~2015)

	1950	1970	1990	2000	2010	2015
Car	22,164	268,924	1,313,210	3,038,913	8,891,041	13,480,973
Motorcycle	5,546	440,005	6,082,966	13,563,017	61,078,188	98,881,267
Traffic Accident	-	-	19,920(`92)	21,649	66,488	98,970

Source: Statistics Indonesia (Date of Search: June 30th, 2017)

In spite of its large impact on traffic congestion and safety, proposed policy measures are not very aggressive and were limited to a few programs. Through a series of focus-group discussions (FGD) on public transportation, the Indonesian Minister for Transportation, Budi Karya Sumadi, announced a plan to launch phased restrictions on motorcycle use in Jakarta. The key was to expand road coverage where motorcycle is not allowed to encourage public transit ridership (Currently, motorcycles are not allowed on the section between Jalan MH Thamrin and Jalan Medan Merdeka Barat). However, no specific schedule has been announced as of yet for this program To sum up, in spite of great magnitude of problems caused by motorcycles, there have been no effective demand management strategies to curb the use of motorcycles.



[Figure 51] Motorcycle-prohibited Section between Jalan MH Thamrin and Medan Merdeka Barat

Rail Development Underway

In Jakarta, there have been a few attempts to build a subway network since the 1980s but these have failed. Various plans have been drafted to improve public transit infrastructure, but have not been completed due to various reasons including automobile lobby, infrastructure cost allocation and a nexus between political and business circles. Recently in 2008, the Metro Rail Transit (MRT) Jakarta was established to develop urban rail system for the Jakarta region (이훈기, 2003). MRT was first proposed by the government in the 1980s. It then was suspended due to the Asian financial crisis in 1997. After local governments gained regional autonomy in 1999, Jakarta resumed the MRT in 2002.

In 2006, STEP (Special Term for Economic Partnership) was introduced in collaboration with the Japan International Cooperation Agency (JICA). Its objectives were (i) Resolve severe traffic congestion (ii) Promote Jakarta's economic growth by developing an efficient transportation system (iii) Reduce negative environmental effects from public transit and improve the urban environment and (iv) Build the first

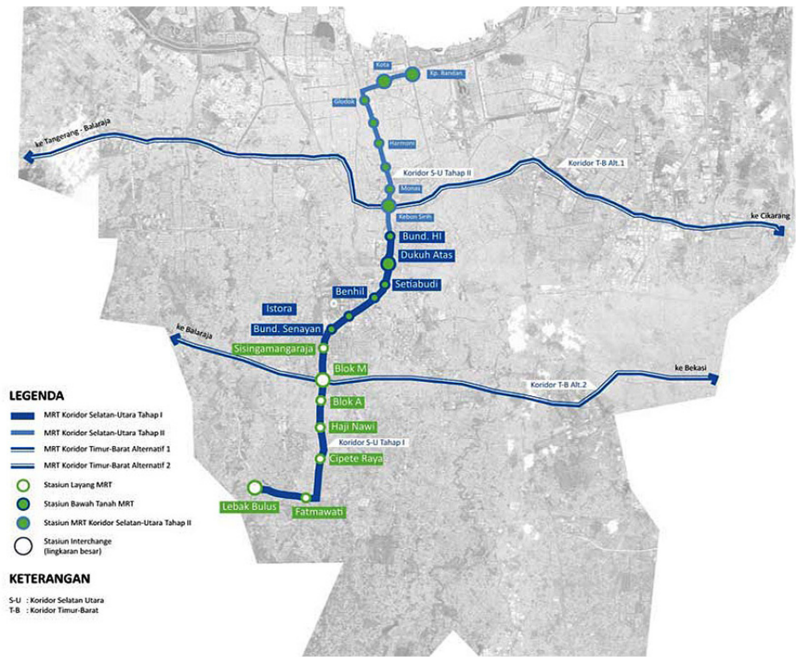
cutting-edge rail system at the national level that symbolizes Indonesia's economic growth. STEP estimated the following benefits from the MRT rail system: (i) 300,000 or more users daily; (ii) 30 minute reduction of travel time (on the Lebak Bulus-Bundaran HI route); (iii) 48,000 new jobs (during the five project years); (iv) Reduced CO_2 (approximately 30,000 tons estimated by 2020); and (v) Reduction in accidents, promotion of social/economic development, etc.

The MRT project is being funded by JICA. The Japanese and investors plan to invest total of JPY 600 billion in Jakarta's MRT (currently under construction) which includes underground and ground rail networks. For some sections (Lebak Bulus-Dukuh Atlas), the construction cost is approximately JPY 144 billion (total construction cost for the Phase 1 north-south section is not confirmed). JICA is to provide financial aid of JPY 120 billion. The rest (JPY 24 billion) will be covered by the Indonesia government (42%) and the local government (58%).

[Table 8] MRT Jakarta Outline

Category	North-South Line (Total Length: 23.3km)		East-West Line (Total Length: 87km)
	Phase 1 Construction Section Lebak Bulus-Bundaran HI	Phase 2 Construction Section Bundaran HI-Kampong Bandan	
Total Length	15.2km : 9.2km (above ground), 6km (underground)	8.1km	Feasibility review underway
Number. Of Stations	13 : 7km (elevated), 6km (underground)	+ 7km (elevated), 6km (underground)	
Distance between Stations	0.5km~2.0km	0.8km~2.4km	
Travel Time between Stations	5minutes	5minutes	
Estimated Capacity	412,700persons/day (2020)	629,900persons/day (2020)	
To Be Opened in	2016	2018	2024~2027

Source: MRT Jakarta, 2013



Source: https://littlefootprintsinthecity.wordpress.com/2015/04/15/mass-rapid-transit-mrt-jakarta/

[Figure 52] MRT Map (Planned)

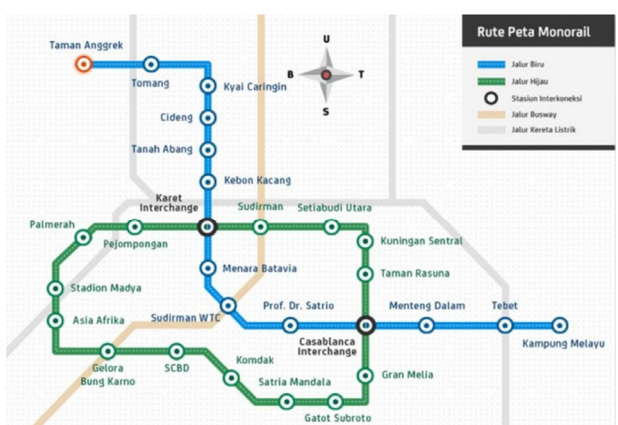
Once complete, the MRT system will carry 173,000 users daily, according to the Indonesia government. Construction is progressing along Jalan Sudirman, the most important road that connects Jakarta's north and south. This section experiences the worst traffic congestion in Jakarta.

In 2013, Joko Widodo, former governor of Jakarta, declared that the monorail project that had been suspended in 2007 would be resumed. The monorail project had been initiated in 2004 but was suspended due to financial difficulties that coincided with a financial crisis. In Senayan and Kuningan in central Jakarta, there are lines of unfinished concrete pillars standing exposed in the middle of the road, the result of the monorail project suspended five years earlier.

Source: https://commons.wikimedia.org/wiki/File:JakartaMonorail1.JPG

[Figure 53] Jakarta Monorail

Construction of the monorail is led by state-owned PT Jakarta Monorail to connect Jakarta's city center with the surrounding satellite cities (54km). Jakarta's monorail project proposes two lines (a total length of 29km): circular and regular. The monorail is expected to transport 300,000 people in a day.



Source: http://news.metrotvnews.com/read/2015/01/14/344832/ahok-segera-kirim-surat-untuk-pt-jakarta-monorail

[Figure 54] Map of Rute Peta Monorail

However, many Indonesians are skeptical about all the rail projects. They are worried that the projects will worsen the traffic congestion. In addition, if the work were to be suspended as has occurred before, the construction will be delayed again. Some citizens think that if the inappropriate ties between politicians and business are not severed, the projects will turn out to be greatest pandemonium in history and Jakarta's notorious traffic congestion will remain unresolved (박경서, 2013).

A plan for an inter-regional rail system has been proposed as well, connecting Jakarta and Bandung. It is the first high-speed rail system in Indonesia. According to a local media, construction is expected to start soon and is awaiting finalization of the design change. This project is funded by China. Kereta Cepat Indonesia-China (KCIC), a consortium for the high-speed railway project, has widened the distance between track centers from 4.6 meters to 5 meters. This is expected to allow maximum speed to increase from 250km/h to 350km/h. The Jakarta-Bandung high-speed railroad will be 142 kilometers long and cost USD 5.1 billion to build, 75% of which is to be financed by the China Development Bank (CDB) and the rest (25%) by the KCIC.

Ground was broken for the project last January in 2015. In March, construction of the first 5-kilometer segment in Walini was approved, but the rest (137.3km) has not yet been approved (there are four train stations: Halim, Karawang, Walini, and Tegalluar). The government has licensed the KCIC for 50 years of operation from May 31, 2019. This is the scheduled completion date of the high-speed rail, but the construction has had some delays due to financial obstacles and design. Land expropriation stands at approximately 60%, mostly in West Bandung.

Expanding Investment on Transport Infrastructure in the Future

Together with the University of Indonesia, the Jakarta provincial government developed a 2020 Transport Master Plan in 2004, presenting the top three goals as follows: 1) Develop public transit 2) Put traffic restrictions in place and 3) Improve network performance. However, the effects of Jakarta's government policies have

been ineffective in relieving traffic congestion. All these objectives depend upon whether the Jakarta is able to develop and improve transport infrastructure in the future. This is a challenge for the Indonesian government.

The national government seeks to expand investment on infrastructure. In the next five years, it plans to invest USD 250 billion in new roads, ports, railways and power plants (ULI and Ernst & Young, 2013). The Indonesian government has set its priority on developing infrastructure and improving investment climate. In 2005, the Indonesian government spent IDR 32.9 trillion on infrastructure, accounting for 6.5% of fiscal expenditures. This steadily grew to IDR 180.9 Trillion which was 11.0% of total spending in 2013. After the Jokowi administration came into office, infrastructure spending occupied approximately 15% of the government budget. In February 2016, Indonesia announced its top 30 infrastructure projects worth KRW 74 trillion and promised government support. Private investment in infrastructure had been dull after the Asian financial crisis of 1997 but has been on the increase since 2005. From 2005 to 2012, private investment in infrastructure continued to focus largely on energy, as it used to do in the 1990s and the early 2000s. Private investment in infrastructure surpassed USD 3 billion in 1995, before plunging in 1998 due to the financial crisis. By 2008, this had regained pre-crisis levels. Transport infrastructure investment amounted to USD 3.7 billion.

To invite more foreign investment in infrastructure is the key to sustain its effort. Japan plans to spend invest (Jakarta Globe, 2011) USD 2.4 billion for developing Jakarta's Metropolitan Priority Area infrastructure. In December 2010, the Indonesian and Japanese governments signed a Memorandum of Cooperation (MOC) on technical and financial support for the development of roads, railroads, hydropower plants and ports. Obviously, there is a growth potential in Indonesia infrastructure via Foreign Direct Investment (FDI). Indonesia's infrastructure market is worth USD 55 billion in 2016 and USD 91.7 billion in 2020, enjoying a growth of 6~7% annually. Despite its unfavorable investment climate, the infrastructure market has high potential for growth, thanks to the sheer power of 260 million people as well as continued population growth and urbanization.

[Table 9] Indonesia's Infrastructure Market: Present Status & Future Trends

Category	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Infrastructure Market Size	Billion-dollars	46.8	47.8	49.9	55	62.6	71.3	81.1	91.7
Rate of Real Growth of Infrastructure Market	%	6.6	7.0	5.4	7.3	7.2	7.1	6.8	6.8
Percentage of Infrastructure Market as a share of GDP	%	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5

Note: 2013~2014 figures are estimates. 2015~2016 figures are outlooks.
Source: BMI, 2015, "Indonesia Infrastructure Report Q4 2015", pp.11~13

Investment on transport infrastructure is expected to grow in value from USD 30.5 billion in 2015 to USD 56.5 billion in 2020. Roads and bridges that account for half of transport infrastructure are expected to be worth USD 30.1 billion in 2020, while railways are expected to be valued at USD 9.4 billion, airports at USD 7.3 billion, and maritime sector at USD 8.9 billion.

[Table 10] Indonesia's Transport Infrastructure: Market Outlook

Category	Unit	2013	2014	2015	2016	2017	2018	2019	2020
Transport Infrastructure Market Size	Billion Dollars	28.4	29.2	30.5	33.6	38.4	43.8	49.8	56.5
Real Growth of Transport Infrastructure	%	7.6	7.6	5.5	7.5	7.4	7.3	7	7
Road/Bridge Infrastructure Size	Billion Dollars	15.1	15.5	16.3	18.	20.6	23.7	27.1	31.0
Railway Infrastructure Size	Billion Dollars	4.8	4.8	5	5.6	6.4	7.3	8.3	9.4
Airport Infrastructure Size	Billion Dollars	4.1	4.1	4.2	4.6	5.2	5.8	6.5	7.3
Port/Harbor/Waterway Infrastructure Size	Billion Dollars	4.4	4.8	4.9	5.5	6.2	7.0	7.9	8.9

Note: 2013~2014 figures are estimates, 2015~2016 figures are outlooks.
Source: BMI, 2015, "Indonesia Infrastructure Report Q4 2015", pp.21~13

In short, while there is a great potential for developing Jakarta transport infrastructure by attracting foreign capital investment, the full potential is not being realized. Foreign investment as a share of Indonesia's GDP is still lower than other emerging economies. In 2010, Indonesia enjoyed an economic growth of 6.1%, but foreign investment between 2010 and 2011 remained at 2% of GDP. In 2012, foreign investment was 2.2%. Indonesia's foreign investment as a share of GDP is much lower than in Malaysia, Thailand, Vietnam and China (오윤아, 2016).

03 Manila, the Philippines

1. Population and Economic Growth of Metro Manila

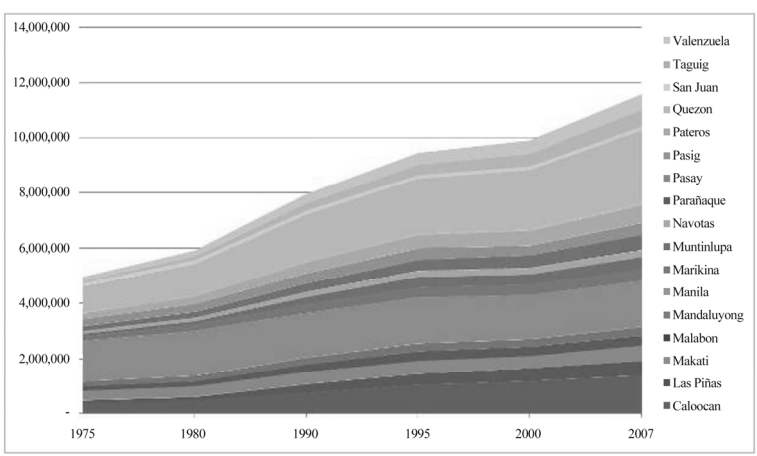
The Philippines is a country comprised of more than 7,000 islands. Located on the island of Luzon, the capital Manila is a highly dense city with about 11 million inhabitants (national population is 100 million).

Metropolitan Manila, or simply Metro Manila, was designated as the National Capital Region of the Philippines in 1975. Metro Manila is the political, economic, social and cultural center of the Philippines. It occupies 638.55km^2 (0.2% of the national territories; similar in size to Seoul) with population of 11,855,975 (2011). It hosts 11% of the total national population. Its population density is 18,567 people per square kilometer. Its Gross Regional Domestic Product (GRDP) per capita is USD 10,223 in 2010. From the 1960s to the 1970s, due to the rapid population growth, the capital area was expanded to cover the surrounding areas. Between 1960 and 1975, Metro Manila's population growth was 3.05% p.a. on average-1.29 times higher than the average annual growth of 2.36% between 1980 and 2010. As another illustration, the population was 7.35 million in 1987. It continued to grow, reaching 7.97 million and 8.38 million in 1990 and 1992 respectively. The net growth amounted to 1.03 million in only five years. Today, Metro Manila is a mega city with a population of 11 Million(민동환, 2013).

Source: (Right) https://www.pinterest.co.kr/

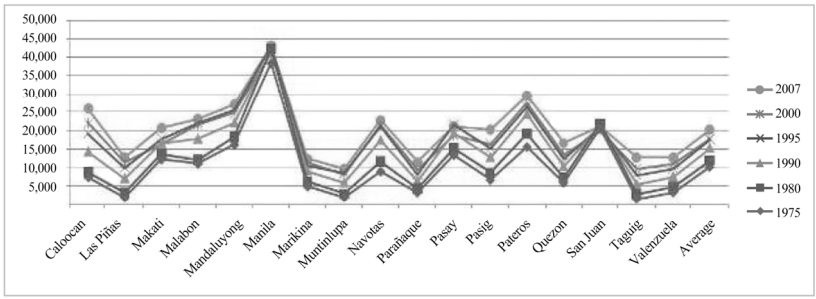
- Area : 613km^2 (Seoul : 605km^2)
- Populations : 12,877,253 (2015)
- Population Density : 21,000/km^2
- GDP per Capita : $ 4,200 (2013)
- Language : English, Wikang Tagalog
- Religion : Catholic(83%), Christian(9%), Islam(5%)

Source: https://www.travelgayasia.com/essential-guide-manila/



Source: 박지형 et al., 2011, A Comparative Study on the Comprehensive Benefits of Transit-Oriented Development(TOD) in Asian Mega Cities: Focusing on the Seoul, Bangkok, and Manila Metropolitan Areas, the Korea Transport Institute.

[Figure 55] Population Growth in Metro Manila (1975~2007)



Source: 박지형 et al., 2011, A Comparative Study on the Comprehensive Benefits of Transit-Oriented Development(TOD) in Asian Mega Cities: Focusing on the Seoul, Bangkok, and Manila Metropolitan Areas, the Korea Transport Institute.

[Figure 56] Population Growth in Metro Manila (1975~2007)

Metro Manila is comprised of 17 local government units. Seventeen municipalities in Metro Manila are the following: Manila, Quezon City, Caloocan, Navotas, Malabon, Valenzuela, Marikina, San Juan, Mandaluyong, Pasig, Pateros, Makati, Pasay, Taguig, Parañaque, Las Piñas and Muntinlupa. In the early days, there were only 4 city governments: Manila, Quezon City, Pasay, and Caloocan-and other units, such as Navotas, Malabon, San Juan, Mandaluyong, Makati and Parañaque.

Seventeen municipalities in Metro Manila have unique characteristics as follows:

- Manila: The center of Metro Manila, the heart of the nation in politics, culture, society, economy, education and all other sectors
- Quezon City: The wealthiest region in the Philippines; offers the best educational climate in Metro Manila, with the University of the Philippines Diliman and Ateneo de Manila University located in the city
- Caloocan: A major bedroom community for Metro Manila
- Navotas, Malabon: The fishing center of the Philippines; 70% of its population is in the fishing industry
- Valenzuela: Used to be the center of farming; due to recent development has experienced an increase in commercial and industrial zones

- Marikina: The center of the nation's shoe industry
- San Juan: The city that played a central role in the independence of the Philippines
- Mandaluyong: One of the main shopping districts of Metro Manila; often referred to as the shopping mall capital of the Philippines
- Pasig: Recently emerging as the commercial center due to the saturation of Makati and Parañaque
- Pateros: The center of the poultry industry (e.g., duck)
- Makati: The Manhattan of the Philippines, and the heart of commerce and business
- Pasay: Part of Metro Manila; home to Manila Ninoy Aquino International Airport and Philippine Airlines headquarters
- Taguig: Located on the western coast of Laguna de Bay; equipped with commercial, industrial, and recreational facilities
- Parañaque: The nation's center of trade and general commerce
- Las Piñas: The cleanest city in Metro Manila; selected for the Global 500 Roll of Honour for Environmental Achievement by the United Nations Environment Programme (UNEP)
- Muntinlupa: Referred to as the Emerald of the Philippines for its beautiful natural environment; a wealthy neighborhood much desired by Filipinos

[Table 11] Municipalities of Metro Manila

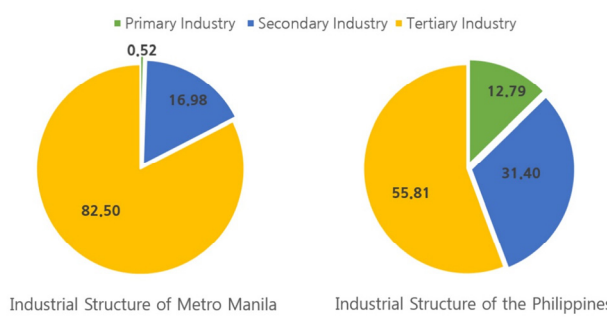
Category	Population (2010)	Area (km^2)	Population Density (km^2)	GDP per Capita ($)
Caloocan	1,489,040	53.33	24,907	9,426
Las Piñas	552,573	41.54	12,815	8,678
Makati	529,039	27.36	20,736	29,259
Mandaluyong	353,337	11.26	27,138	20,258
Malabon	353,337	15.76	23,076	4,334
Manila	1,652,171	38.55	43,079	13,731
Marikina	424,150	21.5	12,500	10,346
Muntinlupa	459,941	46.70	9,699	13,789
Navotas	249,131	10.77	22,780	5,296
Parañaque	588,126	47.69	11,589	10,146
Pasay	392,869	19.00	12,214	6,876
Pasig	669,773	31.00	20,240	12,032
Pateros	64,147	2.1	29,495	3,324
Quezon City	2,761,720	161.12	16,630	11,213
San Juan	121,430	5.94	21,101	16,893
Taguig	644,473	47.88	12,810	12,342
Valenzuela	575,356	44.58	12,762	7,531

Source: Phillippine Statistics Authority (http://psa.gov.ph/)

Each of these municipalities drafts their own policies and programs. Appointed by the president, the Metro Manila Development Authority (MMDA, 1995~current) coordinates between 17 municipalities in Metro Manila. Adhering to the philippine law, the MMDA plans, monitors and coordinates policies and regulates the city. However, the MMDA has no legal authority on 17 municipalities. Its roles are largely confined to planning and maintenance, such as managing transportation systems and solid waste or controlling floods. Detailed urban planning and development policies are made by individual cities and municipalities. The origin of MMDA is Metro Manila Commission (MMC). The MMC was in operation between 1975 and 1990. The Commission was in charge of managing cities and the municipalities of Metro Manila. It had legislative power with regard to city administration. The Metro Manila Authority was in place between 1990 and 1994. It is now called as the MMDA. Since this period, the city administrative powers

(including legislative) were delegated to individual cities and municipalities. The Metro Manila Authority was only engaged in policy coordination for cities and municipalities with regard to their policies.

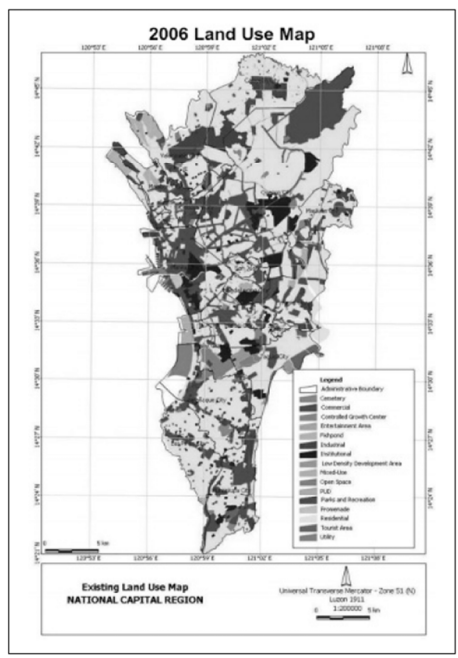
The Metro Manila leads growth in the Philippines. As the center of national economy, the capital region enjoys an economic growth that is faster than that of any other region. As of 2011, the region's GRDP per capita was double that of the national per capita income (Metro Manila: USD 10,223/ National: USD 4,300). Service industries account for the highest percentage, above all other industries: 1.7 times more than the national figure. The area of Metro Manila is 0.2% of the national area, but the GRDP is USD 149 billion: 33% of national GDP (International Monetary Fund, 2013).



[Figure 57] Industrial Composition of Metro Manila

One of the main features identified in Metro Manila alongside its population and economic growth is the suburbanization. Large shopping centers and low-income family residences have emerged along the high-traffic roads. Such suburbanization is chiefly caused by the development of high-density residential areas in urban centers and its subsequent degradation. The suburbanization led to a 120% increase in travel time by car between 1980 and 1996. As on 2006, 45% of the city was residential while 12% was commercial (8% in 1996), 8% industrial (7% in 1996) and 7% were institutional facilities (4% in 1996). One of the most noticeable

aspects was that public space (e.g., parks, green space) was reduced from 44% in 1996 to 28% in 2006. [Figure 58] shows the land use in Metro Manila in 2006. Of the country's top 100 companies, ninety are located in Metro Manila. Moreover, they account for 60% of the national non-agricultural workforce. Around 90% of the country's tax revenue comes from this region (박지형 et al., 2011).



Source: 박지형 et al., 2011, A Comparative Study on the Comprehensive Benefits of Transit-Oriented Development(TOD) in Asian Mega Cities: Focusing on the Seoul, Bangkok, and Manila Metropolitan Areas, the Korea Transport Institute.

[Figure 58] Land Use Map of Metro Manila (2006)

While Metro Manila continues to be the economic, social and political capital of the Philippines, rapid growth has led to serious social issues related to housing, safety, hygiene, unemployment, education, crime, pollution and the ever-widening gap between rich and poor. The Philippine national government has adopted a wide

range of policies such as encouraging the relocation of plants and prohibiting influx to the city. However, these policies have not been sufficient in resolving the aforementioned social issues.

2. Transport Infrastructure Falling behind Rapid Urban Growth

Two urban growth patterns characterize the changes in Metro Manila. First, due to sub-urbanization, there was an increase in the number of person-trips and trip distances and this led to severe traffic congestion. Second, informal settlements have flourished to house poor residents of Manila. Furthermore, commercial facilities established along the major thoroughfare of Metro Manila exacerbated traffic congestion. Fueled from this trend, motorization accelerated after 1990s without any restrictions on private vehicle ownership. Currently there are 2.3 million vehicles in Metro Manila with motorization rate growing at 6% per year (Andra Charis Mijares et al., 2014).

Most of Metro Manila's transportation infrastructure was developed and managed by the government. Today's road network radiating from the city center originated in the road system planned by the Metropolitan Planning Commission in the 1940s. However, in the following decades, the government began to lose control over the development of transportation system and services. While the plan was used to effectively improve Metro Manila's transportation, the area continued to face transportation-related issues such as chronic traffic congestion, air pollution and traffic accidents (박지형 et al,. 2011). Between 1980 and 1995, Metro Manila's population grew by more than 60% and car ownership grew by 130%. However, road extension has only gone up by 18% (World Bank, 2000).

Overall, the Philippine government invests only about 2% of its GDP in infrastructure, significantly lower than its neighboring nations: Indonesia (7%), Malaysia (6%), Thailand and Singapore (4%). According to Siemens' Asian Green City Index (2011), Metro Manila's overall infrastructure was below average (Grade

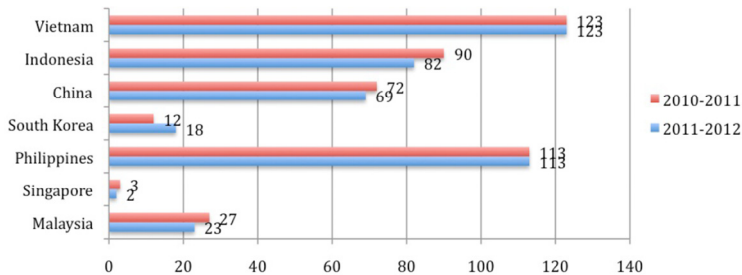
4 out of the five performance bands) when compared to other major Asian cities. In terms of the categories that directly affect the city environment-land use and building, transport, waste, water and sanitation-Manila's placement was far below the average.

[Table 12] Overall Result, Siemens' Asian Green City Index

Well below average (Grade 5)	Below average (Grade 4)	Average (Grade 3)	Above average (Grade 2)	Well above average (Grade 1)
Karachi	Bangalore Hanoi Kolkata Manila Mumbai	Bangkok Beijing Delhi Guangzhou Jakarta Kuala Lumpur Nanjing Shanghai Wuhan	Hong Kong Osaka Seoul Taipei Tokyo Yokohama	Singapore

Source: Siemens, 2011, Asian Green City Index

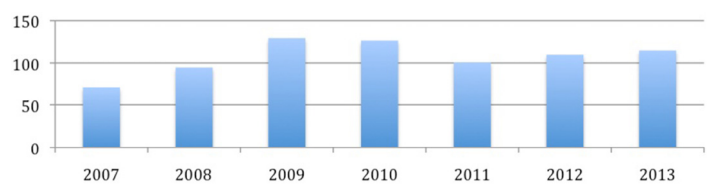
Since 2009, the Philippines has enjoyed an annual economic growth of 5%, but its infrastructure development ranked 113th among 142 countries, including ASEAN nations. Understanding that its infrastructure lags behind its competitors, the Philippine government has prioritized infrastructure development to enhance its global competitiveness. Not only has the government allocated funds, but it has also encouraged private investment in Public-Private Partnership projects.



Source: Cited from WEF, 2011, The Global Competitiveness Report 2010~2012

[Figure 59] Quality of Overall Infrastructure Ranking: Asian Countries (2010~2012)

The commitment to develop infrastructure and increase investment is quite high in the Philippines. In 2009, the Department of Public Works and Highways (DPWH, in charge of roads, bridges and flood-damaged facilities) was assigned PHP 130 billion (USD 3.1 billion), the largest budget assigned to a single department.



Source: DPWH budget from 2007~2013 in billion Php. Data from DBM

[Figure 60] DPWH Budget (2007~2013) of the Philippines

Nonetheless, situation in terms of its transport infrastructure is still dire. Metro Manila in particular has poor public transportation services and inefficient roadway networks while being a witness to an increasing number of passenger cars. Manila was selected as the world's most congested city by Forbes magazine in 2006. Manila is notorious for its frequent congestion and high population density. In Metro Manila, average speed is 10km per hour on most roads. As a result, congestion drives up costs for road users, not to mention the cost and time required to maintain their vehicles. Most main roads in Metro Manila have reached or are

close to their total capacity. The travel speed tends to drop dramatically when the volume exceeds 50% of the total capacity (모창환, 2016).

Manila is increasingly congested due to its poor public transportation services and the insufficient capacity of roads to accommodate the rapidly increasing number of private vehicles. Some of the main roads in Metro Manila have reached their full capacity due to traffic volume. Metro Manila's traffic congestion is thought to have led to an economic loss estimated at 4.6% of GDP. Congestion is not as severe in other urban areas in the Philippines but is expected to worsen due to the combination of rapidly increasing numbers of vehicles and growing urban population (ADB, 2012).

Insufficient Roadway Infrastructure

In a nutshell, the Philippine cities have been unable to cope with explosive population growth. It is manifested in traffic congestion, air pollution and burgeoning informal settlement. This phenomenon is evident in Metro Manila. Metro Manila suffers from infrastructure deficits, traffic congestion, environmental degradation and housing problems. All of these have undermined Manila's economic growth potentials.

Traffic congestion has been one of the most important issues facing Metro Manila. Weekday traffic along major corridors of Metro Manila is the slowest compared to other Southeastern country cities, ranging from 20 to 38km/h. It is slower than Jakarta (23 to 43km/h), Kuala Lumpur (28 to 52km/h), Singapore (40 to 55km/h) and Bangkok (30 to 53km/h). Slow travel negatively affects road user productivity and increases pollution. Congestion cost for Metro Manila users is estimated at PHP 2.4 billion a day in 2012, and expected to be PHP 6.0 billion in 2030 (World Bank, 2017).

It has been also reported in many analyses that the quality of transport infrastructure is insufficient. The country has low proportion of paved roads and only a very small proportion of roads are in good condition. In terms of the size of

road network, the Philippines is comparable to or better than its neighboring developing countries, but it lags far behind in terms of quality. The principal reason behind this is poor and inadequate maintenance, which, in turn, is mainly due to the lack of financial resources and inadequate institutional capacity in the field of maintenance.

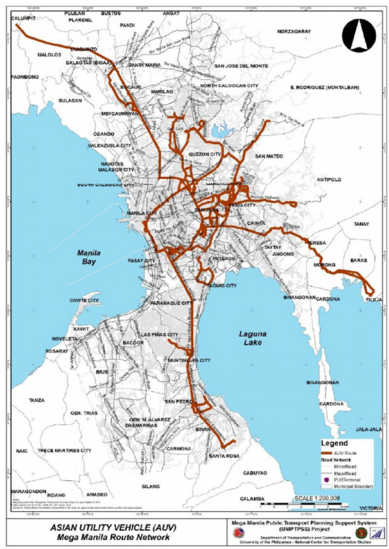
As of 2011, the Philippine road system measured at 215,000km, 15% of which are national roads under control of the DPWH and 85% are regional under the jurisdiction of local governments. Only 79% of national roads and 18% of regional roads are paved with asphalt or concrete (ADB, 2012, p.1). Of national roads that extend 31,400km, 45% (1,200km) were rated as good or fairly good as on November 2011-lower than that of 1982 (52%) and of 2001 (47%). As for regional roads, approximately 20% (35,300km out of 176,300km)-much lower-were rated as 'good' or 'fairly good' in 2009. The country makes an annual investment of 9.6% of GDP in its road systems-far lower than that of other Southeast Asian nations. This has significantly limited the efforts to upgrade or expand the network (ADB, 2012).

Source: https://www.kalibrr.com/advice/2015/11/6-reasons-to-stop-looking-for-jobs-in-metro-manila/

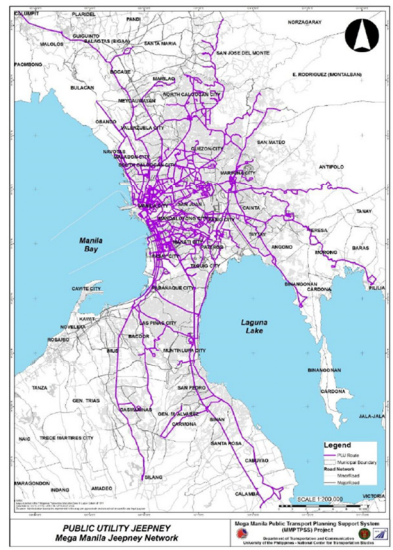
[Figure 61] A Congested Road in Manila

Inefficient Public Transit Service leading to the rise of Jeepneys

Manila's public transportation relies on various means: three urban rail routes including the elevated metro LRT-1 and the MRT-3, inner city and intercity buses, taxis, jeepneys, a modified version of jeeps left behind by the American troops after the Second World War, tricycles and modified motorcycles. Buses include Public Utility Bus (PUB), Public Utility Jeepneys (PUJ), and Asian Utility Vehicles (AUV). Thus, public transit in Metro Manila is provided by low level of service transport providers. Approximately 50,000 Jeepneys and 3,000 PUBs currently transport the majority of public transit users. Further, numerous provincial buses operate in Metro Manila by renting vehicles from their owners. Those informal transit providers compete with each other, resulting in a chaotic on-road situation. These transport providers have routes along the main roadways such as Epifanio de los Santos Avenue (EDSA). EDSA is a urban highway, named after historian Epifanio de los Santos and was built in the 1940s. It is always clogged with traffic. Jeepneys stop at random points to pick up or drop off passengers, while other buses have designated stops. AUVs have fixed routes of more than 15 kilometers and have less capacity than jeepneys. Following [Figures 62~65] show the routes of different types of bus service.

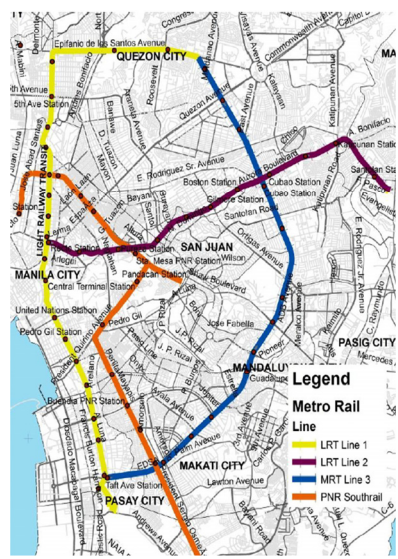


[Figure 62] AUV Route Network, Metro Manila



[Figure 63] Jeepney Route Network, Metro Manila

[Figure 64] Bus Transport Network, Metro Manila



[Figure 65] Rail Transit System Network, Metro Manila

Source: http://slideplayer.com/slide/7320602/

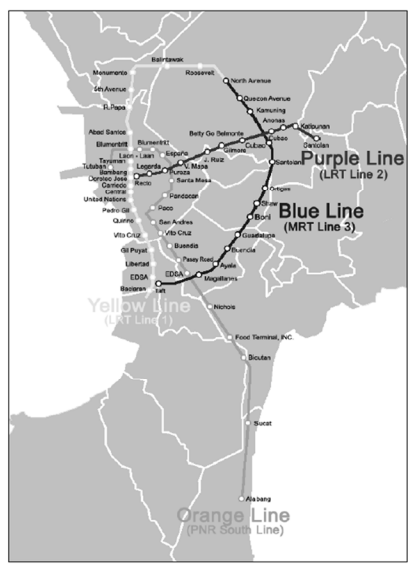
One of the problems related to public transportation service is that the presence of several agencies whose functions are unclear and sometimes conflict with each other. There is MMDA. Then there is the Department of Transportation and Communication (DOTC), the Department of Public Works and highways (DPWH), rail authorities, local government units and the police who all have their own roles. Due to lack of coordination between several transport agencies, most commuters use of variety of transport modes with an average of two to three transfers per journey.

There are urban railway systems in Metro Manila, but metro lines are congested, dilapidated, and often out of service. Users cannot transfer between the three lines. Buses run at an average speed of 10km per hour. The speed is even lower in the major centers of Manila. Anecdotal evidence suggests that it is sometimes faster to walk than to travel by bus. To address the city's transportation problems, the government has implemented rail policies, such as extending the LRT-2 and building the Metro Manila Skyway in three phases (윤장호, 2016).

[Figure 66] shows the current rail and light rail routes operated in Metro Manila: the Yellow Line (LRT Line 1) opened in 1984, the Blue Line (MRT Line 3) opened in 1999, the Purple Line (LRT Line 2) opened in 2007 and the links between the Yellow and the Blue Lines 31). The number of Metro Manila's light rail and metro users is steadily on the rise, but it remains inconvenient. Railway users are required to transfer to another transportation mode in order to reach their final destinations. The total number of LTR 1, LRT 2, and MRT 3 users was 350 million as of 2009. However, rail transit has not provided solutions for the transportation problems in Metro Manila. Finding a resolution to the fundamental congestion remains a challenge (박지형 et al., 2011).

[Table 13] Metro Manila's Metro Networks

Category	Year of Completion	Total Length (㎞)	Station	Daily Average Users	Owned by
LRT1	1985	20.7	20	470,000	Light Rail Transit Authority
LRT2	2003	13.8	11	190,000	Manila Light Rail Transit System
MRT3	1999	16.95	13	350,000	Manila Light Rail Transit System



Source: 박지형 et al., 2011, A Comparative Study on the Comprehensive Benefits of Transit-Oriented Development(TOD) in Asian Mega Cities: Focusing on the Seoul, Bangkok, and Manila Metropolitan Areas, the Korea Transport Institute.

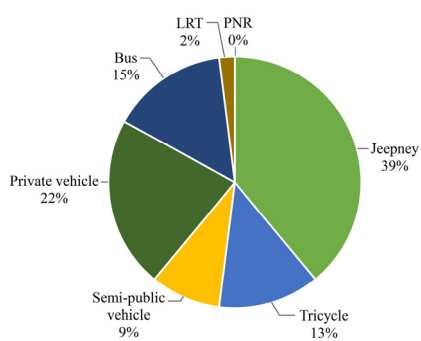
[Figure 66] Rail Connections in Metro Manila

According to World Bank data (2000), para transit has the highest modal share in Metro Manila, of which jeepneys make up the highest portion. Specially, the members of low-income sectors resort to jeepneys. As shown in [Table 14], jeepneys account for 39% of all transportation modes while the LRT and PNR (heavy rail) account for 2%.

[Table 14] Transport Share in Metro Manila

Category		User		Transportation Mode		
		Number (1,000 people)	Percentage (%)	Number of Vehicles (1,000 vehicles)	Percentage (%)	Road Occupancy (%)
Personal	Motorcycles	125	0.7	114	3.2	1.6
	Passenger cars	3,289	18.5	1,316	37.0	37.2
	Trucks	422	2.4	201	5.7	11.4
Semi-public Transportation	Taxis	862	4.9	392	11.0	11.1
	HOV (high-occupancy vehicles) Taxis	226	1.3	48	1.4	1.4
	Private buses	440	2.5	20	0.6	1.1
Public Transportation	Tricycle	2,373	12.4	949	26.7	13.4
	Jeepneys	6,952	39.1	460	12.9	19.5
	Buses	2,653	14.9	57	1.6	3.2
	Light Rail	409	2.3	-	-	-
	Rairoad	6	-	-	-	-
Total		17,758	100.0	3,556	100.0	100.0

Source: World Bank, 2000, Study on Urban Trasport Developement chater 7 Manila



Source: 박지형 et al., 2011, A Comparative Study on the Comprehensive Benefits of Transit-Oriented Development(TOD) in Asian Mega Cities: Focusing on the Seoul, Bangkok, and Manila Metropolitan Areas. the Korea Transport Institute.

[Figure 67] Manila's Transportation Share

Source: http://www.megacities-go-services.com/layout/set/print/Media/Manila/Images-Manila/LOCAL-LIFE/Traveling-and-Transportation/Jeepney-Terminal2

[Figure 68] Jeepney in Manila

Jeepneys account for 76% of public transportation (road occupancy of 57%), while private cars (including taxis and passenger cars) are responsible for 14% (road occupancy of 31%). Road-based transit in Metro Manila is served entirely by the private sector. There are 433 bus companies, which operate 805 routes and most of these companies own ten or more buses. Only seven own 100 or more.

Source: http://www.manilatimes.net/jeepneys-face-uncertain-future/330061/

[Figure 69] An Overcrowded Road with Jeepneys

Jeepneys offer 785 routes in Metro Manila. Many jeepney operators own only one vehicle. Jeepneys provide express services in many areas of Metro Manila. Tricycle and pedicab services are confined to local neighborhood areas and feed passengers to larger public transportation (ADB, 2012, p.4).

3. Planning for Transport Infrastructure

In Metro Manila, due to traffic congestion and unsustainable transport system in general, it has been estimated that $3.13 billion is lost every year in terms of health, fuel consumption and lost investment opportunities (Andra charis Mijares et al., 2014). According to a Siemens report (2011), the competitiveness of Metro Manila's transportation infrastructure is below average. Some of the cities with similar conditions as Metro Manila include Bangkok (Thailand), Bangalore (India) and Hanoi (Vietnam). Seoul is above average. Due to its underdeveloped transportation systems, Manila has suffered an average loss of USD 3.2 billion per year in the last 11 years. The loss is expected to be higher if air and noise pollution caused by traffic congestion are factored in.

A main reason that Manila's transportation quality lags behind is that the government has not made sufficient investment on transportation infrastructure while there was rapid urbanization. The Philippine government has adopted a wide range of policies, but they have not been sufficient to resolve transportation issues. Exclusive bus-only lanes have been introduced, but private vehicles frequently cut in to use the lanes, creating serious safety and congestion problems (Siemens, 2011).

In this context, there have been endeavors to upgrade the transportation infrastructure. Metro Manila seeks to launch various transportation-related research projects to enhance transportation efficiency and stability as well as to develop sustainable transportation modes. Major projects include the following: Metro Manila Urban Transport Integration Project under the auspices of the World Bank and the MMDA's Green Print 2030. These projects are designed to

- Improve existing transportation systems
- Launch and facilitate transportation infrastructure plans
- Encourage the use of environment-friendly transportation (e.g., bicycles) and public transit
- Reinforce the government's competence in terms of implementing transportation policies

The government endeavors to improve transportation system in Metro Manila by making substantial investments in the infrastructure (e.g., light rail, highway extensions). In essence, Metro Manila is focusing on building effective urban railway and BRT system for the future. Currently, Metro Manila plans to build five light train transits (including the LRT and MRT).

[Table 15] Metro Manila MRT/LRT Construction Projects

Project	Construction Period (Estimated)	Financed by	Project Type	Amount (USD 1 million)
MRT/LRT Extension program: LRT 1 South extension project	2011~2015	PPP	Construction/ Rehabilitation	1,555.55
LRT Line 2 East extension project	2011~2013	PPP	Improvement	260.5
MRT/LRT Extension program: Privatization of MRT 3 Operation and Maintenance	2011~2014	PPP	Privatization	150
MRT/LRT Extension program: Privatization of MRT 3 Operation and Maintenance	2011~2014	PPP	Privatization	140
MRT/LRT Extension program: Common ticketing system project	2011~2012	DOTC	Rehabilitation/ Improvement	6.42
LRT 4	-	PPP	-	1,000
LRT 8	-	PPP	-	500

Source: 민동환, 2013, Metro Manila, Emerging Cities Series. World and Cities #1 & 2, Seoul Institute

Launch of the "EDSA BRT Construction and Operation Plan"

As part of the efforts to upgrade urban transportation, the Philippine Department of Transportation and Communications (DOTC) reviewed the introduction of the BRT system in three sections on the main roads of Manila (Quezon Avenue, EDSA [Epifanio de los Santos Avenue] and C5 & Roxas Boulevard) with support from the World Bank and the Asian Development Bank (ADB). It submitted the construction and operation plan for the EDSA BRT routes (with a total budget of USD 800 billion) which was approved by the National Economic and Development Authority. The EDSA BRT is a 48.6km route that connects the EDSA, Ayala Avenue, Ortigas BGC and NAIA (Ninoy Aquino International Airport). It is serviced by 63 BRT stations and 1,151 vehicles. ITS (Intelligent Transport Systems) will be introduced, including the BMIS (Bus Management and Information System) and the Automated Fare Collection System (윤장호, 2016). In addition, bus terminals at the outskirts of Metro Manila have been planned for convenient transfers for passengers. Passengers who transfer between LRT and BRT will be benefitted by the new terminals.

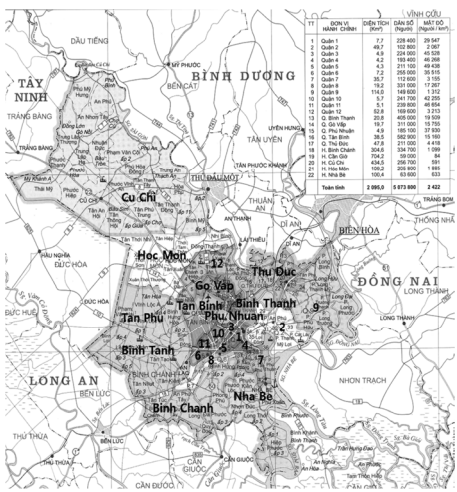
04 Ho Chi Minh City, Vietnam

1. Growing City with Great Potentials

Located in the South of Vietnam, the Ho Chi Minh City (HCMC) is the largest city in terms of population and economic growth. It is a center for dynamic social and cultural activities. With an area of 2,095km² (equivalent to only 0.6% of the entire country) and 7.4 million in population (8.5% of the national population), the city currently contributes 21.1% to national GDP (HCMC Statistics Office, 2011). The city also acts as the hub for the Southern Focal Economic Development Zone, which includes HCMC and 8 provinces and other cities (VAN, Nguyen Thi Cam et al., 2013).

HCMC is approximately 55km west of the South China Sea, adjacent to the Saigon River, a tributary of the Dong Nai River. It was pioneered by the Vietnamese people who traveled south from the Chinese border in the later part of the seventeenth century. During the Nguyen Dynasty, it was part of Gia Dinh Province, but the natives called it Saigon. In 1859, France occupied it and turned it into a typical colonial town. It was elevated to the status of city in 1908, after which it quickly grew into the hub of Cochinchina. Many government offices, churches, theaters and buildings have been built in the French style. The roads, from those times, were beautifully complemented with trees, earning the city its nickname, “Pearl of the Orient”. Buildings and street networks from the colonial period remain to this day, contributing to the city’s exotic ambience. In 1950, the Bao Dai administration came to office under auspices of the French. When Vietnam was divided into North and South in 1954, HCMC served as the capital of South Vietnam.

- Area : 2,096km^2 (Seoul : 605km^2)
- Populations : 8,426,100 (2016)
- Population Density : 3,666/km^2
- GDP : $ 127.8 billion(2010)
- GDP per Capita : $ 15,977 (2015)
- Language : Vietnamese
- Religion : Mahayana Buddhism (12%), Catholic(7%)



Source: (above) http://www.vietnam-guide.com/ho-chi-minh-city/city-centre.htm (below) TS. Le Phuoc Dung, 2005, Viet Nam Administrative Atlas, Ban Do Cartographic Publishing House.

Led by Ho Chi Minh, who declared independence of the Democratic Republic of Vietnam (DRV) in Hanoi, the North Vietnamese troops defeated the French in 1954, driving France out of Indochina. In 1975, North Vietnam absorbed South Vietnam. In the following year, the Socialist Republic of Vietnam (SRVN) was formed. Saigon was integrated with its neighboring satellite cities Cho Lon and Gia Dinh, which were collectively called Ho Chi Minh City.

As a city of significant political status, second only to Hanoi, the HCMC has played a vital role in building Vietnam's socialist system. Its achievements as the

economic hub are particularly notable with regard to the nation's industrialization and modernization. With the surrounding areas (e.g., Dong Nai, Vung Tau, Binh Duong for industry, the Mekong Delta as the breadbasket and the southwest and central regions with forest resources) abundant in resources as its hinterland, the HCMC has been transformed into the country's economic hub. Although Vietnam's economic growth slowed down after the unification, the Doi Moi reforms of 1986 let the nation adopt a market economy system and it enjoyed rapid economic growth since. The growth was particularly accelerated in HCMC. Intensive foreign direct investment (FDI) took place and a significant portion of it was directed to services and tourism.

After the Doi Moi policy, the national economy changed from being centrally planned to market-based. As a result, the economic development was dramatic and the nation began to integrate into the world economy. Given its favorable location, HCMC was the target of massive investment from domestic and international organizations, and attracted many migrants from other provinces and rural areas. Very soon, the city became crowded and there was increased demand for infrastructure, including transportation, housing, markets and hospitals. Due to limitations of land, conflict between land allocation for industrial, commercial, residential, and transport functions occurred and resulted in various urban problems. In addition, the lack of integration between transportation and land-use caused accessibility issues (Pham et al., 2011). Due to the inadequate road infrastructure and poor urban planning, motorcycles have become the most effective mode of transport. Most people use motorcycles because of their convenience and low cost. They provide accessibility to everywhere in the city, even where roads are at their narrowest. As explained earlier, the nickname "motorcycle capital of the world" is being used to describe the specific situation of high ownership and intensive use of motorcycles (Khuat, 2006).

HCMC is currently divided into three area types: a city center, newly developed areas and rural areas. The city center includes 13 urban districts - 1, 3, 4, 5, 6, 8, 10, 11, Go Vap, Tan Binh, Tan Phu, Binh Thanh, and Phu Nhuan. Being the center of

the whole city, there are many high-rise buildings, shopping malls, big schools and major hospitals concentrated in this area. Newly developed areas (Area 2) include 6 newly developed districts - 2, 7, 9, 12, Binh Tan, and Thu Duc. These districts were mostly established from rural districts in 1997. The urbanization rate is quite higher than other areas. Located in favorable places near the city center, these districts have received massive investment in recent years for the development of new residential areas. Besides, investments in infrastructure have also been provided to support urban development. Rural areas (Area 3) include 5 rural districts-Hoc Mon, Nha Be, Can Gio, Cu Chi and Binh Chanh. These are remote districts with low population density. Infrastructure in this area is still poor due to limited investment (VAN, Nguyen Thi Cam et al., 2013).

Administrative Background

Under a socialist, single-party system, HCMC is led by the Chairman of the HCMC People's Committee (Vice Secretary of the HCMC Party Committee), considered to be the equivalent of Mayor. However, the HCMC Party Secretary, higher than the Vice Secretary in the Party, has political clout in deciding major agenda items.

3 Under the HCMC People's Committee, there are 18 departments (e.g., Planning & Investment, Transportation, Industry & Trade) and five government institutions (e.g., HCMC Police, HCMC Statistics Bureau). HCMC is comprised of 12 urban districts, "Quan" (e.g., Go Vap, Tan Binh, Than Phu, Binh Thanh, Phu Nhuan, Thu Duc, Binh Tanh) and five rural districts, "Hyuen" (Gu Chi, Hoc Mon, Binh Chanh, Nha Be, and Can Gio).

Demographic Background (General Statistics Office, 2012)

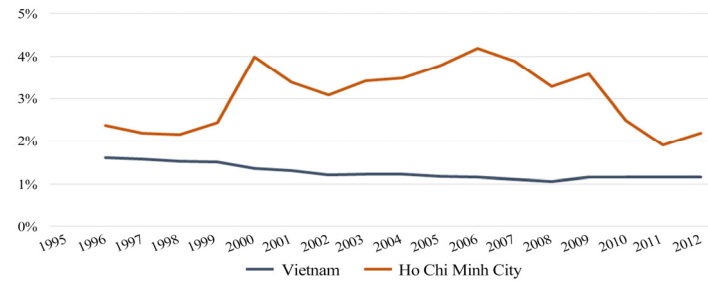
HCMC is Vietnam's most populated city with 7.862 million (2012) population and the density of 3,666 persons per square kilometer is also the highest in Vietnam. HCMC is home to 8.6% of the national population. As on 2011, Vietnam's urban population was 31.65%, with 22.5% of it (27,719,300 people) living in HCMC.

[Table 16] Population of Major Cities in Vietnam

Category	National	Ho Chi Minh City	Hanoi	Haiphong	Can Tho	Da Nang
Area(km^2)	330,951.1	2,095.6	3,323.6	1,523.9	1,409.0	1,285.4
Population (1,000 persons)	88,772.9	7,681.7	6,844.1	1,904.1	1,214.1	973.8
Density (Person/km^2)	268	3,666	2,059	1,250	862	758

Source: General Statistics Office, 2012, Statistical Handbook of Vietnam Year 2012.

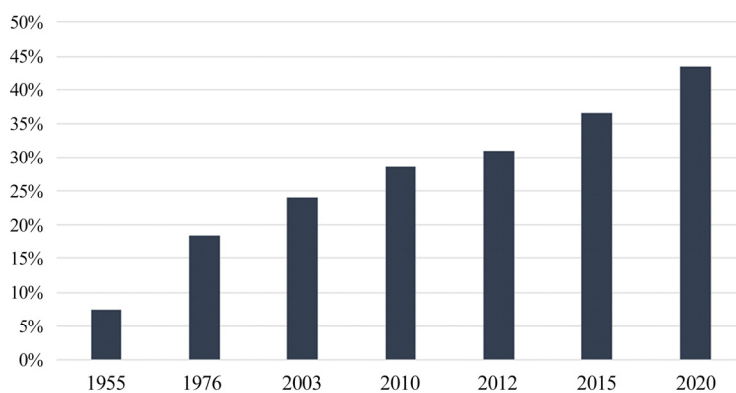
HCMC continues to show strong population growth. Since 1995, HCMC's population growth rate reached its highest at 4%. Recently, the growth is maintained at 2% or higher, indicating a large influx of the nation's population into the city. In the 2000s, growth remained steadily high-3% or higher for a decade-but has, of late, decreased to 2.1% as on 2012. Since the 2000s, Vietnam's total population has enjoyed a steady growth of 1.1%. Thus, HCMC population growth has been twice of the nation's.



Source: General Statistics Office, 2012, Statistical Handbook of Vietnam Year 2012.

[Figure 70] Population Growth: Vietnam & Ho Chi Minh City

Each year, the city sees a drastic influx of people. Its population was 4.6 million in 1995, soaring to 7.4 million by 2010. In the meantime, housing supply remains at 30%, falling far short of demand (Nguyen Thi Hanh, 2013). According to HCMC's demographic statistics report of 2009, those aged 20 to 30 account for 42% of total population. According to the report by the Vietnam Academy of Social Sciences, HCMC's population increases by 200,000 each year, 130,000 of whom are migrants, and the students. Most migrants are laborers seeking job opportunities in the city.



Source: General Statistics Office, 2012, Statistical Handbook of Vietnam Year 2012.

[Figure 71] Speed of Urbanization

As the economic hub of Vietnam, HCMC enjoys dramatic economic growth of 9.2% while national growth is 5.0% in 2012 (CB Richard Ellis Vietnam, CBRE hereinafter, 2013). Thanks to its location, adequate infrastructure and intensive FDI, HCMC has been the engine behind Vietnam's economic growth. A variety of policies has been launched in the interest of creating more jobs: foreign investment in free trade zones, intensive promotion of the IT and electronics industries and removal of unnecessary audits. The number of industries registered in HCMC indicates that services accounted for 72.4% of the city's industrial structure in 2004 (Vietnam Overview, South Korean Ministry of Foreign Affairs and Trade, 2011 & Ho Chi Minh City website http://www.eng.hochiminhcity.gov.vn). HCMC's gross industrial output (USD 2.799 billion) accounts for 20% of the national output of USD 14.049 billion. HCMC is also responsible for 26.2% of national exports (As of 2010, General Statistics Office of Vietnam, www.gso.gov.vn).

[Table 17] Trade: HCMC & Vietnam (2012)

(Unit: USD 100 million)

	Export	Import
Ho Chi Minh City	300	261
Vietnam	1,146	1,143

Source: CBRE, 2012, Ho Chi Minh City Market View Q4 2012.

Since the Doi Moi economic reforms of 1986, Vietnam has opened itself to international markets, attracting foreign direct investment. The yearly growth of registered FDI across the country has recently been on the decrease, but remains equivalent to USD 11 billion. On the other hand, FDI is on the rise in the following infrastructure sectors: construction; gas, electricity, waterworks and sewage and transport and communication.

[Table 18] Amount of FDI in Vietnam by Year & Sector (Registered)

(Unit: USD 1 million)

		2008	2009	2010	2011
Total		64,011.0	23,107.3	19,886.1	15,598.1
Sector	Manufacturing	28,902.4	3,942.8	5,979.3	7,788.8
	Construction	492.1	652.0	1,816.0	1,296.4
	Real Estate	23,702.8	7,808.4	6,827.9	869.9
	Retail/Wholesale	54.8	261	462.1	499.1
	Hotel/F&B	1,350.2	9,156.8	315.5	476.8
	Electric, Gas, Water, and Wastewater	3.7	183.9	2,962.7	2,851.7
	Transport/ICT	1,882.1	299.8	987.5	972.3
	Others	7,622.9	802.5	535.1	843.2
Actual Amount Executed		11,500.0	10,000.0	11,000.0	11,000.0 (Estimated)

Source: General Statistics Office of Vietnam(www.gso.gov.vn)

Major countries investing in Vietnam include Japan, South Korea, Taiwan, Singapore, British Virgin Islands, and Hong Kong (China). A review of their total investment up to 2011 shows that South Korea is ranked second-12% of all foreign investments.

[Table 19] Investments in Vietnam by Country

Country	Investment (USD Million)	Percentage (%)
Japan	24,381.7	12.2
South Korea	23,695.9	11.9
Taiwan	23,638.5	11.9
Singapore	22,960.2	11.5
British Virgin Islands	15,456.0	7.8
Hong Kong (China)	11,311.1	5.7

Source: General Statistics Office of Vietnam(www.gso.gov.vn)

2. Motorcycles and Inadequate Transport Infrastructure for Public Transit

The condition of transport infrastructure in the HCMC is dire. There is only incomplete ring road system without any viable urban highway. Mass transit modes are scarce. With rapid population growth and uncontrolled urban sprawl, developing sufficient transport infrastructure has been the priority of the HCMC and the Vietnam government. There have been efforts to improve the underdeveloped infrastructure with the help of foreign capital. According to the Global Competitiveness Report 2008~2009 published by the World Economic Forum, Vietnam's infrastructure ranked quite low among the 134 countries evaluated.

[Table 20] Vietnam's Infrastructure Competitiveness

Infrastructure	97
Road	102
Railway	66
Port	112
Air Transport	92
Electricity Supply	104

Source: Cited from WEF, 2009, The Global Competitiveness Report 2008~2009; BMI, 2010, Vietnam Infrastructure Report Q4 2010

Due to insufficient domestic capital, Vietnam has relied on the Official Development Assistance (ODA) and foreign investment for developing infrastructure. However, inadequate planning, inadequate compensation for land reclamation and other issues have frequently stunted projects. The Vietnamese government has thus taken actions including compensating for project delays and introducing Public Private Partnerships (PPP) and Build-Operate-Transfer (BOT) to its major infrastructure projects.

However, there still is an obstacle for attracting foreign investment. The Vietnamese government does not allow foreign companies to undertake projects on the land that is already equipped with infrastructure. These are earmarked for

domestic companies. Foreign companies are only allowed to participate in housing development and construction projects that require large-scale infrastructure and of which Vietnamese companies are not capable.

Because of the above reason and others, HCMC is challenged by its inadequate infrastructure, not to mention transport infrastructure. It was only a year ago that drivers could travel in HCMC's CBD without being held up for hours by traffic congestion, albeit they moved at a slow pace. Today, the city still suffers from severe traffic congestion. While the annual growth of building new roadways in HCMC remains at 1%, the number of motorcycles and cars has increased at a rate of 15%. Vietnam's road network measures 222,000km in total-the twentieth longest in the world-but only 19% of it is paved. Compared to other regions in Vietnam, HCMC's transport infrastructure is relatively in good condition. Yet it struggles to accommodate the ever-increasing volumes of traffic, which HCMC's economic growth has brought with it. Traffic volumes are growing as HCMC's population grows at 2% or more per annum. Transport volume reached about 1.06 billion passengers/year of which Hanoi and Ho Chi Minh City accounted for 76% of the total volume (803.4 million passengers). Transport market of public passenger transport by bus remains low: in Hanoi around 8.58%, Ho Chi Minh City about 7%; Hai Phong, Da Nang, Can Tho city about 1% (Challenges and solutions for sustainable urban transport in cities of vietnam_2016). According to the HCMC Department of Transportation, 3.15 million motorcycles and 400,000 cars are registered in HCMC as on 2007. After 8 years, in 2015, the number of vehicles in Ho Chi Minh City is estimated to be 7.4 million (including 562,185 cars and about 6.9 million motorcycles) (Tran Bao Ngoc, 2016).

Source: https://www.vietnambreakingnews.com/2017/04/ho-chi-minh-city-grapples-with-congestion-amid-rapid-urbanization/

[Figure 72] Motorcycles in Ho Chi Minh

Source: https://www.hochiminh.co/travel-blogs/visiting-saigon-by-yourself.html/attachment/vietnam-traffic-jam-2

[Figure 73] An Overcrowded Road with Motorcycles and Cars

Source: http://english.vov.vn/economy/hanoi-brt-line-hit-by-poor-occupancy-four-months-after-launch-349058.vov

[Figure 74] A Chaotic Road in Ho Chi Minh

Source: https://www.citypassguide.com/en/travel/ho-chi-minh-city/daily/news/solutions-proposed-to-saigons-traffic-nightmare

[Figure 75] An Extremely Crowded Road Situation in Ho Chi Minh

The city is traversed by its own registered vehicles as well as some 700,000 motorcycles and 60,000 cars coming from adjacent regions. Some 1,300 motorcycles and 150 cars are registered each day (Harvard Kennedy School, 2008). In essence, the city is flooded with cars and motorcycles. This will create worse traffic woes in the future. However, there is no subway or metro In HCMC (under construction; to start operating in 2018). Bus is the only mode of public transit in HCMC.

Buses have well-developed routes but are not readily accessible by many residents and foreign tourists. Public transit in Vietnam's urban areas only partially meets the urban transport demand: only 7% in HCMC (14.2% in Hanoi and less than 1% in other cities). There are many reasons why people do not want to travel by bus including a lack of connection between bus networks, frequent changes on bus routes due to the impact of construction, ill manners of drivers and the dangerous over speeding by many buses. The government has launched campaigns to encourage the use of buses and discourage the dependence on private vehicles, but people return to their motorcycles or cars after experiencing delayed trips on buses caught in traffic.

In HCMC, the bus system relied on the independent services provided by the Saigon Bus Company (SBC), a public enterprise that manages 900 buses and 28 private bus companies (managing 2,300 buses). It was integrated and managed by the national government, but the system failed due to degrading services. In 1988, the government returned ownership back to the bus companies to resume operation. In 1994, the Saigon Bus Company worked with Australian investors in a joint venture to build new bus routes that radiate outward from the Ben Thanh Market as part of the efforts to improve bus services. Now the provision of bus services in HCMC is scattered among 17 different companies, including SBC, one private company, one joint venture, and 14 private cooperatives. However, despite the existence of many companies, there are only 3,096 buses operating in HCMC. This considerably limits the public transit coverage and frequency. To contrast HCMC with its peer cities of similar size, Bangalore in India, has about 6,000 buses in operation for a population of about 7 million, while Wuhan, China, has more than 7,000 buses in operation for a population of 9 million—i.e, more than double the number of buses than in HCMC.

In addition, the growing congestion also has a negative impact on the quality of service that buses can offer. City officials argue that the difficulties of maneuvering in and out of curbside lanes filled with motorcycles, to pick up and drop off passengers, slow down the buses greatly. There are no statistics available on the

relative speeds of buses and motorcycles in traffic, but the popular impression is that a bus trip takes twice as long as the same trip on a motorcycle. Conversely, 37% of bus commuters are students, some of whom are probably too young to drive or are unable to afford a motorcycle.

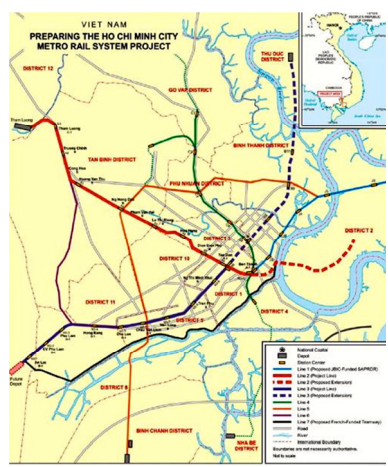
Of 150 bus routes operating today in HCMC, the operators of 113 receive government subsidies in exchange for serving particular areas of the city and guaranteeing a minimum frequency of service. This subsidy program has proven successful in raising bus usage from 36 million passenger trips in 2002 to 360 million in 2010. However, the subsidy bill is growing at a faster rate than the usage, jumping from VND 40 billion (USD 2.5 million) in 2002 to VND 841 billion (USD 40 million) in 2010. The HCMC government sees this as a severe strain on the municipal budget. The increase in subsidy has been due to a combination of factors-growth in the number of buses and riders, inflation in the economy and slow increases in fares. Conversely, bus operators find the subsidies insufficient. Subsidies are calculated based on a standard cost per vehicle per km established by the government, but the operators complain that there is no systematic adjustment of unit costs in the formula. As a result, the subsidy seems arbitrary, with unit costs kept in check in response to the city's budget constraints rather than accurately reflecting the costs of operations.

Following the Ministry of Transportation's 2004 directive to improve public transit services, the Department Of Transportation and Public Works (DOTPW) commissioned studies to prepare a transport master plan and a detailed rail transit plan. Building on this work, in 2008, the HCMC People's Committee adopted a new master plan for 2025 that called for the development of a 161km rail transit system, including six mass rapid transit (MRT) lines, a tram and a monorail. A new agency, the Management Authority for Urban Railways (MAUR), was established primarily to oversee construction of the MRT lines, reporting directly only to the HCMC People's (MAUR is independent from DOTPW). The following is MAUR's rail plan.

[Table 21] HCMC's Metro & Monorail Plans

Line		Section	Station	Cost (USD 100 million)
Metro	1	Ben Thanh ~ Suoi Tien (19.7km/2.6km underground)	14	24
	2	An Suong Bus Station ~ Thu Thiem (19km)	11	Phase 1 :13.7
		-Phase 1 : Ben Thanh ~ Tham Luong (11.3km)	-	-
	3A	- Phase 1 : Ben Thanh ~ Eastern Bus Station (9.7km underground)	11	Phase 1 :15
		- Phase 2 : Eastern Bus Station ~ Tan Kien (6.5km)	-	Phase 2 :2.3
	3B	Cong Hoa Roundabout-Hiep Binh Phuoc (12.1km/ 9.1km underground)	10	12
	4	Ben Cat Bridge-Ngyen Van Linh (24km/15km underground)	20	25
	5	- Phase 1 : Bay Hien-Saigon Bridge (11.7km)	23	Phase 1 :10
		- Phase 2 : Bay Hien-New Can Giuoc Bus Station & Depot Binh Chanh (14.6km/ 7.4km underground)	-	Phase 2 :13
	6	Ba Queo-Phu Lam (6.7km underground)	7	6
Tram	1	Sai Gon-Cho Lon-Eastern Bus Station (12.2km)	23	2.5
Monorail	2	Ngeuyen Van Linh-District 2 (14km)	-	3.5
	3	Go Vap-Quang Trung Software Park-Tan Thoi Hiep (8.5km)	-	2

Source: MAUR, 2008, Ho Chi Minh City Urban Railways Network



Source: ADB, 2006, Socialist Republic of Vietnam: Preparing the Ho Chi Minh City Metro Rail System Project, Technical Assistance Report, p.4.

[Figure 76] HCMC's Metro Rail System Plan

The first MRT line, extending 19.7km between the city center and Suoi Tien Park in District 9 was financed by the Japan Bank for International Cooperation, with construction from 2008. The second MRT line will be 11.3km, running from the city center to Tham Luong in District 12 .The project is financed jointly by the German Bank for Reconstruction, the Asian Development Bank and the European Investment Bank and construction is scheduled to begin soon.

However, skeptics suggest that most of HCMC's transport problems will likely worsen even with the completion of the urban rail projects. According to the 2025 Master Plan, public transit could capture 44% of all trips in 2025 if the six MRT lines are built, yet only 21% of those public transit trips would be conducted in the MRT system. This is to say that, even though the completion of the first two MRT lines (under construction) in the future will surely have a positive impact on certain sectors of the population, it will definitely not rid the city of its rising congestion and road safety issues.

Moreover, by establishing MAUR as an entity independent from the DOTPW, the HCMC government seems to have increased the risk of the MRT system not being effectively integrated with the existing bus services. Certainly, only a seamlessly integrated public transit system, incorporating MRT, BRT and other bus services, as well as high quality facilities for pedestrians and cyclists, will represent a realistic alternative for citizens and encourage them to leave their motorcycles at home and refrain from purchasing a car (World Bank, 2012).

So far, motorcycles are the predominant mode of transport. It is estimated that 92% of all households have at least one motorcycle, and that there is, roughly, one motorcycle for every two inhabitants in the city. Motorcycle ownership grew steadily during the 1990s and took off around 2000, because of the rapid growth in incomes, the reduction of import tariffs on motorcycles and the parallel growth of HCMC's population. Their popularity can be explained as the result of different factors: i) motorcycles offer the same on-demand and door-to-door service as cars at a fraction of the cost ii) motorcycles offer flexibility to park in almost any location iii) HCMC's moderate climate allows for all-year use of motorcycles and iv) other

affordable alternatives, like buses, have been neglected for many years and in spite of recent improvements, still do not offer competitive services. Many Vietnamese have one or more jobs and are responsible for transporting their children. Motorcycles are more convenient for frequent trips for such purposes.

As of 2004, the share of road traffic of privately owned vehicles was very high-93%. Of those vehicles, motorcycles accounted for 78%, passenger vehicles 1.2%, and bicycles 14% (ADB, 2006). The growth of public transport (i.e. buses and taxis) was minimal compared to past figures. Motorcycles still accounted for the largest share-around 70%.

[Table 22] HCMC Traffic Volume: 1996 vs. 2002 (By Transport Mode)

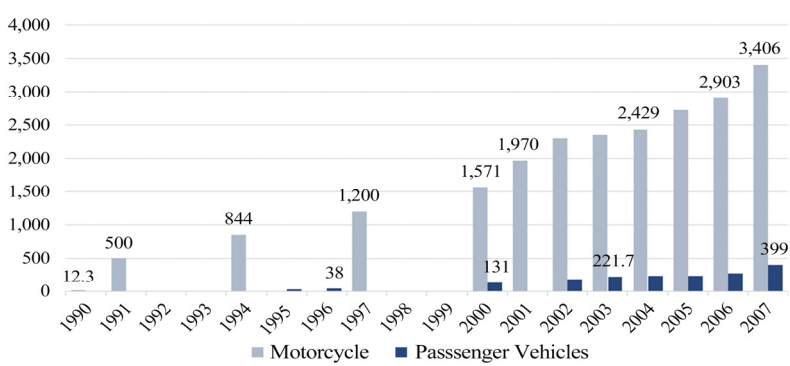
	1996(%)	2002(%)
Bicycle	20.4	17.4
Bus	0.2	1.7
Motorcycle	76.5	74.5
Passenger vehicles	2.2	1.4
Taxi	-	4.1
Motorcycle Taxi	-	0.8
Truck	0.7	-
Weekday Traffic(Million)	8.2	11.9

Source: Harvard Kennedy School, 2008, pp.12, exhibition 5.

There is negative impact of motorcycles on the quality of lives in HCMC. Motorcycles create safety hazards and contribute to degrading air quality in HCMC. Traffic accidents caused by a growing number of motorcycles have become one of the city's major issues. HCMC police have recorded 2,688 traffic accidents in 2015 with 528 people killed and 2,345 others injured (Khanh An, 2015). Each month, a hundred people die in traffic accidents in HCMC, most of which are motorcyclists and pedestrians hit by motorcycles. The number of motorcycles is one of the main sources of air pollution. In HCMC, motorcycles consume about 56% of the total gasoline (excluding diesel) but discharge 94% of the hydrocarbons, 87% of the carbon monoxide, and 57% of the nitrogen oxides and 33% of PM10 (Particulate Matter) released from all the vehicles including gasoline and diesel (Tran Bao Ngoc, 2016).

After taking stock of the risks and environmental issues caused by motorcycles, HCMC is striving to reduce motorcycle traffic and encourage the use of public transit.

While on a lesser scale than motorcycles, a rapidly growing number of people began using cars in the 2000s. The number of privately owned passenger vehicles is still low. Most cars are used for corporate or government/public purpose. In Vietnam, private ownership of passenger vehicles has not been active due to high import duties and registration tax, which roughly tripled the on-road price of car. While only a small fraction of households in HCMC own a car, the growing number of cars is rapidly becoming a problem. However, as economic growth and incomes continue rising, car ownership is becoming easier. The number of registered cars in HCMC escalated from 131,000 in 2001 to 408,688 in 2009, which amounts to an annual growth rate of 13.5%. It is expected that the real explosion of car ownership is yet to come. The Vietnamese government has recently approved the import of second-hand passenger vehicles. As the economy and national income grow, more people are expected to own a private car. The growing number of cars is aggravating congestion at a fast rate and it is certain that a wider scale shift from motorcycles to cars would overwhelm street capacity to the point of total deadlock. Increasing cars in the street traffic also increases the risk to motorcycle users as well as pedestrians crossing streets.



Source: Havard Kennedy School, 2008, p.13, exhibit 6

[Figure 77] Number of Motorcycles & Passenger Vehicles Registered in HCMC (1990~2007)

3. Planning for Transport Infrastructure

With regard to the city's traffic exacerbating markedly, HCMC hosted a meeting in 2007 presided by the Chairman of the HCMC People's Committee. The following are the short-term measures proposed during the meeting (Saigon Times Weekly, Sep. 2007):

- Different commute hours
- Public traffic campaign for orderly use
- Establishment of a special task force to deal with congestion
- Strong enforcement of rules against traffic violations (안유석, Oct. 2007)

Accordingly, the Vietnam government developed "Transport Development Strategy 2020 with a Vision 2030". The strategy seeks to build action plans and provide basic directions for the development of sustainable transport infrastructure under Vietnam's higher-level policies. The Strategy offers guidelines to reducing the use of private transport (such as motorcycles) that have reached a saturation point as well as steps to develop an environmentally-friendly public transit system.

[Table 23] Main Policy Directions for Vietnam's Transport Development Strategy 2020

Category	Main Policy Directions / Description
Objectives	• Develop a sustainable national transport infrastructure • Reinforce transfer/linkage between different modes of transport • Develop safe and environmentally-friendly transport systems • Build a public transit system that helps mitigate urban congestion
Urban Transport Development	• Introduce public bus networks in major cities • Attract investment into building metro/subway systems • Build a railway system in major cities such as Hanoi and HCMC and between cities and suburbs, and restrict/reduce the supply of private vehicles
Description	• Six metro lines and three tram routes (107km in total) planned to encourage the use of public transit and ease traffic congestion • Construction of the Bus Rapid Transit (BRT) system • Construction of four elevated expressways • Construction of ring roads • CMC expects to attract USD 15 billion in transport infrastructure investment by 2020. In 2009, the city developed a transport project worth USD 2 billion.

Source: International Urban Development Cooperation Center, 2016, 신흥국 협력형도시개발사업 조사보고: Vietnam

The Master Plan on Construction of the HCMC 2020

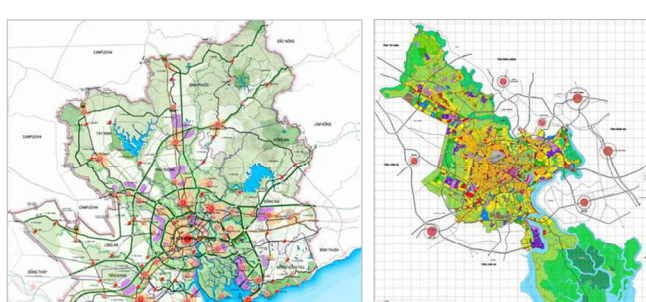
In 2008, regional development plans were established to promote systematic growth of HCMC and the seven nearby provinces of Binh Duong, Binh Phuoc, Tay Ninh, Long

An, Dong Nai, Ba Ria-Vung Tau, and Tien Giang (Target Area of 30,404km^2). In 2010, a revised and reviewed plan was established based on the existing HCMC Master Plan to promote regional development plans even further.

[Table 24] Summary of the Master Plan for the HCMC Region

Category	Vision & Directions for Development
Vision	• Develop HCMC and surrounding regions into a key economic hub for Vietnam and neighboring countries by 2050 • Support and develop HCMC and surrounding regions to be the hub for logistics, finance, services, and globally-competitive hi-tech industries
Development Directions	• Reinforce the network between HCMC and adjacent satellite cities • The HCMC region is divided into the southeastern pole, eastern pole, northern pole, and southwestern pole • Build a close network between the 'cores' of the poles • Assign functions in consideration of geopolitical features of surrounding satellite cities to promote balanced regional development and revamp spatial structure of the greater city region

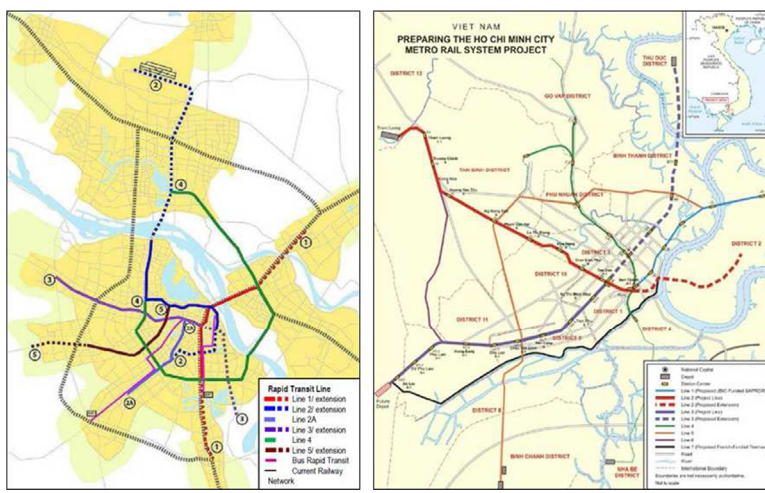
Source: International Urban Development Cooperation Center, 2016, 신흥국 협력형 도시개발사업 조사보고: Vietnam



Source: International Urban Development Cooperation Center, 2016, 신흥국 협력형 도시개발사업 조사보고: Vietnam

[Figure 78] The Master Plan for the HCMC Region and the Master Plan for HCMC with a Vision toward 2025

In line with the Transport Development Strategy under the auspices of the World Bank, 28 public transit construction projects (e.g., MRT, BRT) are currently underway in major cities of Vietnam. Specifically, the strategy focuses on upgrading the country's existing 2,237km meter-gauge network, including the 1726km single-track main line between Hanoi and Ho Chi Minh City, by 2020. In Hanoi and HCMC, six MRT routes have been planned or were newly built. The BRT routes are also being reviewed under the auspices of the World Bank.



Source: International Urban Development Cooperation Center, 2016, 신흥국 협력형 도시개발사업 조사보고: Vietnam

[Figure 79] Metro Rail System Plans (Draft) for Hanoi (Left) & HCMC (Right)

Source: International Urban Development Cooperation Center, 2016, 신흥국 협력형 도시개발사업 조사보고: Vietnam

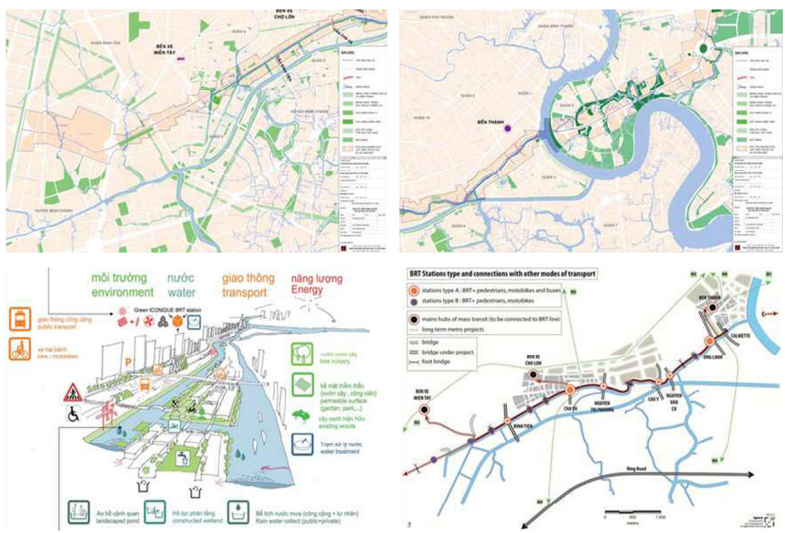
[Figure 80] Plan for BRT Line 1 in HCMC

The Master Plan for Public Transport Development in HCMC 2020 has been drafted under the Transport Development Strategy 2020. It gives the directions for future development of the transport system in HCMC with a strong focus on public transit. In line with the HCMC Master Plan 2020, the 'Model Bus' was introduced and new routes were tried out. As a result, the number of bus passengers rose six times in five years, from 57,000 in 2002 to 380,000 in 2007. With the aid of the World Bank (contributing USD 1.24 million), BRT is currently building a line cutting across the city from east to west in line with HCMC's green transport system strategy. In 2012, a feasibility study was conducted on the BRT project and a review/proposal was made to carry out improvements to the surrounding areas. The project was launched in 2015 with 28 stops on the 23km section.

The target of the plan is to raise the use of public transit for mobility purposes up to around 40~50% of transport modal share by 2025 (from the current value of 5%). Developing a viable public transport network is crucial to achieving this target. However, to ensure the achievability of these targets, all public transit modes need to be integrated and operated efficiently (World Bank. 2015).

The Vietnamese government seeks to use this project to build a TOD model and

to construct an integrated urban transport network. The World Bank proposed that urban redevelopment should be expanded to include the vicinities of the canal along the BRT line. This line would connect to Thu Thiem, one of HCMC's flagship urban development sites. Development along the BRT line and the canal is expected to be vigorous, leading to extensive ripple effects in the future.



[Figure 81] Data from the Workshop on Integration & Development Plans for the HCMC BRT Line & Surrounding Areas

With all the ambitious plans for the transport master plan with public transit development strategy, there are significant difficulties that act as constraints for developing transit infrastructure. First, financing sources are fragmented from different donor countries. Diversified financing sources from different aid schemes shall be advantages for HCMC. The authorities, however, are required to meet the conditions set by each donor. In addition, having various donors has an effect of fragmenting a single project. Second, land acquisition is difficult. Access to land is a major obstacle in every transport project. When a transport infrastructure project is announced, land value naturally increases making it difficult for the public sector

for performing necessary tasks such as clearance of the sites. Cities in Vietnam do not have pre-emptive right to establish a land base for infrastructure projects. Resettlement procedures pose another major challenge. Most of the land users or inhabitants contest the quantum of proposed compensation. Finally, transport infrastructure project involves many agencies within government. For instance, the Bus Management Center (BMC) belongs to the Department of Transportation (DOT). However, the local government also set up administrative units for specific projects such as Management Authority for Urban Railways (MAUR) and Urban Civil Constructions Investment Management Authority of HCMC (UCCI) in the HCMC. They overlap in their functions. This is a typical "silo problem" which is common in government. Despite all the difficulties, the HCMC set the right direction to develop transit infrastructure for the future. The final outcome is yet to be realized (Musil and Simon, 2015).

05 Discussion and Conclusion

As we examined the experience of developing transport infrastructure of Seoul and the status of cities in developing countries, we found that Jakarta, Manila and Ho Chi Minh fall short of necessary roadway infrastructure and sufficient public transit system. Although these cities have plans to develop extensive regional transit network, it has not been fully realized yet. Moreover, it is questionable if those plans can come through because of many issues including funding problems. Here we propose how these cities could learn from Seoul to build sustainable cities.

First, this study conceptualizes urban forms of the cities in our case study and compares them with Seoul. Robert Cervero (1998)'s proposition about urban forms of cities closely relates to the subject of this research. Cervero (1998) mentioned that there are three types of urban forms in terms of the interaction between land use and the transportation system. The first is "Adaptive Cities". In this urban form, urban development activities are clustered at nodes along the fixed transit system, mainly urban railway stations. In most cases, public transit system is set up before urban development expansion. The cities adapt to a pre-determined transport system. Such cities are categorized as "Adaptive Cities". As a result, we see confinement of trips along the radial axes of public transit combined with a large CBD, concentrated mixed-use development around outlying rail stations. This is common in European cities. The Finger Plan in Copenhagen, Denmark shows how urban development can be directed towards rail station areas. Finger-shaped rail system was set up first and subsequently, urban development was strategically directed around transit station areas.

Source: (Left) Cervero, R., 1988, (Right)
https://www.huayuanooc.com/application-of-transitoriented-development-in-chinese-cities/

[Figure 82] Adaptive Cities (Finger Plan in Copenhagen, Denmark)

The second model is "Adaptive Transit". In this urban form, there are challenges of designing mass transit in a sprawled area with trips distributed evenly throughout the landscape. More and more commuters move tangentially. They are often forced into facilities that are not well served by mass transit system. In this case, transit system needs to adapt to a spread-out urban form. BRT is a useful means of transport to serve population that is scattered across the metropolitan area. A case in point is the TransMilenio, the BRT system in Bogota, Colombia. TransMilenio has exclusive bus-only lanes that serve as the backbone of its transportation system. In Munich, a rail transit system called "fast train" was adapted to urban development. Alternatively, as shown in this report, several forms of para-transit in Jakarta, Manila and Ho Chi Minh City had adapted to serve transport needs for their sprawled-out metropolitan areas.

The rise of paratransit in these cities can be explained in two key factors. One is the rapid urbanization without a viable public transport option. Migration to cities overwhelms the capacity of existing public transit. Para transit systems came into being spontaneously. The second factor is the lack of financial revenue to run an effective municipal government system. Even with rapid urbanization and population increase, many cities in developing countries are yet to build the level of revenue that is necessary to run a large-scale transportation system. Similarly,

technical capacity may not be fully ready to ensure efficient governance (Cities Development Initiative, 2011).

Source: (Left) Cervero, R., 1998, (Right) https://www.calliefoundation.nl/s-bahn-karte-munchen.html

[Figure 83] Adaptive Transit (Fast Train in Munich, TransMilenio in Bogota)

The third urban form is “Hybrids” in which two urban forms above are mixed. Seoul is a good example of the Hybrid city. Urban developments were directed according to rail stations. However, to serve the entire urban area of Seoul, urban railway was not sufficient. Seoul developed extensive network of bus system, later upgraded into the network of BRT with median bus-only lanes.

Source: Cervero, R., 1998

[Figure 84] Hybrids (Seoul)

Cervero (1998) indicated that jitneys and minibuses confer substantial economic benefits in cities shaped based on the concept of Adaptive Transit. Without extensive network of guided public transit, small mini-buses or motorcycles can fulfill citizens’ transport needs at a low cost. According to the Cities Development

Initiative(2011), these paratransit, called informal public transportation, adds value in improving the mobility of urban poor as well as providing employment opportunities in informal economy. CDI offers three benefits of the informal public transportation as the following: 1) Flexibility: drivers can accommodate a various demands and needs, 2) Filling the gap: drivers can pick up passengers where formal public transportation such as BRT and subway is lacking, and 3) Serving Niche: drivers can adjust their operation to serve specialized user groups including students, women and the elderly (Cities Development Initiative, 2011).

However, as passenger volumes rise above a certain level, the economic advantages of para-transit, Cervero noted, begin to plummet. It reflects the limitations of smaller vehicles in carrying large passenger loads. As a result, traffic congestion becomes unbearable in major roadways with a lot of small minibus-like paratransit. It is more so since drivers are in fierce competition on the streets to attract passengers. As a result, ground-level road conditions become chaotic. This is what happens when paratransit attempts to substitute mainline public transport. Paratransit operates at its best in a supporting and supplemental role. In a sustainable Adaptive Transit city, the main transport mode should be a Mass Public Transit System such as subway or BRT.

Furthermore paratransit creates various social problems. Quite often, these paratransit vehicles are not regulated by the public sector. In most of the Adaptive Transit cities, paratransit systems are almost entirely privately owned. Although the public sector should regulate paratransit system, overly competitive nature of road transport makes it difficult for effective regulation. In addition, there is a strong political power that hinders development of a new regulation or transit system. Safety regulations are nonexistent or if at all regulations are there, they are not adhered to. Regulations are critical since the vehicles tend to be worn-out and beat-up and ultimately,, it threatens safety of passengers. There is no labor regulation either. Paratransit drivers only earn meager wages with no social insurance. Mostly, the vehicles are rented by drivers from their owners. Then drivers are hired chauffeurs to carry passengers. They have to turn over a certain

proportion of their daily earnings to the vehicles owners. There have been many anecdotal reports that drivers need improved treatment.

There are also disputes over profitable routes. Without the involvement of the public sector, the routes are overlapped and are catered to by many groups of paratransit drivers. Different groups of vehicle drivers form an alliance to control profitable routes. Violent physical conflicts may occur with other groups of drivers to keep their financial interests. Sometimes it has snowballed into bloodshed or sectoral war among the route cartels. Sometimes tribal groups with different religions are involved. In essence, cities based on Adaptive Transit model suffer from "Diseconomies of Scales" when paratransit is heavily used.

To be a sustainable city, it is wise for a large metropolis based on the Adaptive Transit model to entertain a possibility to shift towards the Hybrid model. Most of all, those cities need efficient region-wide public transit to serve the entire metropolitan area. Obviously, subway is the best option. With low economic growth worldwide, building subway system would be too costly. In subway system construction, cost over-run became the norm rather than the exception. Due to its high cost, it is also common that only a few kilometers of subway line is built in limited corridors. When urban rail is ineffective in serving the needs for regional travel, it may not be such a useful transportation means as one might expect. Moreover, underground subway is not easily integrated into existing ground urban area. It needs strategic land use development around the rail nodes. This is especially burdensome when developing subways in built-out urban area (Pojani, D., and Stead, D., 2015).

The BRT can be an alternative. Recently, the BRT system has come into the spotlight as a solution to urban problems such as air pollution and traffic congestion. BRT can be developed at a far lower cost than subways. It is an innovative mass transit system built on technology and has transportation facilities such as an off-board fare collecting system with smart cards and infrastructure, including exclusive bus lanes. Existing traffic signal systems are modified to accommodate a BRT and in many cities, roadways are reconfigured to install

passing lanes. BRT systems require efforts from diverse fields in transportation planning.

In cities in developing countries, if an efficient BRT system can serve as a trunk transit line accompanied with strategic urban development along the way, jeepneys-like paratransit can perform the role of feeder modes with shorter routes. Currently paratransit in the case study cities with insufficient major public transit mode has to traverse lengthy routes to serve the population scattered across the whole region. However, if the paratransit can limit its role to being a feeder to an effective BRT, the routes of paratransit can be shortened and the number of vehicles can be reduced. This would contribute to easing social issues and thereby heading towards sustainable city in a long run.

There are issues to be addressed in this kind of arrangement. First, as the CDI notes, formal transportation network and paratransit systems are at odds with each other because the connections are poorly defined (Cities Development Initiative, 2011). This issue should be addressed when rearranging urban transport system as a whole. For instance, transfer points should be designed so that users can make convenient transfers between BRT or subway and paratransit. Second, there is a financial issue. If the public sector attempts to regulate and limit the role of paratransit as only a feeder transit mode, they will resist it since it means shorter routes with less fare revenues.

Seoul resolved such issues with introducing quasi-public transport system. The quasi-public transport operation system managed by the SMG shares information about the fare revenues from the bus. It is possible in Seoul since almost 100% of fare is collected through the integrated smart card system. Then the SMG subsidizes the bus companies to cover the operating cost. A small rate of profit is also guaranteed, depending upon the performance of the individual bus company. Thus, the key to this system is transparency on fare revenues and close management of the city government. As mentioned, transparency is achieved in Seoul since fare is digitally collected with smart card. The integrated smart card system in Seoul makes transparency in managing fare revenue possible. The case of Seoul shows

that BRT is best served when private sector competition is maintained with public sector supervision.

For cities in developing countries, the first step is to introduce efficient regional BRT system with smart card system. If the BRT is competitive enough, it can generate profits from passengers. Then these profits should be redistributed to feeder modes, which earlier used to operate longer routes with higher fare revenues. Thus, redistributing the revenues from BRT to feeder modes is necessary to make up for the reduced financial benefits so that paratransit will not object to the new arrangement. It will be also be necessary for feeder paratransit vehicles to equip themselves with smart card payment system. More importantly, all-out participatory planning effort will be critical to reach an agreement between the public sector and the group of paratransit vehicle owners and drivers.

BRT should also be accompanied by dense urban development along the transit nodes. Urban development pattern should be strategically directed towards along the BRT lines, as was the case in Seoul. In case of Jakarta, Manila, and Ho Chi Minh City, without sufficient competitive urban rail transit, BRT stations and lines can serve as focal points for dense urban developments. That would be another step forward towards building a sustainable Hybrid city.

Introducing a BRT system into a built-out city involves modifying the existing physical environment. Difficulty in doing so is shown in Seoul. Buses running along an exclusive lane need to weave back into a non-exclusive traffic lane at some point because not all exclusive lanes can traverse the entire network. Of the 282 bus routes, only 32 use exclusive bus lanes for more than 50% of the entire route length. For the same reason, the average speed of the BRT in Seoul is rather slow by international standards. Increasing connectivity by extending the current exclusive bus lanes, therefore, is a crucial and urgent issue to be addressed in Seoul.

We believe the experience of setting up BRT system in Seoul has meaningful implications for cities in developing nations, where a BRT system is seen as a solution to their transportation problems. It is likely that most cities are interested in a BRT, especially if the ones who have studied in this report are already built out

like Seoul. In a city that cannot build an entirely new transport infrastructure, the BRT system needs to fit in with the existing one. In such cases, it is advantageous to understand the possibilities as well as the difficulties and limitations of setting up a BRT in Seoul. Thus, the cities in developing countries will be able to glean valuable inputs from Seoul's experience for setting up and expanding BRT system.

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