A CITY WITH AN ISOLATED BUS RAPID TRANSIT

formulating a design strategy to establish an integrated transit oriented development in Jakarta using the existing bus rapid transit system

THE CASE OF JAKARTA
JAKARTA CASE: HOW TO ADDRESS THE ISSUE OF INTEGRATION BETWEEN THE URBAN FABRIC AND THE BUS RAPID TRANSIT ON THE LOCAL SCALE?
Time constrain has been a major influence in the making of this report. Further improvement can still be made.

This work has benefited of the help from my mentors and the whole City Complex Team. In particular Akkelies van Nes, Frank van der Hoeven, Andrea Peresthu, Meta Berghauser Pont, Roberto Rocco, and Diego Sepulvida.

I would also like to thank my family and my friends for their emotional support.
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1.0 INTRODUCTION
1.1 PROBLEM DEFINITION
1.2 BACKGROUND AND DATA SOURCES
1.3 AIMS / VISION OF THE PROJECT
1.4 RESEARCH QUESTION
1.5 METHOD AND PLAN OF APPROACH
1.1 Problem Definition
Jakarta is the capital of Indonesia, a developed country in the Southeast Asia. With the population of 23 million, Jakarta and the surrounding area is the 4th largest urban area in the world. As the result, Jakarta suffers from inadequate facility such as severe traffic jams caused by too much commuting from areas around Jakarta, and air pollution caused by the traffic.

The newly proposed Jakarta Mass Transit System has created an opportunity to the city’s mobility. The system has just been implemented, not completed yet, but is already working (see figure 1.1). The system will be finished in 2015 completing the whole Jakarta Mass Rapid Transit System. There is an opportunity to reintegrate the unconnected area in the city center. Since 2004, the TransJakarta Bus Rapid Transit (BRT), part of the Jakarta MRT, has been implemented in Jakarta.

However, there is no in-depth research on how the Mass Transit System’s affect the vitality of the city. Currently, the BRT only solves the problem of infrastructure, that is the congestion problem. There is no integration between the BRT network and the urban fabric. There is an opportunity to implement a more sustainable transport mode but there is no guideline to direct the system to this direction. Around the world, large cities started to implement sustainable mobility in their city’s building project. Transit-oriented Development in the United States and cities such as Bogota, Zurich, Singapore are one of the many examples of an integrated transport mode or transit-oriented development. Jakarta is late on the idea of integration between the urban fabric and a transportation network and hasn’t consider the possibility of implementing a TOD on the existing MRT/BRT. With this vision of sustainable mobility kept in mind, and with the author’s concern on the environment and the ever increasing use of private automobiles, the author tries to research on the possibility of integrating the BRT system with the urban fabric to create a more sustainable transport mode by implementing a concept of TOD. Unique in this research is that the author is using space syntax as a method of approach to investigate the level of integration of an area next to a BRT system and the use of research by design to investigate improved urban design in the areas surrounding the stops of the BRT system. For this reason, the author decided to choose this topic for the thesis project.

1.2 Background and Data Sources
The theoretical background for this project is retrieved from information such as Richard Iles’ Public Transport in Developing Countries which has comprehensive lists of characteristic of public transportation in developing countries and provides an insight on some alternative transportation modes; from Newman and Kenworthy’s Sustainability and Cities: Overcoming Automobile Dependence which provides a strategic list of creation of sustainable cities by the implementation of TOD / Urban Villages and BRT / Tram, and examples of cities that overcome the automobile dependence by implementing a strategic design; and the space syntax research which provides an evidence on the relationship between spatial configurations and the liveliness of a road and the distribution of crime / safety condition of the city.

The data collected for the report are gathered from municipal information in the internet, some pictures collected in the internet, as well as personal experience by the author.

1.3 Aims / Vision of the Project
There is a need to create a desirable walking experience to improve the sustainable mobility of Jakarta. To achieve this, there is a need to integrate the BRT network with the urban fabric so that the BRT line will be more effective in solving urban problem (as well as congestion problem).

1.4 Research Question
The research questions for this paper encompasses the idea of sustainable mobility. As urban planner / social researcher, the author asked two questions:

- Descriptive approach: Explanation of the theme. What is TOD?
- Normative / Explanatory approach: How to integrate an urban fabric to a BRT system by implementing TOD? (by using space syntax and research by design as a method of approach)

More about the research question will be described in the Research Question chapter.
1.5 Method and Plan of Approach
The method of approach for addressing the issues consisted of two parts: Research and Design.

Research Phase
The first part, Research phase, is about analyzing the research question. Several authors will be cited as a reference for theories and/or method to create a well-used TOD. The research phase consists of two parts: theoretical approach and technical approach.

Theoretical Approach
The theoretical approach will be of studying theories as described previously. The collected theories will be divided into two sub-approach: urban aspect (relating to the urban fabric e.g. housing type, density, etc.) and infrastructure/mobility aspect (relating to movement e.g. infrastructures, connectivity, accessibility, the street, etc.)

Technical Approach
The technical approach for the research is using space syntax as a approach to investigate the level of integration of an area next to a BRT system and the use of research by design to investigate improved urban design in the areas surrounding the stops of the BRT system. The collected data is essential in determining what kind of intervention should be done.

An explanation about Space Syntax will be explained in the Theoretical Approach chapter.

Design Phase
The second part, Design phase, is the implementation of the analysis to create a strategic design. This strategic design will be implemented on to several case studies. In the end, an evaluation will be made to check the improvement made after the intervention of design.
2.0 CITY PROFILE
2.1 INDONESIA - GEOGRAPHICAL CONTEXT
2.2 INDONESIA - MAIN GLOBAL CONNECTION
2.3 JAKARTA METROPOLITAN AREA
2.4 JAKARTA STREET NETWORK
2.5 JAKARTA HISTORIC DEVELOPMENT
2.6 JAKARTA BUS RAPID TRANSIT
2.7 JAKARTA ADMINISTRATION
2.8 JAKARTA DEMOGRAPHY
2.9 JAKARTA LAND USE
2.1 Indonesia - Geographical Context

Indonesia is the largest country in Southeast Asia. Comprising of 17,508 islands, it is the largest archipelagic state in the world. Its location, just between the waterway trade between India and China, has created an opportunity in trading since the early history of the country. With estimate population of 234,693,997 people on July 2007, Indonesia is the fourth most populous country in the world. Indonesia receives GDP per capita of 2,142.300 (2008), relatively poor compared to most countries in the western world (see Figure 2.3)

The capital of Indonesia is Jakarta, located in the Java Island, the densest island in the world with the density of 979 people/km² (2007), ahead of Honshu Island in Japan (see Figure 2.3). Jakarta is located on the northwest side of the island. Jakarta grows as a trading port under the kingdom of Pajajaran in the 12th century. It became a major trading port during the 14th century in the interior of Java. A Hindu king granted Portuguese traders permission to build a fort at Sunda Kelapa at the early 16th century. Later on, series of recapturing lead to the Dutch capturing the city in 1619, renaming it into Batavia, and forming the Dutch-like settlements with canals.

Fig. 2.1.1 Indonesia is located in Southeast Asia. It is the largest archipelagic state in the world, stretching almost as wide as Europe. Source: http://upload.wikimedia.org/wikipedia/commons/7/70/GDP_nominal_per_capita_world_map_IMF_2007.PNG

Fig. 2.1.2 Jakarta is located on the island of Java (bottom), which is one of the densest island in the world, comparable to the Honshu island of Japan and the metropolitan area of China.

Fig. 2.1.3 GDP (Nominal) Per Capita Map of the World. Indonesia is relatively poor compared to most country in the western world. Source: http://upload.wikimedia.org/wikipedia/commons/7/70/GDP_nominal_per_capita_world_map_IMF_2007.PNG
2.2 Indonesia - Main Global Connection

Indonesia is geographically located in a strategic area. It is located between the Atlantic and the Indian Ocean, which is a busy route for ships between India, Saudi Arabia, Africa and Japan, China; and between the continent of Asia and Australia.

Indonesia is one of the growing economic “tigers” of Southeast Asia, despite its financial crisis that began in mid-1997. Indonesia global connection are connected to vital cities e.g. Hong Kong, Singapore, and cities of Australia. For the past 25 years, its economy has been growing at more than 6 percent per year as it has become an increasingly open trading nation. It has been labeled one of the ten “big emerging markets” of the world by the U.S. Department of Commerce. Most of the economic connection to Indonesia is focused in Jakarta, the capital of the country.

Fig. 2.2.1 Global Connection of Indonesia.
Source: Author.
2.3 Jakarta Metropolitan Area

In the list of largest urban area ranked by 2008 projected population, Jakarta and its metropolitan area is the second largest urbanized area in the world with the population of 21,800,000 people, constituting an area of 2,720 km² with a population growth of 2.38%/year. Jakarta precedes New York City’s urban area (20,090,000 people in an area of 11,264 km², population growth 0.24%/year) and is preceded by Tokyo-Yokohama urban area (34,400,000 people in an area of 7,835 km², population growth 0.15%/year) (Demographia World Urban Areas: Population & Density, August 2008).

Jakarta’s high population is caused by the extension of its urban area into the separate cities of Tangerang, Bekasi, Depok, and Bogor (the whole agglomeration is popularly known as Jabodetabek, an acronym of Jakarta, Bogor, Depok, Tangerang, Bekasi). Jakarta also has a regional connection with other cities in West Java, comprising a Megapol in its relation with Bandung, the capital of the Province of West Java. As the only main economic center in the conurbation, people moves from around Jakarta to the center (Jakarta itself), causing massive traffic during peak hours that causes the population of Jakarta doubles during the day and decreases at night.

Fig. 2.3.1 Jakarta’s Urban Area
Source: http://tbelfield.files.wordpress.com

Fig. 2.3.2 Jakarta Metropolitan Area (right)
Source: Author
Population growth of Jakarta; showing increase in speed during the 1900s, 1950s (immigration of people after the independence of Indonesia in 1945) and 1960s. The picture on the right shows the increase of urban area in Jakarta from 1976 (6 million people), 1989 (9 million people), and 2004 (13 million people).

Fig 2.3.3 Jakarta Urban Sprawl
Source: Author

Fig 2.3.4 Jakarta City Growth from Space (right). Green color marks the urban area, red marks nature
Source: NASA.gov
2.4 Jakarta Street Network
Jakarta consists of an irregular network of roads stretching from north-south and east-west. Tollways form two ringroads along a radius 5 km and 10 km respectively. This network of streets connect the Jakarta city boundary with the adjacent cities on its periphery, spreading the metropolitan boundary of Jakarta.

Road quality varied, from an extremely good quality around a major development area such as the Central Business District, to a relatively bad quality such as in the most neighborhood, where the roads usually lack basic amenities needed for pedestrian such as pathways.

Fig. 2.4.1 A pathway in Thamrin Road, Central Jakarta. A typical wide pedestrian in Jakarta with no activities. source: Google Earth

Fig. 2.4.2 A pedestrian in Kota, the historic center is used by illegal shack. source: Google Earth

Fig. 2.4.3 A street network in Jakarta source: Author

2.0 CITY ANALYSIS
Global Angular Integration map
This map is produced using a depth map program to analyze the global connectivity of Jakarta. This map shows the area of Jakarta inside the first ring road. The global angular integration map shows the concentration of area that is connected to a larger regional scale, through highways or toll-ways. These areas are generally good area for global/regional based economy, such as malls, and is largely car-based.

Fig. 2.4.4 Jalan Kramat Raya, a sample of a street with a high global integration.
Source: Google Earth

Fig. 2.4.5 Global Integration Map
Source: Author
**Local Angular Integration map**

This map is produced using a depth map program to analyze the local connectivity of Jakarta. This map shows the area of Jakarta inside the first ring road. The local angular integration map highlight the streets that is vital with micro economical development e.g. local shopping streets or old historic center. These streets are generally a good candidate for a pedestrian-oriented businesses.

Figure 2.4.6 A Chinatown in the Glodok area shows a high local connectivity despite its far proximity with major artery road.

source: Google Earth

Figure 2.4.7 Local Angular Integration Map

source: Author
2.5 Jakarta Historic Development

The Precolonial Period (1624-1730)

During the pre-colonial period, Sunda Kelapa (the early name of Jakarta) was already the main port of the Kingdom of Sunda, a Hindu kingdom. In 1552, relationship has been develop between the Kingdom of Sunda with Portugal. Later in 1557, the Kingdom of Sunda was attacked by the Muslim sultanate of Fatahillah. On June 22, 1557 Fatahillah won and changed the name of “Sunda Kelapa” into “Jayakarta.” Dutch ships arrived in 1596 and the relationship between Jayakarta and Dutch kingdom started. In 1615, because of the deteriorating relationship, prince Jayawikarta attacked the Dutch with the help of 15 English ships. The attack was won by the Dutch, therefore worsening the already bad relationship between Prince Jayawikarta with the Banten government. In the end, the Dutch established relationship with Banten government and is allowed to establish Batavia in place of Jayakarta.

During the early colonial period / mercantilism. The Dutch started to expand Batavia in a Dutch-city characteristic, a fortified city with with criss-crossing canals.

1624-1730
early colonial
The Modern Colonial Period (1730-1945)

The modern colonial period/dual colonial economic is characterized with major colonial urban development. The city started to expand to the south. In 1811, the city center moved to southern Weltevreden. In 1873, the First Railway (Nederlandse Indische Spoorwegen Maatschappij) is created and in 1877, the first modern harbor.
The Transitional Period (1945-1970)
The transitional period is characterized with the Japanese occupation of the country. Batavia was renamed Jakarta. As a temporary capital was created in Yogyakarta, urban development in Jakarta stagnated. During this period, Indonesia also received its independence in 1945.

The independent era is characterized with major scale urban development. In 1958, the first Jakarta Master Plan (1965-1985) was implemented. In 1959, Jakarta became a province called DKI Jakarta. In 1960, the main avenue of Jakarta, the Thamrin Avenue is inaugurated. In 1970, because of the massive flow of urbanization, Jakarta was declared a closed city.
Late Independent Period (1970-1990)
In 1978, the first highway, Jagorawi, was inaugurated. In 1984, the second master plan of Jakarta (1985-2005) was implemented. In the same year, the new airport of Soekarno Hatta replaced the smaller Kemayoran airport. The new airport is located outside the city limit and was connected with the westward Tangerang Highway. In 1988, the eastward Cikampek Highway was created. The two highway increases the urbanization of the city to the direction of east and west.

1970-1990
late independent era

10km
The Global Era (1990-2004)
The global era / neo liberalism is characterized with some economic crisis as well as the increase of the size of Jakarta. Jakarta population increases to its regional area, the whole metropolis (which is called Jabotabek) consisted of 13 million people, living around the edge of the limit of the province of DKI Jakarta. Jakarta was planned to merge the cities around it yet most of the industry remain in the center of Jakarta and is poorly distributed.
2.6 Jakarta Bus Rapid Transit

Currently, the solution for Jakarta transportation problem is the program called "Development of Macro Transportation Pattern (MTP)" (Program Pengembangan Pola Transportasi Makro (PTM)), which is created under the law of Perda No. 12 Th. 2003 & (Sk. Gub. Dki Jakarta No. 84 Tahun 2004. The new law basically introduced a new system of public transportation which consists of four new means of transportation: Transjakarta, a bus rapid transit system which is based on Transmilenio system in Bogota, Colombia; monorail lines; new railway lines; and subway lines. The entire system is planned to solve the traffic problem in Jakarta and is planned to be finished in 2015.

The whole program is called Jakarta Mass Transit System which is planned to be finished in 2015. See Figure 2.5.1

Figure 2.6.1 Jakarta Mass Transit System 2015. The completed MRT will be consisted of network of bus, subway, monorails, railway, and river transportation.

Source: PAMINTORI CIPTA
Jakarta needs more busways

City needs more busways, says the mayor who started it all

Adisti Sukma Sawitri, The Jakarta Post, Jakarta | Wednesday, April 25, 2007

The Colombian mayor who revolutionized Bogota’s public transportation system has said that Jakarta’s administration should focus on expanding the bus rapid transit (BRT) network instead of developing a subway or monorail.

Former Bogota mayor Enrique Peñalosa, who championed the BRT in his city, told a transportation seminar here that it would be cheaper for Jakarta to expand its busway system.

“A subway would cost three times its contract value, yet it would only cover several lines, (but) with the same amount of money you could reach all parts of the city with the (busway) network,” he said during a seminar on BRT best practices.

The administration has signed a soft loan contract for the subway with the Japan Bank for International Cooperation worth $800 million, which Peñalosa said could end up costing it $2.4 billion in repayments, while a BRT covering the entire city would cost only $5 million.

“Imagine how many schools and health facilities we could create if we transfer the subway capital into schools and health facilities,” said Peñalosa, who is regarded as a public transportation expert after his success in managing the BRT and bicycle ways in Bogota.

The Jakarta administration has been attempting for some years to realize an integrated mass rapid transit (MRT) system that would include the busway, subway and monorail networks. While the subway and monorail are still waiting for domestic and international financial support, the administration has established seven busway lanes, most of which run in Central and South Jakarta.

Enrique Penalosa, former mayor of Bogota, closed the event with a keynote speech. Source: Jonas Hagen
2.7 Jakarta Administration

Jakarta is headed by a governor (not a mayor), and is a provincial capital known as DKI Jakarta\(^1\). It consisted of 5 kotamadya ("municipal")\(^2\) and 1 kabupaten administratif (regency)\(^3\), the Kabupaten Kepulauan Seribu or the thousand islands, which is an overseas area on the north of Java Island. The 5 municipal (kotamadya) are North Jakarta, East Jakarta, West Jakarta, South Jakarta, and Central Jakarta. Jakarta consisted of 43 districts/kecamatan and 265 sub-district/kelurahan. The whole system responsible for the sheer size of the urban area in Jakarta. The province has a total area of 7,638.02 km\(^2\) (661.52 km\(^2\) land and 6,977.5 km\(^2\) sea). Most of the area is used for residential area of 43,788.57 ha and industrial area of 4,417.87 ha\(^4\).

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\(^1\) DKI Jakarta is an abbreviation of Daerah Khusus Ibukota Jakarta or "Jakarta Special Capital Region". It is headed by a governor, and the governor also elect the 5 mayors and 1 regent of Jakarta.

\(^2\) A Kotamadya is defined as "municipal" or a "city". A kotamadya is headed by a walokota (mayor). We can say that DKI Jakarta is a province which consist of 5 cities: North Jakarta, East Jakarta, West Jakarta, South Jakarta, and Central Jakarta.

\(^3\) A kabupaten is defined as a "regency" or "second level region". It is headed by a bupati or "regent". In hierarchy, it is one step lower of the Indonesia administrative division below the provincial government. Difference between a regency and a city lies in demography, size, and economy. Generally a regency comprises a larger area than a city. A city usually has a non-agricultural economic activities. All regents, mayors and member of representatives are elected for 5 years term. However, in Jakarta Special Capital Region, mayors and regent are chosen by the Governor.

\(^4\) According to data from bkpm.go.id and http://regionalinvestment.com/sipid/id/displayprofil.php?ia=3
2.8 Jakarta Demography

The population of Jakarta metropolis increases rapidly, but the population of the city of Jakarta is actually decreases. This is caused by the urban sprawl where people moves to the urban periphery, causing the center to declines in activity and vitality. See Chart 2.7.1

East Jakarta is the most populated area of Jakarta, followed by South Jakarta, and West Jakarta. These areas are where the residential areas are mostly concentrated. The least populated area of Jakarta, the central, followed by the north, is administrative area and industrial area respectively.

West Jakarta is the most densely populated area of Jakarta, followed by South Jakarta. The least populated area of Jakarta is North Jakarta, characterized by industrial area.

South Jakarta is the area in Jakarta which experiences the highest population growth. This is followed by West Jakarta. Central Jakarta experiences a reduction of its population growth.

Demographically, out of the employed person in Jakarta, half of it are workers. The other half consisted of job seekers and people who is not economically active. East Jakarta has the least population for workers while South Jakarta has the most.

Fig. 2.8.1 Declining population of Central Jakarta, increasing population of Jakarta Metropolis (Jabotabek) source: Rahma dkk (2004)
2.9 Jakarta Land Use

Most of the land use of Jakarta is comprised of housing, either “formal housing” or “informal housing”. “Formal housings” are houses that are officially registered by the government, and usually have good amenities. “Informal housings” are houses that are not officially registered by the government. “Formal housings” are sometimes historic building; build as a continuous development of the previous housing during the Dutch colonial period or during the Late Independent era. “Informal housings” condition can be either very good condition, similar to that of the formal housing; or very bad, as in slum area; or the traditional kampong area. Some informal housing is turned into formal housing because of the good quality of the area, or either victim to another development.

Industrial land use consisted of Industrial Lot, Agricultural Lot, and Commercial Lot. Industrial lots are mostly concentrated on the north. Agricultural lots (in form of sawah, or “rice paddies”) are distributed on the undeveloped area of the east and the west. These agricultural lots are mostly going to be turned into another development. “Commercial lots” comprised of a mostly traditional exchange places such as markets, retails, and warehouses. Most of these areas, even though are legitimate area, have a bad condition and not internationally oriented.

Service lots in this map consisted of government offices, global businesses, schools and hospitals. Most of these areas are usually a well organized area, and are internationally oriented and some are good example of urbanism. Central business districts area fell into this category. Service lots are concentrated in central Jakarta and are the economic generator of Metropolitan Jakarta. This area is the cause of traffic jam during rush hour, as people from the periphery of Jakarta moved in and out of this area.

Figure 2.9.1 Jakarta land use (2008)
source: Municipal Library of Jakarta
Open spaces consist of Open lot, water body, cemetery, and vacant lot. Most of this area is concentrated on the undeveloped area of Jakarta in the east and the west. Public spaces for the city life of Jakarta are generally small and don’t really contribute to the urban livability of Jakarta.

Other characteristic of Jakarta’s land use is the lack of public space. The reason of this are mostly in the misuse of land use in Jakarta, causing an ineffective typology that is undesirable for pedestrian.

Jakarta is a very car-dependent city, so most of the open spaces have been converted into parking lots. Because of this car-dependency issue, the basic requirement for pedestrian is often discarded. Pathways and basic street amenities are very rare in Jakarta. See figure 2.8.2

Other characteristic of Jakarta’s land use is the use of fences. Most of the buildings in Jakarta are fenced, that includes office buildings, malls, and houses. This typology has contributes to the lack of public space in Jakarta. The cause of this is people’s perception of the high crime rate of Jakarta, so people start building fences around the house. According to space syntax, this kind of typology is actually the typology that attracts burglary (later discussed in the Methodological Approach Chapter). Some houses build as much as 5 meters height of walls to protect themselves, and some people include security officers to guard their house.

People also switch to fenced houses because of the lack of pathway or lack of organized boundary. Since there are no “public space” (which includes the pathway), people build houses with entrances and windows directly on the street. This is perceived as an uncomfortable space, so people started to build fences directly beside the street to maintain their private space. This typology, with the fact that there is no pathway in Jakarta, is very common.
3.0 PROBLEM STATEMENT
3.1 PRE BRT IMPLEMENTATION PROBLEMS
3.2 POST BRT IMPLEMENTATION PROBLEMS
3.3 RESEARCH QUESTION
3.4 TECHNIQUES AND METHODS OF APPROACH
3.1 Pre BRT Implementation Problems
Before the implementation of the BRT, there are several problems in Jakarta’s urban fabric. These problems can be divided into two aspects: Urban aspect and Infrastructural aspect.

Urban Aspect
There is a lack of public space in Jakarta. Most existing open spaces in Jakarta are either empty lots or parking spaces. A very private typology of buildings in Jakarta (with clear line between public and private realm, through fences) also contributes to the lack of public space in Jakarta. This situation creates a very undesirable experience for pedestrians. Walking in Jakarta becomes undesirable.

Car-oriented planning also causes an undesirable urban sprawl. Increasing congestion causes city to move outward instead of inward. Some inner city becoming neglected because of low maintenance. One of such area is the historic center of Jakarta, the Kota area.

Infrastructure Aspect
People dependency on motorized transportation causes increasing congestion. People solve the problem by switching to motorcycle which caused more problem. Available public transportation doesn’t work to solve the problem because of the bad planning and management.

GLOBAL / INFRASTRUCTURAL ISSUE

Fig. 3.1.1 (left to right) A road condition in the edge of Jakarta metropolitan; A rush hour in Jakarta.
Fig. 3.1.2 (left to right) Dilapidated building heritage in Kota, the historic center of Jakarta, available open space is used for parking space; A very motor-oriented city, motorbikes riding on the pathway is an everyday scene in some area; Most available open spaces area usually used for parking area.
Source: map.google.com

Fig. 3.1.3 (left to right) A road condition in the edge of Jakarta metropolitan; A rush hour in Jakarta.
source: map.google.com
3.2 Post BRT Implementation Problems
After the implementation of the BRT, there are several problems in Jakarta’s urban fabric. These problems can be divided into two aspects: Urban aspect and Infrastructural aspect.

**Urban Aspect**
A car-oriented street pattern causes an undesirable walking experience toward the BRT stops. Walking to a BRT stop is not very enjoyable. There are no facilities that support walking to the BRT stop. As a result, people still prefer to use cars instead of walking to the bus station.

There is no integration between the urban fabric with the BRT stop.

**Global / Infrastructural Context**
BRT stop is often positioned in a very bad way. It takes too much time to reach a BRT stop because of the complicated route. To reach a BRT stop, people need to climb stairs, walk a considerable distance, or go underground to avoid the traffic. There is an impression that even now the motorways is prioritized over the pedestrians. The BRT stop is isolated from the urban fabric too. Once a person arrived at a transit stop, he/she basically isolated from the city.

Some transit stop stopped at a very strange location, such as a simple pathway surrounded by no facilities or any development. These transit stops are often the victim of lack of maintenance.

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**GLOBAL / INFRASTRUCTURAL ISSUE**

![Fig. 3.2.1 (left to right) Unused MRT transit stop; Instead of integrating the people, the transit line acted as a large wasted space](map.google.com)

Source: map.google.com

![Fig. 3.2.2 (left to right) A badly positioned MRT transit stop. It took approximately 5 minutes to reach this transit stop in Buncit, an area on South Jakarta; The long path to the MRT transit stop in Kota.](source)
3.3 Research Question
As a social researcher, the author asked two questions: Descriptive approach (the what question) and Normative/Explanatory approach (the how question).

Descriptive Approach
What is a good integration between the urban fabric and the transit system? What is the Transit-oriented Development?

Descriptive approach question are often skipped because of their obvious nature, but it is important to address this question to understand more about a subject.

Normative Approach
What is a the strategic measures for implementing a transit-oriented development (TOD) in Jakarta?

This can be divided into two aspects: local / urban aspect and global / infrastructural aspect

Local / Urban aspect
• How to design a qualitative condition to make a desirable condition for moving between a BRT transit stop and an urban fabric.
• How to create a desirable walking condition from a neighborhood to a transit stop?
• How to create a more compact neighborhood?
• How to reorganize the land use around a BRT transit to make it more effective and feasible.
• How to provide public space?
• How to reduce the high perception of crime in a neighborhood?

Global / Infrastructural aspect
• How to provide a good accessibility to an isolated station?
• How to create a more sustainable mode of transportation?
• How to provide a good quality bus lane?

To approach these questions, the author will make an analysis based on several sources described in the theoretical approach chapter.

3.4 Techniques and Methods of Approach
The method of approach for addressing the issues of Jakarta consisted of two parts: Research and Design.

Research Phase
The first part, Research phase, is about analyzing the research question. Various studies will be made especially on the field of sustainable mobility, e.g., how to avoid an automobile-dependent city planning, etc. A study will also be made on several city comparison will be made between the situation of the city that has implemented a kind of sustainable mobility in its urban fabric. All the before-after situation of these cities will be compared; for example, how is the improvement of sustainable transportation mode in Paris contributed to the improvement of the city. The point will also be considered for the improvement of sustainable mobility in Jakarta. The conclusion of this analysis will be compiled in a strategic design checklist.

Theoretical Approach
Most theoretical approach will be from Richard Iles’ Public Transport in Developing Countries which has comprehensive lists of characteristic of public transportation in developing countries.

Technical Approach
Technical approach refers to the method that the author will used to determine the following subject:
• Determining the vitality/accessibility of current Jakarta rapid transit system, a comparison could also be made between the condition before and after the Jakarta rapid transit system.
• Determining the location on which the author will make a design intervention.

The technique that will be used for the research will be the space syntax method. Space syntax is a method developed by Professor Bill Hillier at The Bartlett, UCL in the 1980s as a tool to help simulate the effects of their design, and has grown as a tool extensively used in architecture, urban design, planning, transportation, interior design, as well as archaeology, information technology, urban and human geography, and anthropology. According to spacesyntax.org, it is “a set of techniques for the analysis of spatial configurations of all kinds, especially where spatial configuration seems to a significant aspect of human affairs, as it is in buildings and cities.”

After a place has been chosen, an analysis on the connectiv-
Fig. 3.4.1 Strategic phasing of the research on implementing a TOD in Jakarta.
Source: Author
4.0 THEORETICAL APPROACH
4.1 URBAN ASPECT
4.1.1 SUSTAINABILITY AND SUSTAINABLE MOBILITY
4.1.2 TRANSIT-ORIENTED DEVELOPMENT (TOD)
4.1.3 SAMPLE CASE STUDIES
4.2 MOBILITY / INFRASTRUCTURE ASPECT
4.2.1 SPACE SYNTAX RESEARCH
4.2.2 BUS RAPID TRANSIT
4.3 CONCLUSION: URBAN+MOBILITY
4.4 GOAL OF THE PROJECT
4.0 Theoretical Approach

The theoretical approach of this project is divided into two aspects: urban aspect and mobility aspect.

Urban Aspect

This is the research on the urban fabric of the area such as the housing type, the open space, the neighborhood, the density, etc.

To assess this matter, several theories is studied e.g. the definition of sustainable mobility; “Cities and Transport Mode”, which consisted of a theory of sustainable nodal city, where automobile dependency is discouraged and public space is encouraged; and several samples of case studies that shows several cities that implemented a strategy to assess the problem of overcoming automobile-dependence in their city.

Mobility Aspect

This is the research on the connectivity or accessibility of the area, and the transportation mode. Several theories for this chapter is about transportation mode and the space syntax research itself.
4.1 Urban Aspect

4.1.1 Sustainability and Sustainable Mobility

Sustainability or sustainable development can be understood as a context where any economic or social development improve, and not harm, the environment.

Concept of sustainability revolves around three aspects: (1) need for economic development to overcome; (2) need for environmental protection; and (3) need for social justice and cultural diversity to express their value on solving the issue.

The term ‘Sustainable mobility’ originates or also known as sustainable transport/transportation, has no formal definition, but is a logical that is developed after the earlier term Sustainable Development which originated from a 1987 report from the United Nations World Commission on Environment and Development (WCED) called *Our Common Future*.

The term is also used to describe various forms of transportation which minimize fuel consumption and emissions. It can refer to public transport, cycling, walking, and environment-friendly technology that are also commonly referred as “green transport”.

The New Zealand Ministry for the Environment offers another definition for a transportation/mobility that is “more sustainable” (which shortly means sustainable in a longer term). This definition extends not only on the mode of transportation, but also to the layout of cities and the balance of transport investments (in terms it provides better accessibility to commercial area, residential area, and government

"Sustainable transport is about finding ways to move people, goods and information in ways that reduce its impact on the environment, the economy, and society."

Some options include:

- using transport modes that use energy more efficiently, such as walking or cycling and public transport
- improving transport choice by increasing the quality of public transport, cycling and walking facilities, services and environments
- improving the efficiency of our car use, such as using more fuel efficient vehicles, driving more efficiently, avoiding cold starts, and car pooling
- using cleaner fuels and technologies
- using telecommunications to reduce or replace physical travel, such as tele-working or tele-shopping
- planning the layout of our cities to bring people and their needs closer together, and to make cities more vibrant and walkable
- developing policies that allow and promote these options, such as the New Zealand Transport Strategy."

The World Business Council for Sustainable Development defines “sustainable mobility” as “the ability to meet the needs of society to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values today or in the future.” The definition encompasses many aspects, that is accessibility, financial outlay required of users, travel time, reliability, safety, security, greenhouse gas emissions, impact on the environment, resource use, equity implications, impact on public revenues and expenditures, and prospective rate of return to private business.

There is a lot of subjects that is encompassed by “sustainable mobility”, as for this thesis, the effect is focused on the impact on the three main aspect: accessibility to functions (economical and social), and environmental, whilst the other effect will be researched in a lesser focus.

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4.1.2 Transit-Oriented Development (TOD)

A TOD is a mixed-use residential or commercial area designed to maximize access to public transport, and often incorporates features to encourage transit ridership. A TOD neighborhood is usually characterized by a transit stop (e.g. train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with progressively lower-density development spreading outwards from the center. TOD scale are usually between 400m to 800m from the transit stop, which is considered to be an appropriate scale for pedestrian.

The concept of TOD was understood earlier as a concept of a city and its association with the transport mode. According to Newman, cities can be divided into three types based on transportation technology.

**Walking City**
Characterize ancient city. It consists of high density (100 to 200 people per hectare), mixed land use, narrow streets in organic form. Destination can be reached on foot in half an hour. This city rarely more than 5 kilometers across (walking is agreeable within 1 kilometer distance, cycling is within 5 kilometers distance). Samples are medieval cities of Europe. See Figure 4.1.2.1

It is feasible to re-create Walking City areas within modern cities as an “urban villages” or a TOD. Samples are the new suburban centers along Stockholm’s rail system, or new district centres such as Arabella Park (Bogenhausen District Centre) in Munich.

**Transit City**
Characterize cities of the end of 19th century. Cities are able to accommodate more people. Density is reduced, half-hour average accessibility with the use of new technology (train, tram, streetcar). Trains form a sub-center at railway stations, trams create a linear development; these area are growing with mixed use development. The transit city generally 20-30 kilometers, density is between 50-100 people per hectares. See Fig. 4.1.2.2

Samples are Melbourne and Philadelphia, which retain their tram-based linear development.

**Automobile City**
Characterize the cities after the World War II. Car-oriented, supplemented by buses. Low-density housing became
more feasible, zoning become apparent as a result of separating residential and business centers. Density is 10-20 people per hectare, city expand as much as 50 kilometers across. See Figure 3.1.1.3

Samples are most American cities e.g. Denver, Houston, and Perth. Some cities began to expand even more, almost to the limits of comfortable car commuting. Fast commuter trains provide connection for people living up to 80 kilometers outside the city, but there is little that people can reach easily other than by car. Cities in the third world such as Kuala Lumpur and Bangkok has adopt this automobile city pattern though they have a more walking-and-transit-oriented urban form.

Problems of Automobile City
There are constraints on automobile-dependent cities. This will be divided into three: economic efficiency, environmental responsibility, and social equity:

- **Economic Efficiency**
  - Infrastructure costs. Excessive for new suburban infrastructure while older city infrastructure deteriorates.
  - Transportation costs. Total costs of car transportation system exceed transit system costs by 30-40% and are not paid by users.
  - Time costs. Congestion produces loss to city.
  - Land waste. Loss of land for parking and roads, reducing the available productive land.
  - Housing waste. The mismatch of housing type and household need is in increasing

- **Environmental Responsibility**
  - Oil vulnerability. Increasing vulnerability to oil shocks while the global oil production peaking around 2005.
  - Greenhouse gases. Pressures to reduce carbon dioxide because of global warming issues.
  - Smog. Problems of car-based city which is a problem for population health.
  - Sprawl impacts. Loss of countryside on the urban fringe increases at a rate of 0.4 ha per new household in Australia and higher in U.S. cities. Asphalt for sprawling cities create more stormwater pollution.
  - Traffic Impacts. Noise, visual intrusion, community severance, traffic accidents, parking blight caused by excessive traffic.

- **Social Equity**
  - Inequities in being car-less. Disadvantaged vulnerable people (old people, young people, disabled people, poor people, or just people who is unwilling to be car-less) creates inequity.
  - Inequities in location. Access disadvantaged residents in outer suburbs because of lack of transit.
  - Loss of Community. Community and neighborhood interactions are decreasing.
  - Loss of Urban Vitality. Vitality and culture is reduced as public spaces are dominated by cars rather than people.
  - Loss of public safety. Reduced safety as public realms is lost to privatized urban life.

4.1.3 Future “Sustainable City”
To realize a “sustainable”, the number of the stations should be increased around the major track, creating another alternative mode of transportation. Around this stations are urban villages around main station with high density and mixed use, medium dense housing 800m around transit stops, and low density housing which demand responsive transit or cycle distance to transit. This concept is what we call as Transit-Oriented Development. See Figure 4.1.2.4

To achieve a future “sustainable” city, there are several strategies that needs to be implemented:

Step 1: Create a more sustainable city to revitalize inner city
Inner city usually already have transit-oriented and walking-oriented character, with dense, mixed land uses. To reurbanize this area, the opportunity for people to live non-automobile dependent lifestyle have to be extended. Strategies are by implementing streetscape preservation, street festivals, low-income housing to retain a mix of incomes, and investment in new businesses by innovative entrepreneurs. Reducing the atmosphere produced by an image of crime-prone area is also need to be achieved.

Streets need to be reclaimed for people. To achieve this, a traffic calming techniques should be implemented so that a desirable walking condition can be achieved.
- Street planting on reclaimed road space (i.e. low
garden, shrubs, and tall trees). Strong vertical elements e.g. trees are able to reduce the optical width and help to slow traffic.

- Sidewalk-widening, and the creation of segregated bikeways in each direction.
- Narrowed driving lanes (down to 3 – 3.25 m)
- Provision of light rail occupying up to half the existing road space (e.g. Grenoble and Zurich)
- Planted central islands limiting long forward views and chicanes that convert straight streets into winding s-shapes through small landscaped protrusions in the road.
- Provision of angle parking (this also has the effect of better separating the widened pedestrian facility and cycleway from traffic).
- Conversion of traffic lanes to woonerf-style service and access roads, as in some Dutch cities. A woonerf-style road is a road where pedestrian and cyclist has higher priority over motorized transportation.

Traffic calming in central cities and subcenters also involves:

- Pedestrianization of key activity center streets and squares.
- Provision of facilities for pedestrians, e.g. quality paving, seats, and shades (for particular climate)

Traffic calming in busy roads involves:

- Strong entry statements, including well-designed signs to alert motorists to the type of roadway modifications ahead, repeated rumble strips (i.e., street surfaces roughened or cobbled) to signal approach of traffic-calmed sections, and pronounced narrowed entry points at the beginning and end of a traffic-calmed strip.
- Reduced width pedestrian crossing points at regular intervals, marked by a change in street surface and use of visual elements e.g. trees.
- Planters, bollards, and other street furniture to strengthen the visual perception of the road are as being not just for movement of traffic.
- Creation of elements that is able to restrict vehicle speed, but that do not affect the operation of larger vehicle like buses (e.g. speed bumps and plateaus).

**Step 2: Focus Development around the present rail system by introducing a Transit-Oriented Development.**

Urban villages can be developed around a station or transit stop as a transit-oriented development. One important thing that should be mention is that park-and-ride areas is not a good use of station environments, and it is better to implement a bike-and-ride facilities. Bicycle facilities allows an extension of station catch area from 800 meters (on foot) to 5 kilometers (on bike) without contributing an environmental problem.

**Step 3: Discourage Future Urban Sprawl**

It involves a process of changing the investment in highways that take people out of the city, and changing zoning processes to protect rural land in urban fringes.

**Step 4: Extend Transit System to Poorly Served Suburbs, and to build new urban villages around them.**

This ensures to create an optimized electric rail transit systems at reasonable cost, as the involve land development at stations will help to provide extra revenues and it becomes more feasible to create the subcenters or urban villages and provide local services.

**Conclusion: Quality of Sustainable City**

A sustainable city has several characteristic that can be divided into several contexts:

- **Economy (and Technology)**
  - Information and Services-oriented; remaining heavy industries has to be situated in eco-parks or in rural towns.
- **Social Organization**
  - Local, community base, but globally linked (through media or digital connection)
- **Transportation**
  - Walking and cycling (local), Transit mode (across city).
  - Cars only act as a supplementary. Air connection for international transportation.
- **Urban Form**
  - “Sustainable City”. Transit-Oriented Development or Local urban villages (high-density mixed use) linked across the city via transit; medium and low-density areas around villages. Sprawl is not encouraged.
- **Environment**
  - Low to medium resource use, low to medium wastes, closeness to nature.
Conclusion: Measures to Approach Constraints.
To approach the constrains, there are several measures that can be implemented. The selected measures here are "urban systems approach", in which changes address both technological and urban issues.

- **Economic Efficiency**
  - **Infrastructure costs.**
    Capital will still be wasted (even if it is private money) if development is low density and scattered (car-dependent) rather than focused and transit-oriented.
  - **Transportation costs.**
    Pricing and flexibility are not the solution since urban system could become totally car-based with minimal transit. Regulations and planning need to be redirected to ensure that the total system works.
  - **Time costs.**
    Land use changes also needed to reduce the need to travel
  - **Land Waste.**
    Land loss is important in longer term because there are good arable land as important resources. It is necessary to intervene and regulate loss of urban space for social and economic reasons.
  - **Housing waste.**
    Housing mismatch requires changes. Planning schemes need to be based more on performance and design standards than density, as well as facilitating large-scale change, such as in urban villages.

- **Environmental Responsibility**
  - **Oil Vulnerability.**
    Provide more housing and employment location choices with less in-built transportation energy requirements and with less-energy-intensive modes as their base.
  - **Greenhouse Gases.**
    Price changes, technological approaches, and changes in behavior; as well as providing housing, employment, and transport options with lower greenhouses gases.
  - **Smog Pollution**
    Action is needed to reduce growth in car travel.
  - **Environmental Impacts from Suburban Sprawl.**
    Incremental approach is not enough to slow down environmental degradation at fringe area. Bigger changes in the density and style of urban development in new and existing areas needs to be done.

- **Local Traffic Impacts**
  Car dependence should be decreased by urban systems changes, such as area-wide traffic calming, providing less-car-dependent housing and employment arrangements, building new public transportation systems and giving priority to non-motorize transportations.

- **Social Equity**
  - **Transportation and Locational Disadvantage.**
    Integrated land use and transport policy solutions that reduce the need of car travel and make transit more viable.
  - **Community Loss.**
    Transportation planning need to recognize the important role played by walking and cycling, as well as to consider the qualitative human aspects of access and transportation, such as opportunities for unplanned interactions, not just quantities of motorized traffic and the roads needed to cope with them. Approaches are public transportation system well utilized by all sections of the community (not just the transportation disadvantaged) and community-enhancing possibilities (by interactions among passengers and by drawing people through major activity center along its route)
  - **Urban Vitality Loss.**
    Face-to-face meeting and contacts are important, particularly for creative economic functions and recreation purposes. Cities have to be structured from dependence on cars and emphasis on private.
  - **Public Safety Loss.**
    Policing needs to be in partnership with communities. Public realms need to be enhanced through creating humanly attractive spaces that encourage interactions, therefore increasing the strength of community values.
    Moreover, according to Nes, A. van The spatial conditions for a vital compact city - The structure of the street net and its impact on urban sustainability. There is a relation between a perceived fear of a street and the actual condition of the crime figure in the area. The research shows relation on how the topology of the street (e.g. the number of windows and doors) creates a different degree of safety in a street environment. Dense mixed-use function is the key solution in producing this condition.
4.1.3 Sample Case Studies

In this chapter, the author will study several samples of city that has a successful mission in overcoming automobile-dependence.

Curitiba, Brazil: Rede Integrada de Transporte

Curitiba is a city of a million people in southern Brazil which is based on 4 principles which has elevated Curitiba into one of the best model for a sustainable city:

- Land use and transport integration — focus urban expansion along busways and promote dense land use along them through zoning, regulations, and fiscal incentives.
- Public transport priority— busways on major roads, segregated bus stops with preboard ticket payment.
- Service integration — use transfer stations and terminals, include circumferential and feeder routes, and use an integrated fare.
- “Affordable” innovation — articulated and bi-articulated (locally built) buses, express buses with specialized boarding tubes, public services and other activities located at terminals.

Bogota, Colombia: Transmilenio Busway

The Transmilenio project in Bogotá started in operation since December 2000. It was basically a network of troncales (“busways”) inspired from Curitiba. Bogotá’s first “troncal” was actually built in the 1980s on Caracas Avenue. Although never operated as originally designed, this two-lane-per-direction busway was used by nearly 500 buses and carried an estimated 35,000 passengers per hour per direction — a level that is usually obtained by metros and not buses. The Transmilenio modified the infrastructure and implemented busways on 2 other main arteries.

In the future, 20 new corridors will be added to the system. The goal is to have 85% of the population within 500 meters of a bus stop. Other policy is the “Pico y Placa” that restricts the use of 40% of the private autos during peak hours. The city also implemented two carfree days (in February 2000 and 2001 to spread awareness about the alternative ways to move in the city. In the future,

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a new 200 km bike lanes will be introduced in the city.

**Singapore: Land Use Planning and Traffic Management**

Because of Singapore’s small space and the high rate of economic growth, Singapore needs to promote innovative transportation policies to prevent congestion. Singapore achieves this through the effective use of travel demand management. Singapore is able to keep the cars-per-thousand population figure as low as 120 cars, second only to Hong Kong at 55 (which is normally 350-550 cars in high-income countries) (World Bank 2000). With several policies, e.g. Area License Scheme (1975), the Vehicle Quota System (1990), and the Electronic Road Pricing Scheme (1998), Singapore is able to reduce automobile use and the overall outcome have no major negative side effects on economic growth. The generated revenue from this scheme is used to invest in social improvements.

On urban context, Singapore create a city-wide planning that is totally based around the integration of high-density, mixed-use nodes at rail stations on the rapid transit system. Especially in the center, there is an increasing orientation toward pedestrians and cyclists for local access to nodal centers land to transit.

**Perth, Rapid Transit System**

Perth is a complete automobile-dependent city. For more than 50 years new suburbs have been built in Perth on the assumption that the majority of people will not need a transit service. Most suburbs are low densities and without access to railways. The only public transportation to these suburbs is a subsidized bus service that rarely came more than hourly at off-peak times.

Despite of this, recent trends shows that a people started to avoid using cars and return to the inner city. Because of this, the decline of the inner city has reversed. New residential and commercial areas are being built. This trend of a more transit-oriented urban life is now starting to occur in some very car-dependent suburbs.

One sample is a suburb in the northern part of Suburbs which grew in 1960s and 1970s on a low-dense, car-oriented model. By 1980s, the freeway was clogged every peak hour and the people was not satisfied with the bus service. So during the 1990s, the Northern Suburbs Rapid Transit System is built. This Rapid Transit System is linked to the existing bus services.

Three predictions of the Perth municipal have been proven wrong. First is the prediction that railway will lose patronage over the existing buses, but the result is that people is actually using the railway if there is a transfer point from the buses to the railway. Second is the prediction of it is impossible to get people out of their cars, which is proven wrong because even in an automobile-dependent city, people can give up their cars. Third prediction is that rail system will be a financial disaster, which is wrong because apparently the Northern Suburbs Rapid Transit System has won many awards for engineering and architecture. If people are given a good option, then rail infrastructure can be viable in modern, automobile-dependent cities and can do even better than roads financially.

**Conclusion**

In general, the conclusion for overcoming an automobile-dependence in a city can be divided into three aspects:

On the urban aspect, the strategy is the creation of a more transit-oriented development which consist of a high-dense, residential/mixed-use development. The urban fabric has to be connected to the transit stop.

On the infrastructural aspect, public transportation should be prioritized and highly invested. Pedestrian should be prioritized, and network of bikeways should be considered.

Moreover, several policies needs to be implemented to help attaining a sustainable, automobile-independent city. Facilities and public services should be located at terminals or major transit stops. High parking charges and high cost of car ownership should be implemented. Development of new community code to encourage urban villages / transit-oriented development / high dense, mixed-use urban fabric should be realized. See Table 4.1.3.1
4.2 Mobility / Infrastructure Aspect

4.2.1 Space Syntax Research

Space Syntax is a method which provides an evidence-based approach to the planning, design and operation of buildings and urban areas. In this project the space syntax method is used for determining the integration/vitality of an area and the visibility of a street.

Space syntax is a method developed by Professor Bill Hillier at The Bartlett, UCL in the 1980s as a tool to help simulate the effects of their design, and has grown as a tool extensively used in architecture, urban design, planning, transportation, interior design, as well as archaeology, information technology, urban and human geography, and anthropology. According to spacesyntax.org, it is “a set of techniques for the analysis of spatial configurations of all kinds, especially where spatial configuration seems to be a significant aspect of human affairs, as it is in buildings and cities.”

The first implementation, the analyses of the integrity/vitality of an area, relates to how well a street or an urban area thrives. With space syntax, differences can be analyzed between a highly-integrated neighborhood and a low-integrated neighborhood (see Figure 4.2.1.1).

The second implementation is the use of space syntax to check the level of visibility of a road. This is strongly related to the perception of crime or security level of an area. With space syntax, it can be determined that an area is either prone to burglary or not. The method is based on the number of “eyes” that faced into a street. A street with low visibility has few “branches” connected to the street, while a street with high visibility has many “branches” facing to the street. This can be implemented with the number of windows or opening to a street. Thus, a street with low visibility has few opening facing to the street, while a street with high visibility has many openings facing to the street (see Figure 4.2.1.2).

Fig. 4.2.1.1 (above graph) A highly integrated neighborhood is usually characterized by a close grid pattern on its street (left), whilst a poorly-integrated neighborhood is characterized by a branch-like grid pattern on its street, usually a characteristic of a cul-de-sac neighborhood of the 1960 (right); (below graph) A highly visible road or street is characterized by many number of branches leading to the street (left). A poorly visible road has few branches leading to it (right). Source: Author
4.2.2 Bus Rapid Transit

Bus Rapid Transit (BRT) or Busways can be used for conventional buses or trolleybuses. This system can be located alongside roads, in the median strips of dual carriageways, or in its own lane independent of the road system. Busways usually have a radial routes leading into the city center. However, the large width of the required busway lanes means that it has to stop short of city center areas, except if it is possible to construct tunnels or elevated tracks. Short lengths of busway are sometimes constructed to enable buses to provide direct services between areas which do not have direct road connection, e.g. historic city centers, or between residential areas which do not have direct road links.

The first fully segregated bus system in Europe was introduced in Runcorn New Town in the UK (1971). Runcorn is a new town which is developed around a specially-built road reserved for buses - the busway. Other examples of busways are the extensive systems in Curitiba and Sao Paulo, Brazil and in Bogota, Colombia. A 13 kilometer busway was opened in Jakarta in 2004. In 2005, busway in Manila is incorporated in the new highway encircling the city.

The advantages of busways are its low cost, can be introduced gradually, and are flexible to divert if there is a problem in the lanes. To prevent non-bus traffic to enter the lane, bollards or lifting barriers can be introduced.

Good passenger access to the system is essential. Stop spacing varies in practice, it can be as little as 300 meters. 1 kilometer is normal for a high-capacity busway. Much closer spacing is required in city center areas.

The maximum capacity of a busway is approximately 30,000 passengers per hour in each direction. The actual passenger flow is determined by load factors, as well as the number and design of the stopping places, the type of buses, dwell time at stops, and the number and design of intersections with ordinary roads. A typical actual peak vehicle flow is of the order of 200 buses per hour in each direction (or about 3 buses each minute or approximately 12,000 passengers).

The Station

A good BRT Stations should have a number of common features.

- Provision of a sheltered connection between the station and the transit vehicle.
- Ensure that the passengers pay their fare before entering the station. Recent solution is the use of a smart-card reader and a turnstile at the station entrance. Other solution is the use of a fare receipt.
- Provide passengers with options to access the station without using car. This can be achieved via feeder bus systems and pedestrian / bicycle lane. A facility to support this can also be introduced, such as a bicycle storage facility (see Figure 4.2.2.2).
- Provide a base for an economic development. Samples is the BRT station in Brisbane, Australia, which were sold to a new building so that the station would be incorporated with the building. Also in the city, the BRT was put in a tunnel beneath the downtown, promoting economic development and supporting a mixed use, pedestrian-only mall. In Boston, a new underground BRT system is supporting the complete redevelopment of the South Boston waterfront. Billions of dollars of new commercial and residential development has been attracted to the area, in part because of the access enabled by the new BRT system.

Flexibility

Another advantages of BRT is the flexibility to upgrade the busway system as well. As demand increases and additional capacity is required, busway can be upgraded into guided buses and finally to an LRT line. see Figure 4.2.2.1.
4.3 Conclusion: Urban + Mobility

The theoretical implementation for this project is through the use of urban-based theories and mobility-based theories side by side. The urban context theory is used as a base guide for implementing a TOD. Unique in this approach is the use of space syntax in mobility aspect to determine the integrity of an area.

Thus the goal of this project is based on the side by side implementation of this theoretical approach. From the urban point of view, the goal of this project is the creation of ‘urban villages’, a mixed-use, transit-based development that is characterized by compact development. From the infrastructural point of view, the goal of this project is the creation of ‘integrated mobility’, in which the existing transit point is connected to the adjacent neighborhood by the creation of linkage of public space (parks, bicycle routes, public strips). The combination of this implementation will produce positive side effects: more green spaces, pedestrian and bicycle friendly city, public transportation oriented society, etc.

Fig. 4.3.1 A combination of analysis between urban-based theory (left) and infrastructure-based theory (center and right) is the method of analysis that is going to be used to achieve sustainable mobility in Jakarta.

source: Author
4.4 Goal of the Project
The goal of the project is:

- The integration of the BRT line with the urban fabric. The BRT line should act as an effective ‘revitalizer’ of the urban fabric adjacent to it. This will create a sustainable planning for further improvement of the infrastructure.
- Establishment of “transit hubs” or “urban villages” or “transit oriented development”, a high dense, mixed-use neighborhood that acts as an attractor and employment provider for the areas around.
- Accessible, sustainable, and more desirable urban environment by removing private motorized transportation in the area around a transit hub.
5.0 STRATEGIC PLANNING APPROACH
5.1 INTRODUCTION: PROBLEM STATEMENT
5.2 STRATEGIC PLANNING SCHEME
5.3 BASIC STRATEGY: SPACE SYNTAX
5.4 STRATEGY: URBAN ASPECT
5.5 STRATEGY: INFRASTRUCTURE ASPECT
5.6 PHASING
5.1 Introduction: Problem Statement
Based on the previous analysis, the problem of the integration between the BRT network and the urban fabric can be analyzed by looking at urban condition around a BRT stop. The problem can be divided into two aspects: Urban aspect and Infrastructure aspect:

Urban Aspect
Low Local Connectivity
A poorly located BRT stop will have a low local connectivity. A BRT stop that is placed in the middle of nowhere will have few users. Low local connectivity is also caused by poorly-integrated street pattern (i.e., a street pattern with a pattern that caused a low integration value in the space syntax analysis). Samples are a BRT stop that located close to a neighborhood but with no access to the neighborhood.

Ineffective Distribution of Functions
Some BRT stop is surrounded by few functions. Few functions give few activities around a BRT stop. Some neighborhood may have only one big mono-functioned building (e.g., a big warehouse, or a big workplaces, etc).

Lack of Public Space
The typology of most buildings in Jakarta is that the building is surrounded by fences, claiming all the available space to itself and giving only one opening to enter the place. This typology of “privatizing” available spaces results in the lack of available public space. This available open spaces are mostly converted into private parking areas.

The only available public space around a BRT stop in Jakarta are often a strip of badly maintained pedestrian path. The lack of public space around a BRT stop contributes to the undesirable experience to walk to the BRT stop.

Low Visibility: High Perception of Crime
According to space syntax method, some street can have a low visibility quality if there is a lack of “street intersections” or lack of opening along the street. Often a street in Jakarta is a long street with few intersections, and the building alongside the road is fenced by walls. This kind of street is often perceived as a crime-prone area. This high crime perception contributes to the undesirable condition to wander on the street.

Infrastructure Aspect
Difficult Accessibility to a Transit Stop
Reaching the BRT stop in Jakarta is uncomfortable. Most of the BRT stop in Jakarta is poorly located (too far from the urban fabric, not directly accessible to the community).

Isolated Transit Stop
Most of the BRT stops are isolated and segregated from the urban fabric. There is no facility or public service in a transit station, which makes it hard for people if for some instance they forgot something.

Threat: BRT line becomes a barrier for urban fabric
There is a threat that instead of integrating the urban fabric, the BRT line would segregate the urban fabric instead.
Figure 5.1.1 General problem of the integration between BRT and the urban fabric in Jakarta can be divided into two: urban aspect and infrastructure aspect. Dealing with this problem will give a solution to establish a TOD in Jakarta’s urban fabric.

Source: Author
5.2 Strategic Planning Scheme
The strategic planning approach for establish a well-integrated TOD in Jakarta’s existing city pattern is concluded in this scheme. The strategic planning approach is derived from the existing urban and infrastructural problem of Jakarta.

From the urban problem, the strategy is the creation of urban villages and the provision for public space. The infrastructural strategy are divided into BRT lane improvement, BRT stop improvement, and other supporting amenities.

Figure 5.2.1 Strategic Planning Scheme
Source: Author
5.3 Basic Strategy: Space Syntax

To achieve a vital living environment, a good degree of connectivity must be achieved. To analyze this, a space syntax analysis have to be done to check the degree of the connectivity of a site. Global integration map can be done using the UCL Depthmap software, or using the three-step analysis following this reference:

- 0 - 20 % > very bad connectivity
- 20-40 % > bad connectivity
- 40-60 % > connectivity
- 60-80 % > good connectivity
- 80-100 % > very good connectivity

Once a street has a good degree of connectivity, the street can be developed into a shopping street. Walking experience should be increased within the 400m radius of influence (the walkable radius). Walking and biking experience within 700m radius of influence (the bikable radius).

5.4 Strategy: Urban Aspect

Once a street already has a high degree of connectivity, a vital neighborhood can be established. On the urban aspect, the strategy can be divided into three aspects: The introduction of Urban Villages and Public Spaces

Urban Villages

Urban villages is mainly a compact scheme of mixed-use housing and commercial area. The ideal urban villages new housing will create efficiency in providing residential as well as creating opportunity to provide more public space.

Urban villages is well-connected to the transit stop by means of public space. The type of housing in an urban village should be of mixed typology (cost, density) to make it more viable.

Denser housing (highrises)

denser housing is located especially inside the walkable radius of 400 m from the station. Ideally it is supposed to be mixed-use highrises of single family housing and/or low-income apartments.

Dense housing (rowhouses)

dense housing is located inside the bikable radius (between the radius 700 m - 400 m) from the station. Ideally it can be a multifamily housing.

How to Achieve?

Mixed-use Function

According to the daily rhythm of people activities at daytime; the function around the radius of the transit stop; the ideal situation of the functions is: 65% Entertainment Areas (e.g. movie theaters, swimming pool, sports center, recreation center), 22% Services (e.g. clinics, adult evening school. schools, library, post office), and 13% Workplaces (ideally concentrated around the station (See Figure 5.3.3). samples are 5 ha of office space and car free area of Zamilla Park in Munich, and employment for 18,000 workers in Arabellapark, Munich).

Number of Inhabitants

The number of inhabitants can be determined after the pre-casted number of inhabitants is known.

Ideally, the housing within the walkable radius (400 m, about 50 ha) should be highrise storeyed apartments, while the housing within the bikable (between radius 400 m and 700 m, about 104 ha) radius can be a least denser housing but still compact.

Reference for high dense living with mixed use function:

- Dense living minimum 200 person per ha
- Denser living minimum 650 person per ha
- Densest living minimum 1500 person per ha

Fig. 5.4.1 Introduction of a building with muxed-use function.
Source: Author

Fig. 5.4.2 Urban Villages concept. Building are becoming more and more denser as it go closer to the transit stop.
Source: Author

Fig. 5.4.3 Daily rhythm of people activities at daytime
Source: Author
**Public Space**
To create more public space, a network of public space which is connected to the station is established. This strips of public space is called bicycle splines, all connected to a transit station park.

**Station / Transit Park**
A station park is situated beside the transit stop to provide a visual public catchment area for the area around the station. The station park is always surrounded by a dense mixed functions and car park facilities.

**Bicycle Spline**
Bicycle splines are strips of car-free road that acts as a circulation area for bicycles and pedestrian, as well as creating a secondary public space. All the bicycle splines merge with the existing public space along the way, creating a continuous public space experience. Providing shade and landscaping should be emphasized on bicycle spined to create a pleasant walking/biking experience. The bicycle splines are always surrounded by mixed functions. It can be used to establish a shopping street quality to a neighborhood. Ideally, the bicycle lane should be noticeable by using different color, creating marks or tree shaded area.

**General Provision of Parks**
Generally people needs open space / park. Following this rule, a park should be available for public within a walkable distance.

Knowing the nature of the park in Jakarta (often neglected, or a place that is perceived as a crime-prone area. It is important to create the park as open as possible; and to create a community activity within the park (e.g. community garden)

**How to Achieve?**

**Introduce a Bicycle Spline following the Street with the Highest Degree of Connectivity**
By introducing a direct street to the BRT stop so that a direct line is available from the subjected neighborhood to the BRT stop. Establishment of a direct street that is inaccessible for cars and pedestrian friendly could create a very vital shopping street on the subjected area.

**Public Space Within 400m of walkable radius**
A public space is important to create a desirable environment. A public space should be available within a walkable radius (400m). Below are alternatives of public space that can be implemented on the urban fabric:

- Community garden can be implemented according to demand of the site. Community garden will help create people’s awareness to keep the environment desirable.
- A transit park should be implemented around a transit stop as a focal point.
- Street furnitures / amenities and a good tree shading quality is needed to create a desirable condition for pedestrian.
- Private parking ground can be turned into a public space.

**Reducing the Perception of Crime – Space Syntax**
A long street with few branches are prone to burglary. A long street with few branches also create a perception that the area is empty and not very pleasant to walk.
An ideal branches within a road should be ideally less than 100m to be pedestrian-friendly. Tall fences or walls should be discouraged, a shorter hedge can be used as an alternative. Facade should be created with lots of openings.

5.5 Strategy: Infrastructure Aspect

Improvement of BRT Lane and BRT Stop

Busway lane should be organized so that it doesn’t segregate the urban fabric. Transit stop facilities should not be isolated from the urban fabric. A good transit stop should be surrounded by several functions to support its function as a focus of activities.

Centralized Car Park Facility

Car park facility is important to create alternative for people otherwise enable to walk or bike. Most of the parking facility in Jakarta are private parking

Fig. 5.5.1 Transformation of the organization of the buslane. BRT station need to be integrated close to the urban fabric.
Source: Author

Fig. 5.5.2 Scheme of long term development for the BRT system.
Source: Author
facility. A public and centralized parking facility can serve as a facility that would is important to create alternative for people otherwise cannot walk or bike. This is true especially in a commerce area e.g. CBD. A centralized car park facility can help to create a desirable experience around an area.

How to Achieve?
Accessible BRT Stop
BRT lane can be placed closer to the urban fabric to provide easier access to the BRT stop (especially in large road). This would create an integration of the entire system and the integration of the BRT stop with the urban fabric.

Sustainable BRT Lane
There are several scenarios to improve the sustainable quality of the BRT lane. The lane can be later covered with grass. In the case of the improvement the entire transportation (reducing the use of oil, etc.), the bus can be later transformed into an electric, non-polluting tram. This can be done step by step by upgrading the existing bus into a guided bus, and later upgrading it into a tram (which would be able to accommodate more people into the system.)

Car Park – Transit Stop
A location for a car park should be close to the transit stop and within a walkable radius of 400m. Along the way, a desirable pedestrian-oriented public space should be created.

Transit Park
Transit stop should be surrounded by supporting activities. One such example is the creation of a transit park around a transit stop, surrounded with supporting functions, to focus the activity around the transit stop.
5.6 PHASING
The phasing strategy of this project is based around the new transit stop. The introduction of BRT brings more people to a place that is once unconnected because of the increasing traffic and low mobility.

The strategy is divided into two, the urban intervention and infrastructural intervention. The organization of the phasing is aimed toward low cost change for maximum effect. The urban intervention strategy is centered on the reorganization of the space. It is first started with the introduction of an integrated network on the already populated area to create a flow for the increasing people. The second strategy is the upgrading of a function to create a more efficient land use of the area. The third strategy is the establishment of a mixed use dense housing to create more space for the increasing value of the area. The fourth strategy is to provide amenities such as parking space to increase the desirable condition for public space around the area. If the urban intervention is fulfilled, the second part of the phasing, the infrastructural intervention, can be implemented. Infrastructure upgrade is a longer phase and will involve an upgrade of the streets as well as technological upgrade of the existing BRT system to support the idea of sustainable-nodal city.
6.0 STRATEGIC INTERVENTION - ANALYSIS
6.1 BRT LINE ONE
6.2 INTRODUCTION: GENERAL IMPRESSION
6.3 BUILDING TYPOLOGY
6.4 DISTRIBUTION OF FUNCTION
6.5 CONNECTIVITY
6.6 BRT STOP TYPOLOGY
6.7 CONCLUSION: SWOT ANALYSIS
6.1 BRT Line One

The nature of this analysis is to provide samples of design intervention that can be done after implementing the proposed strategic design to implement a TOD in Jakarta. The samples given is not meant as the only absolute solution, but as an alternative solution for various solutions that can be applied.

There are many kind of urban fabrics in Jakarta, most of them are residential use. For simplification, the area of interference chosen for the project is the transit stops along the main BRT line one. This line is chosen because this line gave the most varied kind of neighborhood in Jakarta.

Since most area in Jakarta are residential areas, the chosen area are dominated with the characteristic of a residential area, or an area that has a potential to be developed as residential areas. The chosen areas are the Kota BRT Stop (a historic center of Jakarta), Mangga Besar BRT Stop (the informal housing, most typical area of Jakarta), Setiabudi BRT Stop (the central business district of Jakarta), and Blok M Terminal (the formal housing, a very automobile-dependent area of Jakarta).

Fig. 6.1.1. Four chosen case studies along Line 1
source: Author.
6.2 Introduction - General Impression

BRT Stop Kota – The Historic Center
Kota area is the historic city center of Jakarta, also known as Old Batavia (Oud Batavia). The area is small, spanning for only 1.3 square kilometers of both North Jakarta and West Jakarta. The city was arranged in several blocks separated with canals. The situation of the Kota area remains neglected since the 1970s. There is not enough effort to protect and conserve this area. Many remaining historical buildings are steadily deteriorating. However, there is still effort of restoration. Since late 2007, the government closed the Pinangsia street and replace it as pedestrian.

In an urban point of view, this area has several strength, such as a must visit touristic center of Jakarta. It is surrounded by heritage buildings and great public spaces. The weakness of the area is the abandoned buildings. The remaining buildings are used as warehouses or offices. There is lack of entertainment or leisurely places in the area. There is an opportunity to use the remaining street and turns it into pedestrian area. The fact that most of the area are state-owned is also an opportunity. The three-step analysis shows that the area has a good local connectivity, which is another opportunity to develop a shopping street. The far proximity of this area from the real center of Jakarta may cause further neglecting of the area.

Typical deteriorating condition of the historic buildings in Kota. Most of the building are used as an office or a warehouse, most of them went to bankruptcy.
source: Google Earth

Fatahillah Museum, or Stadhuis van Batavia, is one of the surviving building in the area.
source: Google Earth

The route leading to the Kora BRT station is complicated. People have to cross the road and then go up winding a circular ramp to reach the BRT station.
source: fondus.blogspot.com

The way out of the BRT station can only be reached by following an underground route. The station is isolated by the road.
source: fondus.blogspot.com
BRT Stop Mangga Besar – The Informal Residences
The BRT stop Mangga Besar is located around a typical informal housing of Jakarta: It is a stretch of street, with no pedestrian path, and with houses that avoids contact with the outside. The typology of the buildings are either closed with high fences, or has few openings (which is also caused by believe of high crime level in these areas).

The neighborhood is also located close to the Glodok shopping center which is a Chinese town as well as the pribumi (local) people.

The strength of this area is the high connectivity of the area, both local and global. The weaknesses are that the area has inefficient land use. The many streets of this area don’t really connect with the transit stop. The building typology also caused low visibility for some of these streets. The opportunity of these areas is that most of the building typology is flexible and can be easily modified, although a negotiation with the private owner of the area should be made.
BRT Stop Setiabudi – The CBD
Setiabudi Transit Stop is located in the middle of the Sudirman Central Business District. The area is characterized by tall building with a ‘privatized’ typology. All of the building in the CBD area are ‘private’, which means that the only people who can enter the area around the building is the user of the building. This kind of typology caused the roads to have a very few opening, and thus contributes to the low visibility of the area. Public spaces are lacking, because most of the open spaces are turned into a private parking area. Some buildings has their own canteen/restaurant, in which an interesting phenomenon happens. Workers who work in buildings with no canteen or restaurant started to move to these area. This is a proof that people are walking in this area but they often are faced with undesirable walking condition.

Most of these international corporate are located close to the Sudirman street, the main artery of the CBD. Just behind these highrises are neighborhoods. Some residences are formal housings that is well-organized, some are small informal residences that are either abandoned by their owner or turned into a rental for people who worked in the adjacent companies. The conditions of this area are often very poorly maintained, and are not feasible to be maintained. From this fact, there is an opportunity of redeveloping these area, whilst on the other hand, there is a threat that the redeveloped area might face a threat of an increasing car use because of the upgraded connection.
6.0 STRATEGIC INTERVENTION - ANALYSIS

BRT Stop Halte BLOK M – The Formal Housing

BLOK M is a business and shopping quarter located in Kebayoran Baru, South Jakarta, Indonesia. The development is less modern than some developments around this area. Many buildings are not maintained and deteriorating. Even so, these areas are quite crowded daily, and even more at night. The quarter is very popular because of the cheap goods, the adjacent nightlife, and the close accessibility to the center.

The adjacent neighborhood is one of the most exclusive residential areas in Jakarta where many prominent Indonesians live. The area was intended for a solely residential area, but because of the high connectivity of this area, some of these areas are run as places for businesses, especially by Korean expatriates. The strength of these areas is the formal houning with well-distributed functions. The weakness is the very automobile dependent character of these areas. There is also no connection between the existing low-wealth BLOK M retail area and the neighborhood surrounding it. The good connectivity of these areas, especially the area inside the BLOK M retail area can be used as an opportunity to create public space. The fact that the area is state-owned is also an opportunity for this area.

The shopping quarter Blok M’s public space is mostly a road for cars. source: fondus.blogspot.com

Blok M Bus Terminal is the southernmost point of the BRT’s Line One. source: www.panoramio.com

Typical residential area in the neighborhood, a very low dense residential. source: Google Earth

Pathway is available, but nobody uses it. The pathway is poorly maintained. source: fondus.blogspot.com
6.3 Building Typology
The building typology analysis shows the quality of housing around an area and the density of an area. The denser the surrounding neighborhoods around a BRT stop. Basically there are 5 types of building typology in Jakarta: big governmental building, main commercial area (internationally oriented), civic building (for the use of the common people), organized formal residential, and fine-grained informal residential.

Conclusion
Kota - Abandoned Buildings
The buildings are colonial Dutch-style housing located along the canals. All of the buildings (except the one located inside the protected area) are in terrible condition, all are threatened by inefficient industrial activities which sometimes uses the building in the historic center as warehouses.

Mangga Besar - Lack of Facility
This area is a dead end to enter in the sense that there is no facility within the inner neighborhood. The buildings are closely packed, targeted toward the low income, and some are either in a very bad condition or owned by a rich person which creates a very bad sense of architecture for the area. Working places and shopping facilities are relatively few, usually located along the main road.

Setiabudi - High Contrast
Highrises of large international business corporate and occasionally extremely wealthy apartments are centered along the main corridor of the CBD. Inside this area is a generally unconnected low income, informal housing, and some schools (usually targeted for the low income). More dense pattern are on the north side, which is not part of the CBD and generally a housing for low income as well.

Blok M - Large Detached Houses
High wealth housing dotted the places. All are fenced and usually have their own security guard. Some houses are turned into something else, usually Korean Restaurants or Boutiques. Trees are plentiful, walking is a nice experience (except that they don’t have pedestrian way to walk on). Roads are generally empty, except around the Blok M station.
6.4 Distribution of Function

The function analysis is to represent the variety of potential users nearby the area by counting the number of activities per different function. In this case, the activity is decided to be entertainment-leisurely-base activity, services to people, and workplaces. This will give a closer picture of the social environment surrounding the area.

To decide this, the functions around an area of 700m in radius (the bikable distance) is analyzed. The total percentage of the functions is summed. According to the defined set-up, calculations have been made for the ideal percentage of the functions to produce a balanced daily life. The percentage, as it was mentioned before, is 65% entertainment areas, 20% services, and 13% workplaces.
6.0 STRATEGIC INTERVENTION - ANALYSIS

**Setiabudi**

- **Upscale Bars**
  - Most bars are located inside the highrise which was located along the main road of the area.

- **Unconnected Schools**
  - Most schools are located inside the highrise, but it is not very connected from the bus station, and it is threatened by the appearance of large-scale companies which are attracted by the benefits of the area.

- **The Golden Triangle**
  - This area is one of the major business centers called The Golden Triangle. The golden triangle is composed of three main roads and is largely automobile-dependent, despite its close proximity to each other.

- **No Public Places**
  - Parking places are provided by the highrise. There is no public place.

**Blok M**

- **Blok M Plaza**
  - The main bus stop is located around the Blok M Plaza, a business and shopping quarter selling luxury products. Upper scale shopping centers are Blok M and Pasaraya Plaza. Restaurants are plentiful, from inexpensive places to expensive ones.

- **Good Services**
  - Services are plentiful around the area, although not within the reach of the station.

- **Small Workplaces**
  - There are some small workplaces.

- **Semi-Private Spaces**
  - Public places are mostly private-oriented, targeted toward the residence of this area, which is mostly high-end residences. Some local retail is near the public places. One park close to the station is well-used but has limited space. Public places of this type are mostly private-oriented, such as private swimming pools, etc.
6.5 Connectivity
The connectivity analysis is divided into the public transportation map and the space syntax’s three-step analysis map. The public transportation analysis shows the available connection around the transit stop. The space syntax’s three-step analysis shows the degree of the connectivity of an area on a certain walkable or bikable radius (shown by the 2 circular lines, each of radius 400 m and 700 m around a transit stop). If the lines of the three-step analysis is well spread inside these radiuses, it means that the area is well connected. If the lines are few, then the area is now well connected.

Kota

The connectivity inside the walkable radius is well-connected, but the connectivity within the bikable radius is not well-connected. Connectivity is very low, only distributed around the protected center. Most of the other area of the historic center is not well-connected.

Kota BRT Transit Stop is connected with the Kota railway station.

Public Transportation

Three Step Analysis
The connectivity inside the walkable radius is well-connected, but the connectivity within the bikable radius is not well-connected. Connectivity is very low, only distributed around the protected center. Most of the other area of the historic center is not well-connected.
Three Step Analysis

The bikable radius doesn’t receive enough connection especially on the west side and on the east side of the BRT station. Connectivity is very high because of the main north-south axis. Despite of this, the connectivity to the west-east axis is relatively low.
Three Step Analysis
Connectivity is extremely low, both on the walking scale and on the biking scale. Connectivity is extremely low. The long main axis doesn’t create enough “branches” to distribute the connectivity.

Public Transportation
There are many connections from the Setiabudi BRT Stop. It is also relatively close to Line 6 transit stop (Karet Kuningan BRT Stop), which is the southern suburb line.
Blok M Terminal is the southern end of line 1. It is a BRT stop as well as a Bus depot for other buses.

Three Step Analysis
Connectivity is relatively high. The walking radius has many connections. The biking radius has a lot of connection as well, but there are many long lines with few branches.
6.6 BRT Stop Typology
Station typology shows the typology of the existing BRT Stop. This is shown to understand how is people moving from or to the BRT station.

Kota BRT station
Kota BRT station are special because it has to be connected to the Kota Railway Station located adjacent it. There is an opportunity of creating a lively public space in the area. Instead, the only public space for people is located underground, as an empty alley that leads to one function. The space above is used for car traffic. This is indeed not a simple solution.

Mangga Besar BRT station
Mangga Besar BRT station is a typical example for a BRT station in Jakarta. It is located in the middle of road, segregated from the urban fabric. Since on the middle of the street is a canal, the transit stop is divided into two parts that connect the two stations on the either side of the canal.

Setiabudi BRT station
Setiabudi BRT station is another typical example for a BRT station in Jakarta. It is located in the middle of road, segregated from the urban fabric.

Blok M BRT station
Blok M BRT station is located in the southernmost point of the BRT’s Line 1. It is integrated with the bus terminal, of which integrated to a retail center. Instead of this close proximity, there is no public space in this area (apart of several parks dotting the area that are not connected in anyway with the two functions).

Conclusion:
It seems that the car traffic is still prioritized over walking or cycling. People are obliged to walk above or under the road network to avoid it. Open space for people are lacking, most open spaces are either carpark facility or roads.
Setiabudi

Blok M

6.0 STRATEGIC INTERVENTION - ANALYSIS
6.7 Conclusion: SWOT analysis

Generally the problem of the BRT station can be divided into four aspects based on the strategic planning: urban villages, public space, supporting amenities, and infrastructure / connectivity.

On the "urban villages" aspect, the problem is either the lack of facility or the lack of dense mixed-use function.

On the "public space", most of the problems are allotted to the lack of public space around the BRT stop.

On the "supporting amenities" aspect, the problem is mostly related to the provision of parking area for the effected area.

On the connectivity-infrastructure aspect, the problem is related to the space syntax research and provides a reason for making an intervention on certain area.

The explanation of each urban area is described in Fig. 6.11.1

<table>
<thead>
<tr>
<th>BRT STOP</th>
<th>Urban Villages</th>
<th>Public Space</th>
<th>Supporting Amenities</th>
<th>Connectivity - Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOTA</td>
<td>S Historic city center, national heritage, canals, touristic potentiality.</td>
<td>S Available open space surrounded by heritage building.</td>
<td>W Badly placed parking area, e.g. segregating the building with the canal.</td>
<td>S Good local connectivity.</td>
</tr>
<tr>
<td></td>
<td>O Existing building already has a typology of a dense housing. Existing building can be turned into mixed-use housing. Vacant warehouses and offices can be re-organized into different supporting functions.</td>
<td>W The area outside the main historic center area has no public space.</td>
<td>O Space along the canal can be transformed into public space.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W Lack of entertainment area, Neglected, unconnected area in the west.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANGGA BESAR</td>
<td>W Inefficient land use (single-zoning, non-mixed-use)</td>
<td>W Lack of public space because of a closed building typology, which contributes to the low visibility of the area.</td>
<td></td>
<td>S Good global and local connectivity, the area is thriving for commercial center and/or shopping street.</td>
</tr>
<tr>
<td></td>
<td>W Commercial areas are concentrated in a mono-functioned building or offices located along the main route. Most of this facility are private.</td>
<td>O Empty lot close to the BRT station.</td>
<td></td>
<td>W Low visibility</td>
</tr>
<tr>
<td></td>
<td>W The area outside the main historic center area has no public space.</td>
<td></td>
<td>S Strategic area may be &quot;threatened&quot; by motorized transportation.</td>
<td></td>
</tr>
<tr>
<td>SETIABUDI</td>
<td>S Organized, dense building located closer to the BRT station.</td>
<td>W No public space</td>
<td>W No centralized parking area.</td>
<td>W Inner neighborhood is not connected to the BRT station.</td>
</tr>
<tr>
<td></td>
<td>O People are leaving the inner neighborhood, turning them into cheap small rentals. There is an opportunity to renovate the area.</td>
<td>W No human mobility. Car-oriented.</td>
<td></td>
<td>O The area is close to other BRT station of the Line 6. There is an opportunity to connect both BRT station.</td>
</tr>
<tr>
<td></td>
<td>W The inner neighborhood is a low dense residential with an unclear land use and temporary illegal buildings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOK M</td>
<td>S Commercial areas around the terminal, well-distributed functions</td>
<td>S Parks</td>
<td>W Lack of pathway</td>
<td>S Good local connectivity.</td>
</tr>
<tr>
<td></td>
<td>W Low-dense housing, car-oriented planning.</td>
<td>W Lack of connected public space. Available open space in the commercial areas are used for parking.</td>
<td>W Divided social class</td>
<td>W Automobile-oriented planning. All existing streets are used for cars.</td>
</tr>
</tbody>
</table>
Fig. 6.7.1 General characteristic of the study case area based on the conclusion of the SWOT analysis. Kota’s problem is the deteriorating historic center caused generally by misuse of landuse. Olimo and Setiabudi’s problem is the unconnected inner neighborhood to the BRT Stop. Blok M problem is the automobile-dependent residentia and the Blok M retail area that is unconnected with the adjacent residential area.
7.0 STRATEGIC INTERVENTION
7.1 BRT LINE ONE
7.2 KOTA BRT STOP
7.3 MANGGA BESAR BRT STOP
7.4 SETIABUDI BRT STOP
7.5 BLOK M BRT STOP
7.0 STRATEGIC INTERVENTION

In this part, several samples of strategic design implementation will be mentioned briefly. This solution is not meant to be the only solution, but rather an example of what is the result of an implementation of the strategic planning on the given site.

The result given may not be the best solution for implementing the idea, but based on space syntax research, the given result will produce the best result for integrating a BRT transit stop and the urban fabric, regardless of any conflict that might rise, such as the claiming of land or the demolition of buildings.
7.1 Kota

Problem Context

Before the implementation, Kota is supposed to be a touristic center, the old town of Jakarta; with museums and heritage buildings. Despite of the touristic center status, the area is lacking of entertainment facilities and most of the area is filled with abandoned warehouses or businesses.

Except for the area around the main square (Fatahillah Square), the area is completely paved for car use. The historic area along the canal is used by cars.

In the design intervention, the unused warehouses and office buildings are turned into a mixed-use building consisting of a retail area, small businesses, and residential area on the upper level. On the urban level, this would create a variety around the area, improving the area into a potential touristic center.

The introduction of a shopping street area (by implementing the bicycle spline concept) create a desirable walking experience in the area. Car removal create a new urban space that replaced the lack of public space in the Kota area.
1. establish bicycle spine

2. connect existing public space

3. urbanize the building (mixed use attached housing with leisurely five utilities and civic facilities e.g. cafes, retails, hotels)

4. urbanize the building (mixed use dense highrises)

5. add amenities

6. extend the busline, establish clear roads in the eastern area
7.0 STRATEGIC INTERVENTION

- Historic City Center Area
- Motorway along the canal can be transformed into a public space.
- European Building Typology, suitable for mixed-use

Legend:
- Green: denser, mixed function building
- Grey: public space
- Black: existing

Before
Connect the Western area with a bicycle spline
A new axis consisting of mixed-use residential and retail area reconnect the area on the west with the touristic historic center

Reclaim the area along the canal for pedestrian use
Change the motorway into a pedestrian-only street with supporting function

Parking Area near BRT stop
Provide a collective parking building as a transit point around the BRT transit stop.

Introduce a dense highrise of mixed-use building
Located inside the walkable radius, close to the station.

Opportunity, extend the busline
A BRT station is introduced in a walkable 300 m space so that the line can be extended to the touristic Sunda Kelapa Harbor area

Transform the Building Use
Existing building is transformed into a mixed-use building consisting of residential and retail area.
Jalan Kali Besar Barat (before).

The area along the canal needs to be reclaimed for people. Before the intervention, the street is used for motorway (8m), with an addition of 3m used for parking space. Pedestrian pathway along the canal is only 2m wide, as well as on the other side of the road.

The buildings along the canal are usually banking companies or warehouses, some of them are out of business. The building condition is very bad, because of the badly performing businesses.

There is a lack of public amenities / furniture for people. The street lamps are badly maintained.
Jalan Kali Besar Barat (after).

A wide 4.5 meter pathway (besides the buildings) and 6.5 meter pathway (besides the canal) is introduced. Street amenities are introduced to support pedestrian activities. Both pathway are integrated to one another by introducing a narrower 5 meter motorway (including the provision of bicycle lane). Street planting is also introduced.

The workplaces and warehouses along the canal are turned into a mixed-use area consisted of residential area and commercial area.
Jalan Kopi (before)

All the existing space in the street is used either as parking areas and motorway. There is no pedestrian path. Pedestrian are expected to use the remaining space that is usually used for motorway. There is no street furniture e.g. trees or chairs.

The buildings are usually banking companies, warehouses, or abandoned buildings. The building condition is very bad, because of the badly performing businesses.
Jalan Kopi (after)

The whole street is pedestrianized with the concept of bicycle splines. A segregated bicycle lane (1.6m, both sides) is introduced. The street is also refurbished with street amenities e.g. trees and street lamps to create a desirable pedestrian-oriented space.

The buildings are converted into a mixed-use area consisted of residential area and commercial area.

Fig. 7.1.1. Singapore’s Duxton Road, is one example of a historic area that is once a slum area but turned into a mixed-use entertainment area.
source: Google Earth
7.2 Mangga Besar

Before the strategic design implementation, the area around the Mangga Besar BRT stop was used as a residential area with no supporting functions. The land use of the area doesn’t get any advantage of its close proximity to the BRT stop.

In the design intervention, the residential area is upgraded to include mixed functions and amenities. The street in the area is upgraded by introducing a bicycle splines. The adjacent new urban functions creates a desirable walking experience on this area. Trees and gardens maintained by people in the neighborhood contributes to the desirable pedestrian oriented atmosphere.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>establish bicycle spines</td>
</tr>
<tr>
<td>2.</td>
<td>create public space</td>
</tr>
<tr>
<td>3.</td>
<td>urbanize the building (mixed use attached housing with civic facilities e.g. nursery, night class, library, etc.)</td>
</tr>
<tr>
<td>4.</td>
<td>urbanize the building (mixed use dense residential, stacked residential close to the transit stop, mixed with leisure facilities (e.g. restaurant, retail, stores) and offices.</td>
</tr>
<tr>
<td>5.</td>
<td>add amenities</td>
</tr>
</tbody>
</table>
7.0 STRATEGIC INTERVENTION

- **O** Good global and local connectivity. The area is thriving for a shopping street and/or retail area.

- **W** General lack of public space.

- **W** Retail close to the BRT has no public space.

- **W** Inefficient land use, residential area with no supporting facilities.

- **W** Low visibility because of the building orientation and typology.
Introduction a dense highrise of mixed-use building
Located inside the walkable radius, close to the station.

Create transit park close to the BRT with supporting function
This will provide a public space for people and a transit point for cars and/or bicycle.

Introduce a bicycle spline
Because of the high connectivity, street should be reorganized into shopping streets with vegetation.

Reorganize building typology
Building typology is changed so that it creates variation for sight and create visibility to the street.

After
Jalan Kesejahteraan (before)

Before the intervention, the relatively narrow street of Jalan Kesejahteraan near the Mangga Besar transit stop, is used solely as a car-oriented space. There is no pedestrian path or street furniture. Both sides of the street is flanked with fences that creates a feel that the street is empty with no activity (based on space syntax, this crime-prone feeling is related to the lack of "visibility" on a street).

Despite its close proximity to the transit stop, most of the building in the area are single-use, residential buildings or commercial buildings.
Jalan Kesejahteraan (after)

The intervention reorganized the street into a pedestrian-oriented street. Community garden is established to create an urge to the people to maintain the space. Stalls for occasional traditional market may also be introduced to create vitality in the area.
7.3 Setiabudi CBD Area
Before the strategic design implementation, the area around the Setiabudi BRT stop is a large and vital central business district area in Jakarta. There is no urban space around the BRT stop, except the pedestrian area which basically only-used for walking with no outdoor facilities. Within the area are neighborhood of rentals and residential areas that mostly is abandoned or sold because of the rising land price (assumed). The quality of these housing are low and the streets are narrow. Most of the houses are two floored housing, and is a low dense housing

After the design implementation, the area is reorganized to include new urban space by opening and converting the existing private area into a new urban space that is accessible for pedestrian. In the inner areas, the neighborhood has been upgraded to include new retail areas further in the neighborhood (created by upgrading the existing housing into mixed-use functions)
1. establish bicycle spines
2. connect existing public space
3. urbanize the building (mixed use attached housing with multipurpose facilities and civic facilities e.g. cafes, offices, nursery)
4. urbanize the building (mixed use dense building)
5. add amenities
6. infrastructural interference

7.0 STRATEGIC INTERVENTION
W
Low dense residential with unclear land use

S
Organized dense-use building close to the BRT station.

W
Large parking areas for each office building. Lack of public space

W
No human mobility, car-oriented planning

W
Inner neighborhood that is not connected to the BRT stop.

O
People are leaving the inner neighborhood, turning the buildings into cheap small rentals, often the state is very bad. There is an opportunity to renovate the area.

O
Close to other BRT transit stop, strategic area.

7.0 STRATEGIC INTERVENTION
Introduce a dense highrise of mixed-use building
Located inside the walkable radius, close to the station. This new highrise should support low income people too. Variety is important.

Parking Area near BRT stop
Provide a collective parking building as a transit point around the BRT transit stop.

Connect the two BRT stops with a direct line for bicycle (bicycle spline)
Introduction of bicycle spline will create a new connection and new supporting functions for the inner neighborhood.

Densify the inner neighborhood
The unclear land use and poorly densified typology should be densified to accommodate the increasing interest of the land.

Opportunity, introduce a shuttle to connect the two BRT transit stop
Introduce a feeder loop that can transport passenger between the two transit stops.
Outer Neighborhood Street (before)

Before the intervention, most of the land are private. There is no public space or public plaza. Parking area is very dominant in the area. All open spaces are allotted for parking building.
**Outer Neighborhood Street (after)**

The interventions create a transit park that is located right beside the BRT transit stop. The existing parking building in the area is converted into a retail, the entrance to the inner neighborhood.

Existing open carpark are turned into a pedestrian-oriented public space with parks and adjacent retails. A collective parking buildings replaces all the parking area on the site, which is now has to be converted into a public space.

Still within the walkable radius of 400m, a new mixed-use/residential building is established. The building has retails on the ground floor to accommodate the area.

Bellevenue Tram Stop (Zurich) can be used as a model for future transit stop.
source: Google Earth
Inner Neighborhood Street (before)

Before the intervention, the street pattern and organization of the land use is disorganized. Some streets are only 3m wide for traffic on both sides. There is no pedestrian area (although some existing narrow street (sometimes only 1 meter wide) can only be used by pedestrian).

The land use of the area is disorganized. Most of the existing buildings are temporary residential (e.g. rentals for workers or immigrants) or have been sold out. There are many empty lots.
Inner Neighborhood Street (after)

The interventions create an organized street use: a 3m segregated bicycle lane on both side, pedestrian lane, and street furnitures (street lamp, trees). The existing buildings are re-densified into mixed-use residential buildings with retails on the ground floor. The upgraded function creates a desirable condition for pedestrian along the bicycle splines. It is important to maintain variety for the residential, especially the provision of residential for both the rich and the poor. An interesting typology is also important; greenery can be introduced on the buildings to create a terrace garden. Empty plots are turned into mixed-use developments or public spaces.

Las Ramblas in Barcelona, a pedestrian boulevard. Source: http://cortney7.files.wordpress.com
7.4 Blok M
The Blok M terminal stopped at a retail center that is famous in Jakarta for its cheap electronic products. The area around this retail center is privatized, and cars have to pay to enter the area. Despite of the policy, the whole space in the retail center are allotted for car parking.

After the design implementation, a new underground parking space is created to replace the outdoor area with pedestrian-friendly space. The surrounding area is connected to the terminal by bicycle lanes which lead into the area.
| 1. Establish bicycle spines | 2. Connect existing public space | 3. Urbanize the building (mixed use attached housing with leisurely facilities and civic facilities e.g., cafes, retails, hotels) | 4. Urbanize the building (mixed use denser housing) | 5. Add amenities | 6. Extend the bicycle line |
S  
Blok M Retail area concentrated around the terminal

W  
Available open space are used for parking.

S  
Dense grid street network, which contributes to good connectivity in the area

W  
Lack of pedestrian pathway, car-oriented planning.

S  
Parks

W  
Low dense housing, car-oriented planning. Social class differences, people in the residence area doesn’t go to the cheap Blok M retail area.

7.0 STRATEGIC INTERVENTION
Opportunity: Extend the retail area into the low dense neighborhood
Integrate the Blok M retail area with a new retail area on the south to integrate the two social class.

Collective Underground Parking Area near BRT stop
Create a collective parking area to replace the open parking space of the Blok M Retail area

Introduce a dense highrise to produce a more mixed-use quality
Located inside the walkable radius, close to the station.

Reclaim the parking area for people.
Create a desirable walking condition in the retail area

Introduce a segregated bicycle lane
Introduce the bicycle land as a comfortable alternative mean of transportation to the high-income people who live in the area.

Create a desirable walking condition in the retail area

7.0 STRATEGIC INTERVENTION
Jalan Melawai (before)

Before the intervention, the street is belonged to the private area of Blok M Market. Even though people can enter for free and walk around the available space, most of the available open space is converted for parking use. There is no street furniture, etc.

The buildings are single-use workplaces.
Jalan Melawai (after)

After the intervention, the street is converted into a space for bicycle lane, pedestrian, and also space for cars to accommodate the businesses in the area.

The buildings are converted into a mixed-use residential-commercial area.
Before the intervention, the street is solely used as a motorway. A 2m pedestrian path existed in the site, but there is no activity in the area because there is no function in the area. Most of the lots are used as a residential (with a very privatized typology). A large area close to the site is an abandoned school lots that can be turned into another use.
Jalan Panglima Polim (after)

The intervention introduces the street with a 2.5m segregated bicycle lane.

The empty school has been converted into a mixed-use residential commercial area that extends the mixed-use area of Blok M into the existing residential. New housing is introduced in the area; varied typology is introduced to avoid the area turned into either rich or poor neighborhood. Available open space is used as a pedestrian-oriented space such as plazas with street furniture e.g. street lamp, trees, and stalls.
7.5 Station (Local case: Setiabudi Transit Stop)

**Before**
Before the intervention, the available space on the street is the 4.5m wide pedestrian area that is used heavily by the workers on the area. Despite of this, the condition for walking in the area is not very desirable. The space is only used for the purpose of mobility from one building to another. There is no trees or other street furniture.

The BRY stop is located on the middle of the street. There is no integration between the BRT stop and the urban fabric around the stop.

**After**
After the design intervention, The entire BRT system and the BRT stop is integrated to the urban fabric along the road. The BRT stop also created a new focal point for the people. The station location is now easily accessible especially for handicapped people.

A bicycle line is established along the bus lane. The close proximity of the bicycle lane and the pedestrian way create a sense of closeness for the people around to try this alternative mode of transportation, especially to avoid traffic jam.
7.0 STRATEGIC INTERVENTION

Before:
- Private carpark
- BRT stop

After:
- Transit park
- BRT stop
### 7.6 Building Typology

The following table shows what kind of building can be introduced to the site. To assume what type of building is suitable for an urban fabric, a calculation is made based on the PERMETA index or urban use. Available through [http://www.permeta.nl/spacemate/index2.html](http://www.permeta.nl/spacemate/index2.html).

<table>
<thead>
<tr>
<th>Area</th>
<th>Footprint</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>Type</th>
</tr>
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<tbody>
<tr>
<td>3000 m²</td>
<td>1500 m²</td>
<td>0.50</td>
<td>3.00</td>
<td>0.16</td>
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</tr>
<tr>
<td>9000 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 7.6.1 Index of urban use (right)**

Source: [http://www.permeta.nl/spacemate/index2.html](http://www.permeta.nl/spacemate/index2.html)

Reference: Walkable

<table>
<thead>
<tr>
<th>Area</th>
<th>Footprint</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000 m²</td>
<td>2000 m²</td>
<td>0.66</td>
<td>2.66</td>
<td>0.12</td>
<td>GSI High Density</td>
</tr>
<tr>
<td>8000 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GSI High Density**

FSI High Compactness

OSR Low Open Space

Reference: Walkable

<table>
<thead>
<tr>
<th>Area</th>
<th>Footprint</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>Type</th>
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<tr>
<td>4000 m²</td>
<td>1500 m²</td>
<td>0.37</td>
<td>2.25</td>
<td>0.27</td>
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<td>9000 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GSI Medium Density**

FSI High Compactness

OSR Medium Open Space

Reference: Walkable

<table>
<thead>
<tr>
<th>Area</th>
<th>Footprint</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000 m²</td>
<td>2000 m²</td>
<td>0.66</td>
<td>2.66</td>
<td>0.12</td>
<td>GSI High Density</td>
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<tr>
<td>8000 m²</td>
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<td></td>
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**GSI High Density**

FSI High Compactness

OSR Low Open Space

Reference: Walkable
### 7.0 Strategic Intervention

<table>
<thead>
<tr>
<th>Reference</th>
<th>GSI (Ground Space Index)</th>
<th>FSI (Floor Space Index)</th>
<th>OSR (Open Space Ratio)</th>
<th>L (Floor number)</th>
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<tbody>
<tr>
<td>Walkable</td>
<td>0.11</td>
<td>1.76</td>
<td>0.5</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Area = 17000 m²</td>
<td>Footprint = 2000 m²</td>
<td>OSR = 30000 m²</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L = 15</td>
<td></td>
</tr>
</tbody>
</table>

**GSI Low Density**  
FSI Medium Compactness  
OSR High Open Space

<table>
<thead>
<tr>
<th>Reference</th>
<th>GSI (Ground Space Index)</th>
<th>FSI (Floor Space Index)</th>
<th>OSR (Open Space Ratio)</th>
<th>L (Floor number)</th>
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<td>0.66</td>
<td>2.66</td>
<td>0.12</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Area = 3000 m²</td>
<td>Footprint = 2000 m²</td>
<td>OSR = 8000 m²</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L = 4</td>
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**GSI High Density**  
FSI High Compactness  
OSR Low Open Space

<table>
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<th>Reference</th>
<th>GSI (Ground Space Index)</th>
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<th>OSR (Open Space Ratio)</th>
<th>L (Floor number)</th>
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<td>3.34</td>
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<td>6</td>
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<td></td>
<td>Area = 43000 m²</td>
<td>Footprint = 24000 m²</td>
<td>OSR = 144000 m²</td>
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</tr>
</tbody>
</table>

**GSI High Density**  
FSI High Compactness  
OSR Low Open Space

<table>
<thead>
<tr>
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<th>FSI (Floor Space Index)</th>
<th>OSR (Open Space Ratio)</th>
<th>L (Floor number)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.23</td>
<td>0.46</td>
<td>1.65</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Area = 43000 m²</td>
<td>Footprint = 10000 m²</td>
<td>OSR = 20000 m²</td>
<td></td>
</tr>
</tbody>
</table>

**GSI Low Density**  
FSI Low Compactness  
OSR High Open Space

---

**Physical density of an area**  
Compactness of an area  
Use of open space in area  
Average Building Height  

- Physical density of an area = Footprint / Area
- Compactness of an area = Gross Floor Area / Area
- Use of open space in area = (Area - Footprint) / Gross Floor Area
- Average Building Height
8.0 LOCAL DESIGN INTERVENTION: SETIABUDI
8.1 SITE AREA FOR INTERVENTION
8.2 DISTRIBUTION OF FUNCTIONS
8.3 BUILDING TYPE
8.4 PUBLIC TRANSPORTATION
8.5 CONNECTIVITY
8.6 LOCAL PROBLEM STATEMENT
8.7 STRATEGIC PLANNING INTERVENTION
8.8 PHASING A FLEXIBLE PLANNING
8.9 THE BICYCLE SPLINE
8.10 PUBLIC TRANSPORTATION BRT
8.11 BUILDING USE AND LAND USE UPGRADE
8.12 BUILDING DENSITY
8.13 THE WALKABLE RADIUS (400m)
8.14 THE BIKABLE RADIUS (700m)
8.1 Site Area for Intervention
Location: The inner neighborhood area between BRT stop Setiabudi (line 1/Red) and BRT stop Kuningan Madya Aini (line 6/Green).

Setiabudi Municipal Area: 884.85 Ha
Site Area: 30.84 Ha

Land Use
Residential: 70% (mostly rentals)
Infrastructure: 8% (narrow streets or alleys)

Open Spaces: 10% (mostly abandoned building sites. There are few public parks)
Industrial: 0%

Public Services: 12% (mostly mosques, there are school complex, hotels, traditional market)
8.2 Distribution of Functions

Upscale Bars
Shopping Center and bars are associated with high income people and is usually located inside the office buildings along the Sudirman Major Artery or Kuningan Major Artery. There are few entertainment areas for the inner neighborhood.

Unconnected Schools
There is a school complex located in the neighborhood.

The Golden Triangle
This area is situated in Jakarta’s main CBD area nicknamed the ‘Golden Triangle’. The golden triangle is composed of three main roads and is largely automobile-dependent, despite of its close approximation to one another. The inner neighborhood in this case, is located just between the two side of the major CBD area.

No Public Places
There is no public place in the area. Most open spaces are used either as parking places or as abandoned construction site. There are many open spaces in the neighborhood area.

Conclusion:
According to the ratio of functions that could produce a balanced living, the inner area needs more entertainment area, less public service, and less workspace.

The area also needs more public space in form of open space. Empty abandoned site or in-between area can be used as an open space.
8.3 Building Type

There are three types of residential areas in the area.

The first type is the 'high living' area, distributed close to the CBD area, most of them are under construction. Some empty land lots on these areas are the result of an abandoned project due to the monetary crisis. This area may provide an opportunity for developing a feasible residential.

The second type is the official residential area of medium-income people, located on the north and the south of the site area.

The third type is the housing in the site area. The site has many low-income residential areas that are mostly sold by the owner. Some people rented their places as rentals to provide a cheap place for low-income people that worked on the adjacent CBD. This housing is very bad in condition. The housing type is of low quality and some are badly damaged. There is no official land use in the area.

Conclusion:
Intervention should be made on the third type housing area. A condition that supports this decision is the condition of the area that is not feasible to maintain.
North view: high-dense apartment

West view: kampung-style residential

East view: CBD area

South view: kampung-style residential

Source: Google Earth
8.4 Public Transportation

BRT Line
- Line 1 - Setiabudi
- Line 6 - Kuningan Madya Aini

Monorail Line
Will be realized in the future, but with the current project management problem, its realization is still unknown.

Other public transportation
None. There are motorbikes (ojeg) that provide cheap service

Conclusion:
The area is closely flanked by two main BRT lines but is not properly connected to it. Some of the inner area are not situated in a desirable walking condition, although it is situated in a desirable cycling distance.

The area is flanked by two BRT line: Line 1 which is the main BRT line and the heaviest line of all. The line is connected to the railway station that in the future will be developed into a main railway connection to Jakarta's main international airport. The Line 1 also connect the area with the suburb area further north as well as expatriate area on the south. The Line 6 is mainly suburb line connecting the area with the suburb to the south.
8.5 Space Syntax - Connectivity
Several analysis of the case study area can be done with the space syntax research. Total Depth Map analysis (r=10) reveals a poorly integrated area in the inner neighborhood to the major route (above). Movement Trace Analysis (agent = 5000) shows that the inner area is not visually integrated with the major route (below).

source: Author
8.6 Local Problem Statement

The problem of the area is generally related to the availability of open space for public.

In the outer edge of the area is a CBD area characterized with tall building with ‘privatized’ typology. All the open space that is located on this area is ‘private’, which means that the only people who can enter the area around this building are the users of the building. Moreover, the open spaces are used for car park instead of public space. Basically there is no park or plaza. This kind of typology caused a condition where the road has few openings / branches to it, creating an undesirable condition for enjoying the available open space. According to the space syntax theory, this condition contributes to the low connectivity and low visibility of the area. The privatized typology also caused the privatization of spaces; most of these spaces are turned into parking area instead of a usable public space.

The inner neighborhood area is a typical kampong area with no land use whatsoever. Most of the small buildings in the area are allotted for rentals, usually used by the low-income employments that worked in the adjacent CBD area. There are also many abandoned or sold plots in the area. Occasionally open spaces do exist, but are reclaimed by the new comers as small restaurants or a shack. The building’s quality is relatively poor and temporary; and is not feasible to be maintained.
Fig 8.6.1 (above) A picture generalizing the problem statement around the CBD area.
Source: Author

Table 8.6.1 Local Problem Statement

<table>
<thead>
<tr>
<th>BRT STOP</th>
<th>Urban Villages</th>
<th>Public Space</th>
<th>Supporting Amenities</th>
<th>Connectivity - Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETIABUDI</td>
<td>S  Buildings close to the BRT stop had already followed the sequence of denser highrise building.</td>
<td>W  No public space.</td>
<td>W  Private parking spaces for each building.</td>
<td>W  Inner neighborhood is not connected to the BRT station by any means. There is little accessibility (only one road) and no feeder public transportation.</td>
</tr>
<tr>
<td></td>
<td>O  People are leaving the inner neighborhood, turning them into cheap small rentals. There is an opportunity to renovate the area.</td>
<td>W  Car-oriented planning (available space is used for car-parking). No human mobility.</td>
<td>W  There is no facility or a transit park / plaza around the BRT stop. The BRT stop is located in the area where there is no supporting functions / activities.</td>
<td>O  The area is close to other BRT station of the Line 6. There is an opportunity to connect both BRT station.</td>
</tr>
<tr>
<td></td>
<td>W  The inner neighborhood is a low dense residential with an unclear land use and temporary illegal buildings.</td>
<td>Human activities happens inside the building, only for the building users (which are workers)</td>
<td></td>
<td>T  Motorized transportation will took over the new street.</td>
</tr>
</tbody>
</table>
8.7 Strategic Planning Implementation

The strategy is divided into two planning phases.

The first phase is introducing public space (bicycle splines) and linking shuttle routes.

The second phase is the refurbishment of the existing building into a compact mixed-use residential-retail development and the strengthening of the bicycle splines (by making it wider and introducing mixed-use development).

The third phase is the reorganization of the BRT system.

Other programs are introduced to the area to facilitate the “commercial” quality that is very prevalent in the site. Facilities that attract business people e.g. media facilities (library), canteens, etc. Facilities for the people that lives in the inner area is also introduced (e.g. nursery, etc.).

First Phase

The first intervention concentrates on the introduction of the bicycle splines on the strip in the inner neighborhood. To achieve this, a bicycle paths is introduced on the street. This would connect the area to the BRT stop in a desirable bikeable distance. On the BRT stop, a transit park and a zoning change will be introduced. A park+ride bicycle station will be introduced around the transit park and in the inner neighborhood in an unoccupied plot.

New form of public transportation is introduced in the inner area to provide more connection. The route may use an existing small public transportation e.g. mikrolet (mini buses) that can later be upgraded as the number of the user increased.

Effect:

The shuttle service will connect the existing BRT stops as well as connecting the people who live inside this area. The introduction of the bicycle lane will give a foundation for bicycle-users to start moving from the inner neighborhood to the BRT station, vice versa. This will give a desirable effect on the inner neighborhood area, making the area more attractive.

Benefit:

- Rental price went high as the inner neighborhood becoming more accessible and desirable.
- Introduced economic-related functions will create activity on the area around BRT station and the park+ride station. People will start using the street.

8.0 LOCAL DESIGN INTERVENTION: SETIABUDI
8.0 LOCAL DESIGN INTERVENTION: SETIABUDI

 denser, mixed function building
 dense, mixed function building
 public space
Second Phase

The second intervention is the strengthening of the new bicycle spline axis. The bicycle spline will need to be widened to 10 m of pedestrian path and bicycle lane. The reason in favor for this is the demand of favorable location in the neighborhood area and the increasing people that went in to the area. Several low quality housing needs to be demolished or renovated to accommodate more people. The sparsely distributed housing will need to be densified. In-between space will need to be filled or converted into open space.

A compact mixed-use housing project will be introduced in the unoccupied plot within a desirable walking distance to the BRT station. According to the methodological research, this should be prioritized for facilitating employees/working people (i.e. a studio type mixed-level of housing). Several commercial-related facilities will be introduced in-between the area.

Integrated carpark facility will be introduced. This will create a base car parking area for the employments and residents alike.

An entertainment-related facility will be created to make the area more attractive.

**Effect:**
New housing will be occupied fast as this area becoming more accessible.

**Benefit:**
- Business grows fast, the area will become an attractive point for the area
8.0 LOCAL DESIGN INTERVENTION: SETIABUDI

denser, mixed function
building

dense, mixed function
building

public space
Third Phase
The third phase is the long-term development of the area. It is the technological refurbishment of the entire BRT system as well as the integration of the BRT stop with the existing urban fabric.

The organization of the lanes will need to be refurbished so that the BRT line will be close to the pedestrian line. Now people can access the BRT stop without having to cross the road. The integration of the BRT stop and the adjacent building brings advantages to the development of the adjacent building. The building can be converted into a transit-oriented development.

A more long term development is the technological upgrade of the BRT system. A series of Bus-guided lane can be created if the Bus use increased. The next thing is the upgrade of the whole system into a tram system. This will reduce pollution and the lane can be layered with greeneries.

Effect:
New bus lane and green strip will create a desirable walking condition for the entire CBD area. Car will have less access to the whole area but the car park. This will become the base for all car-user to start use the area by walking.

Benefit
- Transportation mode will be more sustainable, improving the quality of air. Car traffic will be limited, and the newly improved tram system will replace that.
8.0 LOCAL DESIGN INTERVENTION: SETIABUDI

denser, mixed function building

dense, mixed function building

public space

Legend:
- Dark gray: denser, mixed function building
- Light gray: dense, mixed function building
- Green: public space

0 300m 0 300m
8.8 Phasing a Flexible Planning

Considering the unstable economic condition of Indonesia because of the previous monetary crisis, as well as globalization processes (e.g. rising oil prices and changing lifestyle), the strategic design needs to be very flexible. It is difficult to have a fixed plan in a long-term strategy. In this sense, the strategic design must be flexible.

The first phase of the project is relatively easy to be done because of its small intervention (introduction of the bicycle spline). It is important that the municipal started this first phase of the project as soon as possible. The inner neighborhood transformation is done as a base for a more organized land use in the area for future phase.

The second phase is the phase in which major changes is done. Big investment is needed on the site. Investment is received by the collaboration between public, private, and citizen sectors. Collaboration between TOD and BRT helps invest the project.

The third phase is a macro-scale intervention that would transform the entire Jakarta metropolis into a city with a more sustainable mode of transportation that is able to transform the city. This phase will receive investment from the number of BRT station related TOD in the metropolitan area, and the revenue is used for research and development of the BRT mode.

See Fig. 8.8.1 Phasing for the project.
Source: Author
As for the flexible planning, the author decided to include a two scenario based on the most common issues of Jakarta: the flow of money.

The first phase is relatively easy to be done. All three scenario will need to implement this first intervention. It is important to start the project immediately, especially since the first phase's project are small projects with deep impact (bicycle splines, upgrade of function, etc.). It is important to keep the general vision consistent as well.

Even though the author suggested a flexible planning, it is important that the planning framework is not abandoned so that the vision can be achieved.

See Fig. 8.8.2 Scenario based on the economic stability of Jakarta / Indonesia. Source: Author
8.9 The Bicycle Spline

The bicycle spline is the important element in the design strategy. Bicycle spline is a strategy of not only introducing a clear bicycle lane on an existing, but also the introduction of new public space (p~edestrian path) and new function along the axis.

To achieve this several things need to be done:
- Clear bicycle path
- Upgrading street with new street lighting.
- Stopping point for the bicycle path.
- Supporting economic zone in the area.

Visibility and accessibility is an important element on optimizing the bicycle spline. Both visibility and accessibility will contributes to attractivity and safety of the area, therefore encouraging people to use the space.

The Bike and ride station in the middle of the neighborhood is created to attract people to use the public transportation. This concept is widely used in Netherlands and is a successful concept.

Fig. 8.9.2: The bicycle splines introduced into the neighborhood. In bicycle spline also acts as a connector between the two BRT stops.
Source: Author
8.10 Public Transportation

BRT
In the design intervention, the BRT station is repositioned so that it is now directly adjacent to the urban fabric and therefore easier to access.

For long term planning, there is a possibility to upgrade the BRT system from a bus, into a guided bus, and later into a tram. The upgrading of a bus into a tram may facilitate higher commuters, faster and smoother ride, and it is possible to cover the lane with grass.

The Feeder Bus / Shuttle
To connect the two BRT stops, a loop of feeder bus is created between the two BRT stops. There is a possibility to combine the feeder bus stop with the BRT stop by allowing the feeder bus to enter the BRT lane (design solution is given at the Setiabudi BRT stop). The feeder bus may stop close to the inner neighborhood area, creating another axis of shopping street.

Fig. 8.10.2 The integration between the feeder bus and the BRT stop. Bicycle splines introduced into the neighborhood. In bicycle spline also acts as a connector between the two BRT stops.
Source: Author
8.11 Building Use and Land Use Upgrade

In Jakarta, land use is very disorganized and public space is very lacking. The TOD create diversity of activities and public space by variegating the land use and compacting the urban fabric. Walkable design with pedestrian is put as highest priority.

The land use of the buildings within the walkable distance from the BRT stop is upgraded. The existing parking building is turned into retail and a new collective parking building is created on the site (to provide car use for the three office buildings). This will replace all the car parking facility around the CBD, the carpark is then turned into a public space. In the inner neighborhood, the existing buildings are refurbished by densifying it and introducing a retail area on the ground floor, creating a shopping street along the inner street of Setiabudi.

See page 96 for the detail on the section.
Section East-West

proposed 120m height limit

proposed 16m height limit

parking building

work

work

retail

retail

retail

bike + park facility

mixed-use dense residential area

supporting amenities

central business district

transit park

summer solstice (s)

winter solstice (s)
Fig. 8.11.1 The gateway to the inner neighborhood. This is the meeting point between BRT stop and the feeder bus.
source: Author

Fig. 8.11.2 The transit pocket area close to Jalan Sudirman is the gateway to the inner neighborhood.
source: Author
8.0 LOCAL DESIGN INTERVENTION: SETIABUDI

Fig. 8.11.3 The retail building is a large arcade building that acts as a gateway to the inner neighborhood as well as providing entertainment facilities for the CBD area and the adjacent BRT stop.

Source: Author
Fig 8.11.4 New public space surrounded by mixed-use denser residential (highrises) if it is within the walkable distance (400m) from the BRT stop.

Source: author
Fig 8.11.5 Mixed-use retail residential area in the inner neighborhood forming a shopping street.

Source: author
Fig. 8.9:1 Bicycle lane and transit par (bike park+ride) in the inner neighborhood
Source: Author
8.12 Building Density

Around the radius of walkable distance from the BRT station (400m) is the dense stacked housing, located just beside the office buildings. An empty lot is allotted for another dense stacked housing or apartment. Variety is important, housing should accommodate a variety of social class.

In the inner neighborhood (bikable distance from the BRT station (700m)), rowhouses is introduced to existing urban fabric. The street is also widened to accommodate larger flow of people. The introduced building typology is retail on the ground floor and housing on the upper floor.

See Figure 8.12.1 for reference of housing typology (based on the index of urban use). See figure 7.6.1 for a more comprehensive table on the housing typology.

### Building Density Table

<table>
<thead>
<tr>
<th>Area (m²)</th>
<th>Footprint (m²)</th>
<th>Gross Floor Area (m²)</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkable Radius (400m)</td>
<td>17000</td>
<td>2000</td>
<td>30000</td>
<td>0.11</td>
<td>1.76</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**GSI Low Density**

FSI Medium Compactness

OSR High Open Space

<table>
<thead>
<tr>
<th>Area (m²)</th>
<th>Footprint (m²)</th>
<th>Gross Floor Area (m²)</th>
<th>GSI</th>
<th>FSI</th>
<th>OSR</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bikable Radius (700m)</td>
<td>3000</td>
<td>2000</td>
<td>8000</td>
<td>0.66</td>
<td>2.66</td>
<td>0.12</td>
</tr>
</tbody>
</table>

**GSI High Density**

FSI High Compactness

OSR Low Open Space

Source: Index of urban use (http://www.permeta.nl/spacemate/index2.html)

Fig. 8.12.2 The walkable and bikable zoning of the area in Setiabudi shows buildings that are relatively high-density development with progressively lower-density development spreading outwards from the BRT stop.

Source: Author
8.13 The Walkable Radius (400m)
Intervention on the local scale on the walkable radius is:

- BRT station is segregated from the urban fabric
- No public space
- Parking buildings (each office buildings have their own parking space)
- Parking space

W: denser, mixed function building
W: dense, mixed function building
W: public space

100m
Connect the two BRT stops with a direct line for bicycle (bicycle spline)
Introduction of bicycle spline will create a new connection and new supporting functions for the inner neighborhood

Opportunity, introduce a shuttle to connect the two BRT transit stop
Introduce a feeder loop that can transport passenger between the two transit stops.

Collective Parking
Provide a collective parking building as a transit point around the BRT transit stop.

Introduce a dense highrise of mixed-use building
Located inside the walkable radius, close to the station. This new highrise should support low income people too. Variety is important.

Claim the private space into a public space.
The land is still owned by the building, but the fences are lowered and merged with the pedestrian path. Street furniture and green is introduced

see page 96 for the section
8.14 The Bikable Radius (700m)
Intervention on the local scale on the bikable radius is:

- **Most of the owner of the building sold or convert the buildings into rentals for migrants or for workers. Rentals are extremely cheap, but the condition is very bad.**
- **Abandoned building and lots**
- **Basically the area is unconnected to the BRT Stop**
- **Disorganized land use and street width**
Densify the inner neighborhood
The unclear land use and poorly densified typology should be densified to accommodate the increasing interest of the land. Empty lots should be converted into more mixed-use building and not forgetting the provision of public space for people.

Connect the two BRT stops with a direct line for bicycle (Bicycle Spline)
Introduction of bicycle spline will create a new connection and new supporting functions for the inner neighborhood

Opportunity, introduce a shuttle to connect the two BRT transit stops
Introduce a feeder loop that can transport passenger between the two transit stops.

Additional facility as a magnet to the site
Business center, media center, etc.

see page 96 for the section
Maximum Building Height and Facade

8.0 LOCAL DESIGN INTERVENTION: SETIABUDI
Master Plan Residential Type

8.0 LOCAL DESIGN INTERVENTION: SETIABUDI
9.0 EVALUATION
9.1 STAKEHOLDERS AND AFFECTED ACTORS
9.2 FINANCIAL STRATEGY
9.3 EVALUATION: CONNECTIVITY
9.4 EVALUATION: BALANCE OF FUNCTION
9.5 EVALUATION: INHABITANTS AND RESIDENTIAL TYPOLOGY
9.6 SOCIAL AND SCIENTIFIC RELEVANCE
9.7 REFLECTION ON THE PROJECT
9.1 Stakeholders and Affected Actors

A huge cooperation is needed to make this huge project a success. There will be many effected actors during the project, all the actors are important for the success of the project. This project needs a cooperation between the public sector (as a foreseer of the project) and private sector (as the main capital investment of the project). Citizens are important to produce feedbacks so that the effected neighborhood will bring benefit to the people and urban quality will be improved.

Public Sector

The government has the fundamental role of controlling the project. In this case, the government needs to be fair and democratic in deciding between the competing objectives and defining the chosen objectives. A government needs to be able to ensure that wider public interest is saved.

In case of Jakarta, a corrupt government is a big No for the project. A Commission against Corruption Officer may need to be established to oversee the project just in case.

Private Sector

Private sector is the main investor of the project to keep the project moving. Several private sectors that can be joined into the project are banking companies, motor companies, real estates, etc. Some private sector may benefit directly from the project. One example is the BRT Stops in Sudirman Road, where the adjacent building/real estate is connected directly to the BRT Stop. The financial strategy for this condition is to include the adjacent building/real estate as the investor of the adjacent stop. In other word, the BRT stop is maintained by the adjacent building/real estate as well.

Citizens / Civilians

The role of the citizen is the feedback they give concerning the processes of the project. The main goal of the project is to improve the integration between the urban fabric and the BRT Stop, thus it is important to know the existing quality of life in the effected neighborhood.

Directly effected citizens is especially needed to be taken into account in the whole success of the project. Some residences and/or businesses will be effected directly by the project. These people will receive a higher priority for enjoying the new environment of the project. It is true that there are many type of residences in Jakarta, one of the dominant one is the low income citizens. This is the reason why a variety of building typology is very important in the new TOD (so that the provision of the new housing can be enjoyed by both high (condominium) and low income people (social housing).
9.2 Financial Strategy
A possible financial strategy is to create a mutual collaboration between the Public Transport Authority (BRT) and the Private Developer (TOD). Close proximity and the benefit the TOD receives from the BRT needs to be shared with the improvement of the BRT.

In the first phase, the creation of the TOD; a private, public, and citizen sector needs to be collaborated.

In the second phase, after the creation of the TOD; the received revenues from both TOD and BRT can be invested to further improve the BRT system (technological upgrade, reorganization of the BRT network).

Fig. 9.4.1 Possible financial management for the project.
Source: Author
9.3 Evaluation: Connectivity

On the level of strategic design intervention. An analysis will be made on connectivity, balance of functions, and the changes on building type.

On connectivity, the introduction of bicycle splines created an extra axis that should extend the connectivity of an area.

In Kota, the one axis of a road is extended to the west side of the area, creating a new branch that reaches the area inside the neighborhood so that connectivity is increased.

In Mangga Besar, the axis is strengthened and connected to one another.

In Setiabudi, the axis is extended and another road is introduced, connecting the BRT station to the inner neighborhood area.

In Blok M, the axis is already well-distributed around the area, so there is no major intervention in the area.

Local Design Intervention: Inner Neighborhood of Setiabudi Transit Stop

Several space syntax analysis is done on the condition of the connectivity of the inner neighborhood before and after the introduction of the new street.

A local angular analysis (r=10) shows clearly a connectivity around the Setiabudi Transit Stop (see Fig 9.3.2). Before the intervention, the inner neighborhood is clearly not connected to the busy main street. After the intervention, the inner neighborhood is integrated with the main routes by the introduction of a new street.

Agent-based modelling analyses of the inner neighborhood (see Fig 9.3.3) shows an increase of street users in the inner neighborhood after the design intervention.
Fig 9.3.2 A three-step integration analysis of the chosen site, before (above) and after (below) condition.
Source: Author

Fig 9.3.3 An agent-based (5000 agents) modelling analysis shows the people movement around the neighborhood, before (above) and after (below) condition.
Source: Author

increased connectivity of the inner neighborhood

the road inside is not accessible for people.

increased flow of people
9.4 Evaluation: Balance of Function

On the level of strategic design intervention. An analysis will be made on connectivity, balance of functions, and the changes on building type.

On the balance of function, the reorganization of the building is done to reach the functional balance that is indicated in the 65% - 22% - 13% ratio of leisurely activities - service activities - and workplaces.

In Kota, the changes of workplaces and industrial zoning into a leisurely/entertainment-related activities is done to create a functional balance.

In Olimo, the introduction of leisurely/entertainment-related activities in the inner neighborhood create a balance of function.

In Setiabudi, this is done by introducing entertainment areas that can be used by multiple-users, as well as the introduction of service-related facility for the inner neighborhood.

In Blok M, the function is already balanced, so there is no major change.
9.5 Evaluation: Inhabitants and Residential Typology

On the level of strategic design intervention. An analysis will be made on connectivity, balance of functions, and the changes on building type.

On Inhabitants and Residential Typology, the reorganization of building use produce changes in the balance of function as well as the provision of residential in a neighborhood. Changes are basically done by introducing a mixed-use to a building.

In Kota, the building use is changed from workplaces/industrial buildings into a mixed-use of residential and retails.

In Olimo, workplaces are changed into a residential and retails. New residential also introduced on the top of a major retails, especially those which is located close to the transit stop.

In Setiabudi, changes are done by introducing a mixed-use functions as well as the introductions of a building with different typology and varied functions for different social level of users. This strategy will make the area more attractive to varied number of people.

In Blok M, the changes is done by introducing a residential area within the shopping streets. In the residential area, some building can be converted into a small retail area.

KOTA
- tourism world heritage area festive event
- buildings are abandoned in general because the area is not used for commerce
- the area is not used for commerce
- office
- residential
- change the function
- residential
- commercial

MANGGA BESAR
- medium businesses
- low wealth residential
- traditional shop
- office
- residential
- change the function
- residential
- office
- retail
- institution

SETIABUDI
- international
- high wealth residential
- foreigners
- office
- residential
- retail
- residential
- change the function
- residential
- residential
- residential

BLOK M
- car-oriented neighborhood
- traditional market
- X
- high income residential
- residential
- office and retail
- residential
- office
9.6 Social and Scientific Relevance
Sustainable transport is a concept developed in reaction to problems on transportation policy, practice and performance. Urban transport systems based around motorized vehicles have proved to be unsustainable, consuming energy, producing air pollution while affecting the health of the populations, and delivering a deteriorating service despite of increasing investments. These negative impacts fall on those vulnerable social groups who are least likely to own cars.

Sustainable transportation mainly refers to human behaviour instead of technology. Approaches that are transportation-sustainable are usually a behavioural approach, e.g. reducing physical travel, policy development, improving transport choice (e.g. the use of public transport, cycling, and walking facilities), and cities planning that bring people and their needs closer, as well as making the cities more comfortable to walk in.

Sustainability issue has always been ignored in developing countries, but with the increasing issue of global warming and declining supply of oil, the issue has started to attract people attention. The issue is not very popular in implementation on large metropolis of developing country.

According to Richard Iles, in his Public Transport in Developing Countries, there are characteristics of public transport in developing countries which add to the problems of the public transportation, which is determined by various geographic, climatic, demographic, political, institutional, economic, environmental, and cultural factors.

Jakarta is new in implementing the mass rapid transit. According to Richard Iles, “rapid transit is not a transport mode as such, but, as its name implies, is a means of mass transportation offering a faster service than the alternatives which are available, typically with average operating speeds of 50 kph or more.” It may fall into different categories, e.g. light rail, as well as buses which operate on its own track and therefore faster than other transportation mode. Jakarta and its Transjakarta Busway fell into this category.

So, it can be concluded clearly that the research on sustainable mobility implementation in developing countries has not been well conducted or documented. This is why the research is very relevant for new insight especially for a metropolitan city of developing countries.

Apart from the new insight on implementing sustainable mobility in developing countries, the research could also contribute new insight on behavioral movement of people (which is relevance for anthropologic or human behavioral science) as well as city planning of stations whether it is influenced by mere location or whether function also affect the station.

9.0 EVALUATION

From Theory to Design
This evaluation tries to analyze how the design is derived form the theory collected in the metatheoretical approach.

1 Sustainable mobility in public transportation
> Reorganizing lanes to integrate it with the neighborhood
> Technological changes
(Newman, P. & Kenworthy, J.; U.N. World Commission on Environment and Development)

2 Desirable walking condition in a neighborhood
> Space Syntax – New connections and increased visibility
> Mixed-use Housing as a strategy to revitalize a neighborhood
(Newman, P. & Kenworthy, J.; van Nes, A.)

3 Integration between neighborhood and the existing MRT
> Creation of “bicycle splines”
> Creation of “urban villages”
(Newman, P. & Kenworthy, J.)
9.7 Reflection on the Project
The author interest is on infrastructure and how it is able to help creating a livable urban fabric. The author’s interest on infrastructure appears from he’s own experience of the infrastructure in Jakarta, where the newly introduced Transjakarta BRT Network create hope to reduce a lot of problem in Jakarta related to the traffic problem. At the beginning of the project, the author is interested in making a research on how does the existing BRT network influence the connectivity of the city in a larger scale. The first research of the city is therefore more of the metropolitan scale of the city rather than a local design. Later, because of the larger scope, the author reduces the scope into the effectiveness of a BRT transit stop and the neighborhood adjacent to it (which is also known as the Transit-Oriented Development or TOD).

However a lack of data means that it is impossible to make a detailed research and design at a very local scale. At first, the author tries not to be too involved with a very small scale, but rather concentrating on a strategic design. But later, the author decided to do a smaller scale, providing a better example for implementation if such intervention is needed. However still, the intervention suggested by the author is not meant to be taken as an only suggestion, but rather as an alternative of many options that can be implemented to the site by following the strategic design. Other reason is that the analysis of each site made by the author is not very accurate (because of the lack data of each local site). The four local sites chosen can be seen as a representative of the residential neighborhood in Jakarta. It is should be mentioned that the four local sites doesn’t represent every kind of neighborhood in Jakarta (e.g. a close to green area neighborhood, mall / shopping center neighborhood, etc).

In the thesis, the author tries to find a strategy that can be adopted quickly and easily by local municipals to upgrade an existing urban fabric into a well-integrated TOD that can achieve a sustainable mobility of the city (this is the goal of the project). The author tries to create an approach of the problem: the use of a function’ distribution to analyze what kind of function is needed to a neighborhood and the use of space syntax to analyze the integration/connectivity of a site. Especially space syntax, a very useful which is not well known in Jakarta, as an engineering tool, provides a unique value for the project.

A mutual trust needs to be established especially between the suggested key actors. The municipals need to be consistent in implementation, and the people need to be well-ordered. This is needed so that the city may be able to create a better quality of life for its people.
10.0 CONCLUSION
10.1 ANSWERING THE RESEARCH QUESTION
10.2 RECOMMENDATION
10.3 CONCLUSION
10.1 Answering the Research Question

Descriptive Approach
1 What is a good integration between the urban fabric and the transit system? What is the Transit-oriented Development?

Normative Approach
Urban aspect
2 How to design a qualitative condition to make a desirable condition for moving between a BRT transit stop and an urban fabric in Jakarta?
3 How to create a desirable walking condition from a neighborhood to a transit stop?
4 How to create a more compact neighborhood?
5 How to reorganize the land use around a BRT transit to make it more effective and feasible.
6 How to provide public space?
7 How to reduce the high perception of crime in a neighborhood?

Infrastructure Aspect
8 How to provide a good accessibility to an isolated station?
9 How to create a more sustainable mode of transportation?
10 How to provide a good quality bus lane?

Answer

Descriptive Approach
1 A TOD is a mixed-use residential or commercial area designed to maximize access to public transport, and often incorporates features to encourage transit ridership. A TOD neighborhood is usually characterized by a transit stop (e.g. train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with progressively lower-density development spreading outwards from the center. TOD scale are usually between 400m to 800m from the transit stop, which is considered to be an appropriate scale for pedestrian. See 4.1.2 Transit-Oriented Development (TOD)

Normative Approach
Local / Urban aspect
2 The answer of this question lies on the balanced strategic framework on both urban aspect and infrastructural aspect. On the urban aspect, the structure of the neighborhood needs to be reorganized so that it would accommodate the BRT stations that exist on the side the neighborhood. Giving accessibility to a neighborhood it’s not just by introducing a BRT station around, it’s also by integrating the urban fabric to the BRT station through urban planning. On the infrastructural scale, the answer is related to the concept of sustainability. Infrastructural elements such as bus lane and BRT transit stop needs to be improved so that it is easily accessible for users. The combination of these strategies is needed to create a coherent sustainable mobility on the city. See 5.2 Strategic Planning Scheme.
3 Apart from introducing a new connection to a transit stop, to create a desirable walking condition on this new connection, new functions along side this new connection needs to be introduced. A balanced function of 65% entertainment, 22% services and 13% workplaces need to be introduced on this new axis. Series of public space needs to be introduced within a walkable distance of 400m. Answering the question no 2 as well, a concept is introduced to create a connection to a BRT stop: a ‘bicycle spline’. This concept combined a new infrastructural connection and a new public space. See 5.2 Strategic Planning Scheme.
4 A more compact neighborhood can be introduced by following the scheme of denser building (high-rise) around the walkable distance (400m) from the BRT stop, and dense building (rowhouses) around the bikable distance (700m) from the BRT stop. Compact neighborhood is the answer to urban sprawl and the creation of more high quality public space. See 5.2 Strategic Planning Scheme.
5 Reorganization needs to be made by keeping to the concept of a mixed-function: An area cannot be entirely workplaces or entirely residential areas. In Jakarta case, the answer is the reorganization of a building function. A building use needs to be reorganized to provide a multiple function for the users, therefore creating a variety of activities in a neighborhood. See 5.3 Strategy: Urban Aspect.
6 The lack of public space in Jakarta is answered with the creation of bicycle spline. The splines acted as a secondary public space. Moreover, an intervention on the public-private realm and the co-visibility of a street can establish a new form of public space (e.g. removal of high fences, introduction of public space in/above buildings, the provision of parks every 400m, etc.) see 5.3 Strategy: Urban Aspect.
7 The answer lies on the concept of visibility (space syntax). In Jakarta, people are accustomed with the idea that high fences would protect them from burglary, which is not the case, as burglars can jump through high fences anyway and do his job easily without being seen by people from the outside. This kind of typology would create a neighborhood of “high fences”, where perception of crime is relatively high. A different kind of typology (emphasizing on the relation between public and private realm) can be introduced to a neighborhood. see 5.3 Strategy: Urban Aspect.

Infrastructure Aspect
8 It is wrong to place a station in the middle of the road, isolated from the urban context because of a complicated route. A good BRT stop has to be surrounded by variety of functions and must be easily accessible. A transit pocket park can be introduced around a BRT stop to integrate a stop to a neighborhood. A BRT stop should also be supplemented with other amenities depends on the character of the neighborhood (bicycle shade, retail, shops, parking garage, etc.). See 5.4 Strategy: Infrastructure Aspect.
9 To make the existing BRT system into a more sustainable mode of transportation, it needs to be integrated to the neighborhood around so that more people will use the facility. In order to do that, the neighborhood needs to be connected to the BRT system by providing a feeder public transportation or new lanes. The BRT system itself needs to be reorganized. An isolated location for the station needs to be reorganized by placing it closer and more adjacent to the effected neighborhood. For the long term vision, the bus needs to be upgraded into a more sustainable mode of transportation e.g. tram. See 5.4 Strategy: Infrastructure Aspect.

10 A good quality bus lane or BRT lane can be introduced in several ways. A lane can be reorganized closer to the urban fabric so that it would provide a closer access to the urban...
fabric, as well as providing a protector boundary between the pedestrian path and the busier motorways. Through this configuration, a BRT lane can be covered with grass or other greenery. An electrified BRT lane (e.g. tram) can be achieved through long-term planning. Tram can accommodate more people than bus, provide a more comfortable experience, and it doesn't produce pollution.

10.2 RECOMMENDATION
The planning implementation of the BRT TransJakarta network and to the most extent, the MRT network of Jakarta needs to be observed not only as a solution to overcome automobile dependence, but also to integrate the urban fabric of Jakarta. Cars will always increase as population and urban sprawl increases. The solution of integrating the existing urban fabric with the BRT system (under the name of a TOD) will create a more compact city for the already sprawling Jakarta Metropolis. This will reduce the sprawl and at the same time revitalize the existing neighborhood.

Knowing about the instability of Indonesia’s economy, the project is made very flexible. This project is very important to be initiated as soon as possible, especially during these couple of years where the economy of Indonesia is gradually strengthened.

It is a fact that most new projects in Jakarta are usually oriented toward the high-income residents. As the public sector, it is important to realize a balanced and varied typology so that all kinds of people will benefit by the project. It is also a fact that most social housings in Jakarta are badly designed. Collaboration between architects and urban designers are very important in this project, as well as local feedbacks.

Consistency and discipline are important. It is hard to be consistent in realizing the goal of a long term project. Although several scenarios has been suggested to cope with Jakarta’s changing economic condition, it is important to make sure that the project is always true to its initial objective: to overcome automobile dependence by creating a TOD. Discipline is important, especially because of the well-known corruption that happens in the public sector. Indonesia has been implementing counter measures to deal with corruption. It is important that this project receives extra precaution in the organization.

10.3 CONCLUSION
• Jakarta is different from other city that implement TOD. Jakarta’s urban fabric is existing and has a “disorganized” street network quality. Different strategy has to be developed for Jakarta to establish a TOD.
• Main problem of Jakarta’s transit and the city is the low integration value on the micro scale between the two. Good accessibility has to be established.
• To address this, the strategy is a balanced strategic framework on both urban and infrastructural aspect. To do this, a space syntax analysis has to be done to analyze the connection of a street. After this, intervention can be made on both urban and infrastructure aspect.
• On the urban aspect, the structure of the neighborhood (public space and building typology) needs to be reorganized.
• On the infrastructural scale, improvement on bus stop and bus lane must be made.

Electronic Sources

Space Mate. http://www.permeta.nl/spacemate/index2.html