Mobility plays a major role in the development of the city, sometimes following and sometimes leading the way. The MIM is known by heart for all the Bangkok residents, informally. It is a consequence as well as, the same time, a solution of the city. For the people who have experienced Bangkok, would understand the problems as well as opportunities and hope within this city.

We had to get up at 5 am. to go to school, work, or either go on vacations. A big amount of time was lost in traveling, which also means lost in efficiency, pleasure, environment, and happiness for the residents of Bangkok. This is where I started to question in my city and its mobility. The pursuit towards finding a better solution for the city has started with fully filled ambitions. Thanks to the motivations, encourages, and advises from the teachers, family, and friends that finally result in this challenging thesis study.

And above of all, thanks to Bangkok that has taught me the first urbanism experience and led my study life until this point. I will keep my promise to do the best I can.

MIM Owes

The knowledge team

Thousands of times of thank you to the best mentor team; Diana Garcia Cejudo, Frank van der Hoeven, Machiel van Dorst, and Marcelo Sanchez Gutierrez for your patience, support, and tons of knowledge.

Research & Design supporting

This thesis would not be possible without the supports from “home”, the Bangkok support units are; Pattara (Gap, my brother) for all nice and hard working interviews and photographs, Director of Transport Department of Bangkok (Mr. Winai Limsakul) for the useful information.

Others

All family, friends, and colleague of TUDelft for encourages and a wonderful experience during this two years in the Netherlands. And for a lot more who I did not mention, thank you very much for all supports within these two years of study and this thesis year in particular.

Roj Kanjanapanyakom

Delft, 2010
METROPOLITAN INFORMAL MOBILITY

Bangkok Metropolitan Informal Transport Development Research and Design Package

a condition to promote multimodal transportation in Bangkok, Thailand

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With Greatful helps of

Marcelo Sanchez Gutierrez
Environmental Design

A Master Thesis for:
Graduation Lab: Master of Urbanism
Urban Climate Studio
Faculty of Architecture
Delft University of Technology

Delft, The Netherlands 2010
แด่กรุงเทพ
Dedicated to Bangkok
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Recently, cities and its inhabitant of developing countries around the world are facing seriously problems of the climate change. The cause of this vital global problem is simple: Carbon dioxide emission. For the solution in developing countries’ context, most of the time, the picture we are seeing is a copy-paste project from developed countries. A solar-cell system in the country where people can buy a house from that price, a bicycle lane and pedestrian square in a hot and humid country, a metro system in a country which majority resident cannot afford; these are examples of what see in most of developing cities. In my opinion, this is a huge miss stepping in our urban development. The fact is every city is different. We need to initiate for our own city. We need to put more effort on solution from local knowledge to stimulate our own techniques. What should be the proper program for developing countries in order to initiate in solving problem of climate change, in term of social, spatial, economical, and flexible affordability?

For the context of Bangkok, 37.68% of carbon dioxide emission was from transportation-the transportation in which 95% is personal vehicle. (Traffic and Transport department of BMA, 2007) The cause of this problem is: Public transportation in Bangkok is failed to provide good condition to use them. Primal growth city and rapid urbanization create weak urban structure for Bangkok. Together with hot and humid climate for all-year long, walking from transport node to destination few hundred meters away is a heavy task. This thesis begins with the biggest problem of Bangkok, the capital city of Thailand, in which both local government of Bangkok and the central government have been working for a long time. Problem of extremely heavy traffic congestion in Bangkok is the biggest problem in this metropolitan which consists of approximately 10 million people. Problem of traffic congestion has a widely effect on many issues. Climate change from Carbon dioxide emission, Psychology problem, Productive efficiency, and health problem are examples which mentioned in the report called “Bangkok assessment report on climate change 2009”.

The governments (both local and central) have been trying so hard to solve the problem through both infrastructure and urban planning measures, but not so effective. Although many construction projects have been built such as; ring road, expressway, tunnel, and the latest-metro system, but the number of private vehicles (car and motorcycle) is rising up every year. On the other hand, through the urban design profession, the project such as; bicycle lane, bus lane, park and ride, and BRT have also experimented on the urban area of Bangkok. Now what we see, in the mobile world, is Bangkok with juxtaposition of photos copy of developed western countries’ projects.

The problem of traffic congestion in Bangkok could not be solved easily by “copy and paste” pictures of modern transport system from developed countries. Problem is more complex than what it looks like and also dealing with subjects other than urbanism such as:

1. Bangkok: Primary city of Thailand
   Most development of infrastructure, occupation, functions, and economic was poured into Bangkok. The result is the capital city which dominates the whole country. (Half of the country’s GDP was created by Bangkok) (CIA; World Fact Book, 2009) Therefore, without surprise, number of immigrants and hidden population is rising to approximately 40%. (Achawanichkul, 2005)
2. Rapid urbanization was one of the problems which cause unorganized urban planning structure. The organic urban structure reflects on the space syntax map which shows numbers of less-integrated streets. (Detail explanation in chapter 3) Most of these streets still do not have any mass transit system; in contrast, the street and road which have better connectivity are what we already have mass transit system working on.

3. Local climate character which is hot and humid almost all year long, (120 days/year of having maximum 35 C.) (Bangkok Assessment Report on Climate Change, 2009) And also the micro urban climate of a mega-city like which create Urban Heat Island effect (UHI), mobility mode of pedestrian or bicycle are hardly possible.

Problems on transport and mobility in Bangkok are being taken care by the department of traffic and transportation, the sub-divided department of Bangkok Metropolitan Administration office (BMA). Bangkok has been providing (a top-down approach) various mobility mode such as; minibus, bus, and metro system which service area covered a limited area due to the weak road and street structure.

Surprisingly that these un-uniformed structure street networks has been reached by flexible modes of mobility which are locally invented called “Sam-lor” (means: three wheels). This informally initiated flexible mobile service (mostly runs by immigrants) also has development along metropolising Bangkok, from human powered to motorize and from three wheels to two wheels. Now, the latest form of this mode of mobility is called “motorcycle taxi” which has self-organized character. The motorcycle taxis organize and form a “micro node” in the area which has strong demand of people who wants to move to any short (or sometimes long) distance. Now, Bangkok has approximately 6,000 micro nodes with more than 200,000 motorcycle taxis in operate “informally”.

Solution on mobility problem which has bottom-up approach oriented strategy has not been widely research in this field, especially with hidden population or informal initiatives which hardly predicted and controlled. At the moment of this thesis was composed, there is not yet a study in this field of informal mobility development in Thailand. The author take this as a challenge to compose this graduation project by start- ing from scratch. This thesis will study the bottom-up approach and the appropriate linkage with the top-down planning.

For the period of a one year thesis study in TUDelft, this thesis (MIM) has now come to an end, due to the study time. But the author (and as well as the mentor team) hope that the MIM is a starting point of the process of changing on our thinking on public transport, as well as the way to develop it in Bangkok. This thesis report will be a guide for you through this process of research, design and yet, the discovery of the project from the beginning of the thesis study in the graduation lab urbanism “Urban Climate”. The dynamic in terms of organization in this thesis methodology is another topic that the author found interesting and preferred to keep as original order. That is to say; the thesis was first start without the design project field of study (the motorcycle taxi) but, start with the challenge of reducing the CO2 level which turned to be the opportunity for the developing country. The thesis process continue through the city and the problems analysis to define the project and the site as well as the methodology to test and evaluate it. That also means, the research questions of this thesis also changed over time that the thesis was developed and been discovered in new steps. The reader of this report may find the research questions in the beginning pages of every chapters and parts.

The author hope that the journey of studying in this particular field of informal mobility in Bangkok is just started and will continue in the future. If we can use just a little part form this thesis to pave for our future, this thesis has already complete it task.

Welcome to the MIM of Bangkok.
It’s a Challenge:

Emerging World Cities with populations in excess of 1 million

<table>
<thead>
<tr>
<th>City</th>
<th>Population</th>
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</thead>
<tbody>
<tr>
<td>Seoul</td>
<td>24,470,000</td>
</tr>
<tr>
<td>Mumbai</td>
<td>21,600,000</td>
</tr>
<tr>
<td>Delhi</td>
<td>21,500,000</td>
</tr>
<tr>
<td>Shanghai</td>
<td>19,430,000</td>
</tr>
<tr>
<td>Calcutta</td>
<td>15,700,000</td>
</tr>
<tr>
<td>Manila</td>
<td>15,600,000</td>
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<tr>
<td>Karachi</td>
<td>15,100,000</td>
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<tr>
<td>Guangzhou</td>
<td>14,700,000</td>
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<tr>
<td>Beijing</td>
<td>12,800,000</td>
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<tr>
<td>Ghaka</td>
<td>12,600,000</td>
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<tr>
<td>Tehran</td>
<td>12,100,000</td>
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<tr>
<td><strong>Bangkok</strong></td>
<td><strong>11,971,000</strong></td>
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<tr>
<td>Jakarta</td>
<td>9,815,000</td>
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<td>Wuhan</td>
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<td>7,850,000</td>
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<td>Bangalore</td>
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<tr>
<td>Hyderabad</td>
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</tbody>
</table>
Hongkong  6,980,000
Taipei    6,690,000
Baghdad   6,250,000
Chongqing 6,200,000
Ahmedabad 5,650,000
Dongguan  5,500,000
Chengdu   5,450,000
Ho Chi Minh 5,450,000
Shenyang  5,050,000
Riyadh    4,775,000
Yangoon   4,700,000
Xi’an     4,657,000
Pune      4,625,000
Singapore 4,483,000
Nanjing   4,575,000
Kuala Lumpur 4,525,000
Chittagong 4,350,000
Harbin   4,250,000
Hangzhou 3,925,000
Shantou  3,925,000

Reference: Emerging World Cities, Asia Beyond Growth (2010)
-6.5%  +24%  +36%  +69%  +69%  +60%

CO2 emissions in Asian cities

USA: 5,752,289
Germany: 665,990
Netherlands: 164,513
Switzerland: 41,826
Sweden: 187,075
Denmark: 53,084
United Kingdom: 546,328
France: 381,148
Italy: 474,148

China: 1,121,403
Japan: 1,291,459
Hong Kong: 34,359
Taiwan: 34,859
South Korea: 87,148

Thailand: 276,291
Cambodia: 4,074
Vietnam: 194,713

The World’s fastest growing continent, Asia, is now experiencing the greatest challenge of population explosion, water shortage, and also carbon emission. (AECOM, 2010) It is a challenge of planners and designers to cope with all the problems in the pursuit of a sustainable city. It is also essential and challenges that, how we can design our future city to reduce carbon emission in conjunction with consumption and vitalities of the city? How can we design our future cities with a total free mobile in demand with the zero emission? How can we achieve that without reducing accessibility?

Bangkok is one of cities which have been experiencing huge urbanization in the last 40 years. Population increment along with the development in material wealth created huge resource consumption in consequence. In the case of Bangkok, rapid urbanization in the last 40 years has made big changes in terms of growth for the city; growth in population, growth in economy, growth in demand, and so growth in mobility. (Banchontewakul, 2008) These growths and the (rapid) urbanization result in the increasing trend of carbon emission in Bangkok which is now one of the highest in the world. (Bangkok Assessment Report on Climate Change, 2009) The result of this is climate change and its affect on the urban configuration. Since the climate change has direct affect on urban physical layers, the studio (Urban Climate) uses the exercise “System Approach” to investigate the relation of climate in different urban layers. (in Msc3) The conclusive result, of the problem of CO2 emission, will be further analyzed together with the methodology to solve and structure this one year thesis study.

The next chapter of this thesis study will try to research and analyze from the wider point of view of seeing the problems and the way to solve them and narrow down to find the most potential and practical way of solution to make an intervention for the city.

1. INTRODUCTION
1. INTRODUCTION

- Do you know Bangkok?

- The Problems

- Methodology
Do you know Bangkok?
The first chapter of this master thesis report is an introduction to the overall context of the study field, as well as the case city-Bangkok. The chapter contains of three parts:
- Do you know Bangkok?
- The Problems
- Methodology

Before starting this research and design package thesis, it is essential to give an overview of a short introduction of the study location, Bangkok. The intention of this part is to have a basic idea of the city’s context as a whole for a background to understand more in the following chapters in this thesis. For the people who does not know hoe Bangkok looks like, this part will give the ideas through a photo essay with short descriptions. In each theme, the author tried to put two photographs in contrasts to stimulate the discussion in the current developments of Bangkok.
BANGKOK: Krung Thep Maha Nakhon (Thai pronunciation)
Area: City 1,568.737 km² (605.7 sq mi)
       Metro 7,761.50 km² (2,996.7 sq mi)
Population: 11,971,000
Avg. high temp. in summer: 36°C
Avg. low temp. in summer: 26°C
Do you know Bangkok?

Reference: www.worldpress.com, Bangkok Metropolitan Administration (BMA)
THE PORTRAITS OF BANGKOK

The photo essay of Bangkok selected pictures from Bangkok taken in various places which can be categorized in 5 themes. In each theme, two pictures were selected in order to create discussions in the current developments of Bangkok. The 5 themes are;

1. The Icon
2. The Public Space
3. The Street Scape
4. The Infrastructure
5. The Urban/Suburban

Reference: Bangkok Metropolitan Administration (BMA)
The map of Bangkok; shows major infrastructures and the urban area.

1. The Grand Palace
2. Mahanakorn Project (by OMA)
3. Siam Paragon Department Store
4. JJ Weekend Market
5. Up on Sukhumvit
6. Down on Sukhumvit
7. Suwannabhumi Airport
8. The Hopewell Project
9. Urban
10. Suburban
1. THE ICON: The Grand Palace

2. THE ICON: Mahanakorn Project

3. PUBLIC SPACE: Siam Paragon

4. PUBLIC SPACE: JJ. Market

5. URBAN

6. SUBURBAN

Do you know Bangkok?
Do you know Bangkok? MIM 17

7. STREET SCAPE: Sukhumvit rd.

8. STREET SCAPE: Sukhumvit rd.

9. INFRASTRUCTURE: BKK Airport

10. INFRASTRUCTURE: Hope well
The Problems
In the beginning of the thesis study and yet, this report, the author has opened the discussion and challenge of the contemporary cities, the carbon emission. In Bangkok, the carbon emission level in 2009 has already exceeded the world’s mega cities like London and New York. In the Msc3 (first semester of the graduation year), the studio of Urban Climate has the exercise to analyze the city by seeing it in separate physical layers to look through this superficial problem. In this thesis study, the problem definition was first started with a bigger picture and narrow down to the specific area of the field “mobility” and “multimodality”. This part of the report, will try to describe the process of defining and pin-point on the problem and as well as the relevance to the social and scientific study.
The Problems Analysis

Although the problems’ field in this thesis starts with the CO2 emission of Bangkok but the solution, as well as its deeper analysis, will elaborate with more problems along the thesis process. In this chapter, we will first start to define the framework for this thesis, the mobility. Then, the research will focus on the comparison and argumentations of the public transportation (Multimodality) against private vehicles (Singlomodality). The analysis will try to portrait the experience of the multimodal in Bangkok by giving example of mobility chain scenarios. In the end of this part, the conclusion will define the goals for the design project of this thesis, as well as the methodology for the study process.

In the case of Bangkok, the problem of carbon emission is mostly created by transportation (37.68%), by private vehicles in particular. (Bangkok Assessment Report on Climate Change, 2009)
The comparison of the Multimodal and Singlemodal in Bangkok shows that using the Singlemodal in Bangkok is more comfort, more flexible, and more accessible to destinations in Bangkok. We will try to elaborate more in the part to look at the problems from different point of views.
The map shows all mass transit and the catchment areas (by walking of 5 min.), which concentrated in the central area. However, there is almost 6 million people travel from the outskirt to work in the city center everyday. (Department of Traffic and Transportation, BMA 2007) The future plan of Bangkok is to build new roads to be able to cover and connect most of the urban areas.
Mobility chain and trip experiences in Bangkok

The scenarios of possible mobility chain using in Bangkok shows that the factor of experience and accessibility are important conditions to promote public transport usage.

Mobility Chain scenarios were created by the personal experience of the author
The scenarios of possible mobility chain using in Bangkok shows that the factor of weather comfort and speed are important.
Societal and Scientific Relevance

Mobility and the City
Infrastructure and Mobility has been developing along with Bangkok’s rapid urbanization in the last century; influence in shaping the city and, in the same time, being influenced by the urban fabric. Therefore, four types of developments over time can be defined. First is the historic city center, the city begins with informally settlements along the network of canals and river. Second is the modernizing city, grid and block system adopted from European city during the sea trading create tramway, pedestrian and road network. (Pattanaek, W. 2000) Third are the new towns in town, the residence cluster in periphery area, reached by highways and expressways. (Graham, S. and Marvin, S. 2001) Forth is the business district, Bangkok does not have CBD but the business clusters were tied up with the two lines of metro system. (Marling, G. 2008) These relations in Bangkok of land-use character, users, and featured transportation modes reflect the history of Bangkok in the mobility point of view.

What will happen, if the next era of Bangkok is built by public transport? What will be changed in terms of the spatial development?

Shifting in Mobility
To be able to have the modal shift, the conditions of the modal (ex. safety, comfort, speed, etc.) need to be implemented to reach the certain level. (Rooij, R.M. 2005) In the analysis of the problems in the beginning of this part, we have seen some of the conditions that make people choose the modal to travel such as, safety, comfort, accessibility, etc. Those overall conditions of the modal which suitable for the city of Bangkok (and the modal which...
How much space will we have in 2020?

Apart from the implementation in the modal’s spatial conditions to achieve the shift in transport modal, the dynamic of the space that the (public) transports occupy will also be studied in this thesis. In the desirable future of Bangkok with public transport will be widely used, the city can gained reclaim back the infrastructure spaces from the development in the past. Development package in the public transports which will be described in the next chapters hoped to create enough “pulling factor” to convince people not to use private vehicles. Expressway, Toll ways, and some big roads hope be fewer cars to empty. The city might needs to find the program for those space in order to have the “pushing factor” preventing people not to go back to use cars.
Methodology
This methodology part contains some part of the course AR3U012, the Thesis Plan. (Roj Kanjanapanyakom, 2010) From the previous part of the problem analysis, different layers of problems have been unfold from the superficial level. These problems (and as well as the challenges) create different goals for this thesis to be achieved. To be able to solve these problems and the specific goals, plans and methods need to be defined. During the process of the thesis, the dynamic of the methods which adapted over time along with the new goals that appear also interesting to study. The author preferred to keep the same order of the methodology which was used in this one year study to describe the process in this report. Therefore, this methodology part is rather a “map” of this thesis process.
When connected to the physical layers of the city it is possible to make a balance between mitigating and adapting measures in the process of setting design project and evaluation. This method requires intensive literature and data research. The topic of the literature and data document area basically related to 6 specific physical layers of the city, according to the system approach. (Hoog, Sijmons and Verschuuren 1998)

Approach methods and Techniques

During the whole study process, many methods and techniques were used in this thesis study some are planned (according to AR3U012, the Thesis Plan) some were applied/adapted during the process (According to the changing in goals which was mentioned in the previous page). In this part, we will focus the explanation on the major concepts that frequently used, in the important steps, or interesting during the process. These methods and techniques will also be evaluated in the conclusion chapter (5) which hope to benefit for the future studies of the project. The overall methodology map in the next page will be the conclusion and the process map for this thesis.

Firstly, after the topic was chosen, the studio exercise of System approach will help getting into the effect of climate change on the function and use of the city. Since the climate change has direct affect on urban physical layers, the studio (Urban Climate) uses the exercise “System Approach” to investigate the relation of climate in different urban layers. These physical layers of the city are defined with the use of the layer approach (Hoog, Sijmons en Verschuuren 1998) and the layers defined by Heeling, Meyer & Westrik (2002) and the metabolism of the city. The models of system approach are useful to get a grip on the effects of climate change on the dynamics of the city.

The conclusion of the system analysis shows the relation of the climate change in Bangkok and all causes and effects. This thesis research topic was chosen and aimed to reduce the carbon emission from transportation.
After orientating project and research approach to the problem, an analysis of the city in relation to the specific research topic (Mobility) will be done. This will consider as a conclusion for the problem analysis part. The methods needed in this part are mapping, literature (theory) and data research. In the end of P1, the field of design project together with theoretical framework and location will be selected. After P1, the research will be focus on the way to state the vision for this thesis project. In order to this, besides theoretical framework, data collection from different point of views which related to the project scope is needed. Besides mapping and literature reviewing, another method selected to collect data is interviewing. The interview will focus on 2 main groups which have most influence in the field;

- Interview: Motorcycle taxis in different location
  Aim of interview: To be able to explore how these people integrate themselves into the socio-spatial pattern of Bangkok.

- Interview: Director of Traffic and Transport Department, Bangkok Metropolitan Administration (Mr. Winai Limsakul)
  Aim of interview: To be able to get grip on how complex tasks the problems are from the government’s perspective point of view. To know policy, vision and practice on the case-this has conflict between legal and illegal. To know practice concept of “Motorcycle taxi station” (the recent project on flexible mode mobility from Bangkok).

In the project part of this thesis, the design project has to deal with multiple locations of the nodes. Therefore, the main methods used for the design part and the evaluation part are selecting and testing (by designing). The examples of the process that applied these methods are;

- Finding testing sites for the project: The process needs classification of the micro nodes and select representative locations. For doing this, the other methods chosen are mapping and classification analysis.

- Design evaluation: The process will try to simulate the same methods we used in the design strategy to be able to have an explicit criticize on the whole process.

Aims of the Project
The aim of this project can be divided into 4 layers which are contribute to reducing carbon emission from transport in Bangkok. In the project level, the aim is set to improve spatial configuration of the specific selected mode of mobility and through the scenarios, to see the implementation and implication of the project on the city.
The Methodology Map shows the overall process of the thesis.

Contents in this part contains some part of the AR31012, the Thesis Plan (Raj Kanjanapanyakom, 2010)
2. THEORY
STUDY

- Theory Review Paper

This review paper is part of AR3U022 Theory of Urbanism and AR1U020 Urban Design Methods and Theories. (Roj Kanjana-panyakom, 2010) The aims of this literature research to be applied for the project are;

1. To define the relation between the development in infrastructure and mobility and the city development.
2. To study the synergy of urban development plans from different sectors.
3. Case study of urban and mobility development in the Netherlands.
“Have the contemporary city development contribute to the future (and yet, the existence) of the network city?”
This essay is going to analyze in three scales plans in which “network city” planning scheme plays an essential role, from 1950s until present. These three cases are respectively; General expansion plan of Rotterdam, the “Key Projects” of Kop van Zuid in Rotterdam and the Ceramique project in Maastricht. In the regional scale and city scale, the General expansion plan of Rotterdam and its relation which means to the Randstad will assist to understand in the deep-root policy in the Dutch planning process, the Key Project policy. Moreover, two strategic local scale plans of Kop van Zuid and the Ceramique will assist to identify the essential components of plans which have made a place in the city interact in the network of cities. The comparisons among them will also illustrate a seamless transformation process of the city center development in the Dutch cities towards urbanity in the network city. The aim of writing is firstly to analyze and compare the planning motivations, aims, and meanings in the three realized plans, which share an overlapped time and spatial dimension. Furthermore, it tries to go beyond the stage of operations paving to the desirably future urbanism.
At the beginning of the 20th centuries, the debates of decentralization and centralization existed in most of the European union. (Bosma and Hellinga 1997) The problem is that, many cities were faced by huge amount of urban expansion and the increasing inaccessibility of the inner city. For the Netherlands, the concentration of the urban development on the west of the country, which was called “the Randstad”, has also created big discussion regarding the issue of decentralizing. (Fig. 2.1) Distribution of the people, business, and functions has a negative impact on the Randstad. To be able to compete in the global economy, Randstad has to call for reinforcement. As a consequence, the regional development policy in the last few decades focusing physically to built metropolitan economy by improving the climate for business investment. Although each city has its own function, which can contribute each other in the network city, the level of independent is still high. (Tilman 1997)

During 1990s, there was a reduction of a state intervention, which has direct results in the major cities policy. (McCarthy 1996) A great share of financial resource which was held by the central government since after the World War II, has moved to give responsibilities back to the local government. The result is that, the local authorities can make decision and make integration in the local levels. Examples may found in the cities policies. Another benefit of decentralized governance is that, the municipalities can be flexible in implementing the national policy. (McCarthy 1996) Within the policy framework set by the central government, flexibility allows the municipalities to apply the policy concept to fit most to the local circumstances. In additional, another Dutch approach characteristic found here is “working together”. (McCarthy 1996) The ability and willingness to work through networks is an approach that can be found in many projects as well as in Kop van Zuid (Rotterdam) and Ceramique (Maastricht) which will bring to discuss in the following parts.

The Nature in the Dutch planning:

The question of how we can extract quality of the city has been continuing asked in urban studies. Mentioned in Rooij (2005) that the understanding of contemporary cities is the relation of places in distance and the movement in to each other rather than be defined by assemblages of buildings. As in Ascher (2003), one way of defining the cities is the movement of its inhabitants to achieve greater efficiency. Therefore, to be ambitious to the 21st century urbanity in this network society, problems and challenges in (Dutch) network cities’ spatial planning should be re-defined. Since the regional development concept of Randstad was first realized, the development of the cities connected by infrastructure networks has emerged in a cycle. Meurs and Verheijen (2003) have described this cycle relation that the techniques and technologies in mobility have long been developing along the cities and also reflect the unique quality of the cities. That is to say, Infrastructure and Mobility develop along with Urbanization; sometimes follow sometimes leading the way. As we are now in the middle of this process of...
development cycle, this paper will discuss through urban regeneration projects in the Randstad. Why Urban regeneration projects? The nature approach in the Dutch urban planning, The Planning cycle (Hulsbergen and Kriens 2000) has explained how this development cycle works in pragmatic. In spatial planning practice the cycle consists of the steps program-design-construction-management (and monitoring), which a ‘design’ is made according to a certain design ‘program’, ‘construction’ refers to the situation that a design is actually built, and the management and evaluation of a construction project may lead to a new design program in the future. (Hulsbergen and Kriens 2000 cited by Rooij 2005) (Fig. 2.2)

The following sections in this paper, therefore, positioned by giving an interpretation using different scales of Dutch city development plans (urban regeneration) as examples. The main question to ask is “how these developments contribute to the existence of the network city? As Rooij (2005) pointed out 3 important issues challenging the spatial development of the future network city; 1. Space consumption of infrastructure and vehicles, 2. Decrease of accessibility of urban areas, 3. As well as that, contemporary city still have plenty of absence of coherence between the hierarchical levels in the urban network. These 3 issues are the largest problem fields for the future of cities development.

In this paper, 3 Dutch plans that contribute to developments of the network city model will be bring to illustrate. The structure of discussion will start with the regional scale, government’s physical planning policy of the Randstad. More zoom-in into the city scale, the annexation expansion plan of Rotterdam will bring to the comparison on how the municipality level policy working in coherence with the central plan. To be more precise, the specific area development plans of Kop van Zuid in Rotterdam and the Ceramique project in Maastricht will be compared and discuss in terms of intention of realize the development of the city center of the cities in the network city.

THE REGIONAL PLANNING LEVEL

City - Network city – Mobility:

As mentioned above, the framework in this paper is created on the hypothesis of the model of the network city. Meijers (2007) has characterized the components of network city that; “A network city evolves when two or more previously independent cities, potentially complementary in function, strive to co-operate and achieve significant scope economies aided by fast and reliable corridors of transport and communications infrastructure”. Regarding this explanation, it is clear that, there is a relation on a specific area that the roles “The place in the city” and “The node-inter connection to the network” are co-existence. That is t say, the development in the city scale can contribute the existence of the city in he network of cities. Also in Rooij (2005), he simply explained that “The location of transfer points within the Network City is one of the key success factors for multimodal transport, and together with the architectural lay-out, the urban environment, and the transport function of transfer points, it plays a crucial role in establishing the (desired) hierarchy and structure of a transport system of the Network City.”

In order to realize the network city model, the elaboration of the network notion is proposed by Dupuy (1991). He recognized the existence of three levels of “operators” of networks organizing the urban space. The firs level is the technical networks consist of the physical elements of the networks, the transport infrastructure (infrastructure management) and the services on the networks (exploiting the infrastructure). The second level is a functional network which provide services of production, consumption and distribution. At the third level, people are the operator to use the first two networks. Their daily lives of activities, space, services, desires and demands are creating diverse personal behaviors meanwhile interpreting possibilities of these networks. These components are the instruments for realizing the network city. This also refers to the polycentric (multi-nodal) urban region which can be considered the nodes in a network that is further made up by infrastructure, interurban relationships (interdependence) and flows (Meijers, 2007). Moreover, Castells (1996) who defines cities as networked phenomena. He postulates that the really significant feature is the network, not the particular status or functions and roles cities perform. Cities are nodes of the ‘space of flow” (Castells, 1996 quoted by ROOIJ, 2005).

Randstad:

The Randstad is a ring of large and small cities and settlements surround the open area. (Which later the open area was referred as the Green Heart) The region, the network of cities of Randstad consists of 4 cities; Amsterdam, The Hague, Utrecht, and Rotterdam. The Randstad was planned base on the tradition concept of distinction between urban and rural which seems hardly suitable for this day. (Tilman 1997) Cities will continue to grow, but in the different development direction from the past. Cities will be formed as network cities instead of a concentrate structure. Therefore, the Randstad is no longer consisting of 4 big cities of Amsterdam, Den Haag,
Recent developments in the Netherlands regarding the network city movement can be seen from the government policy on designation of 13 cities as “urban intersection”. The goal is to create developments concerning the cities as a part of strategy to maximize international competitiveness of the country. Consequently, the central government has given priority in funding for these economical infrastructure developments. Therefore, the development of the “Key Projects” within the metropolitan areas was created to achieve this concept. McCarthy (1996) described the Dutch “Key Projects” planning policy that, “In addition to the promotion of cities as ‘engine of the economy’, the prioritization of private sector investment in urban regeneration has also been seen as a priority for central government, which has taken a leading role in the designation of ‘key projects’”. This mechanism means that the central government subsidies for the developments. Despite what have mentioned, the “Key Projects” in the Netherlands were also intended to facilitate the formulation of innovative Public Private Partnership (PPP) of the integrated and high quality mixed-use development projects. McCarthy (1996) He also stated that the important character of Dutch approach is the ability and willingness to work together through informal networks. In addition, McCarthy (1996) also specified that the key projects were intended to provide the basis for physical regeneration of surrounding area and the economic regeneration of the city and of the region in particular. The government involved in projects which were seen as being in the national interest, since the similar kind of developments was often fragmented in the past.

Rotterdam and Utrecht anymore. “Urban sprawl” tends to be founded in this metropolitan region and seems no longer having a compact structure as originally planned. Although each city has its own function which can contribute each other in the network city, the level of independent is still high. (Tilman 1997) The regional development policy in the last few decades focusing physically to built metropolitan economy by improving the climate for business investment. However, The government’s physical planning policy is still based on the concept of Compact city. (Tilman 1997) (Fig. 3.1)
Case Study 1: General expansion plan of Rotterdam

A short overview on the plan:

Rotterdam is the most important port city in Europe and, as the other industrial cities, it suffered from an impressive fast development of the port area. The city was considered larger than the municipality indicated. (Mens 1997) This problem was brought into the International congress of urban planning in Amsterdam as a regional issue. (Mens 1997) The solution was first proposed for annexation, the expansion plan for the greater Rotterdam. The plan was also founded the solutions for many rail road problems. As detailed by McCarthy (1996), the railroad line from Utrecht was curved toward the south of Rotterdam across the river and had a stop at a large station of Rotterdam-Zuid. This has solved 3 problems of; 1. Lacking of a central station, 2. The isolated Rotterdam Zuid, 3. The barrier which was formed by the beltway. The plan was also separated functions of housing, industrial, shops, and offices. The plan was also pointed out that Rotterdam, as the biggest city in the region, could strongly influence the future regional development. In Mens (1997), they concluded that the expansion plan of Rotterdam has lied a question of “Will the city get too big?”, the fear of that a new Rotterdam is created to be an oversized concentrated city which contradicted to the decentralized region-visional plan. The plan has limited the expansion of the city towards the north direction and put the future city on the south part Rotterdam that has the area greater than the area by the annexation plan. This huge amount of land has created a regional design condition that the perspective is impossible to design in one time.

The outcomes of regeneration city re-developm ent plans of Rotterdam may be seen in several phases since 1945. (McCarthy 1998)

1. First concept; 1946 “The Basic Plan”

After the bombardment during the WW II, the plan of reconstruction the city of Rotterdam has become prior necessity. The plan has consisted of the new vision on the new city center functions and expansion of the infra-structures networks. As well as the demand for the new housings however, the plan was restricted the number of houses in the inner city since the people prefer to live in the suburb. (Harding 1994 cited by McCarthy 1998)

2. Implementation; The post 1950 construction boom. Consequences from the large scale plan of reconstruction the city center of Rotterdam, it has brought many large scale functions project “boom” to the city center development. The Lijnbaan shopping center can be one of the examples in this case.

3. Planning after 1974; Inner City Renewal

The plan was aimed to re-orientate the city’s approach towards business leading as a priority. The plan focusing area was still emphasis to the inner city development as the implementation plan in the 50s.

4. Planning in the 1980; The 1985 City plan

The 1980s development plan consisted of series of cultural and recreation facilities intended to enhance the environment for commercial investors and to attracted people to live in the inner city. The examples of the projects in this plan are; the Central Square for shops and the Museum Triangle.

5. Regeneration of the city center in the 90s

In the last decade, the inner city plan continued to progress providing various functions for Rotterdam and yet, the city in its network of the Randstad. Kop van Zuid area has become a strategic location for the expansion of Rotterdam city center.

The Intention:

From above, we can conclude that the aims of development plans for Rotterdam have changed through time regarding particular conditions in the eras. Consequently, McCarthy (1998) has simplified the development into 5 eras; in the 1940s and 1950s the development of the city’s port was prioritized because of the need for economic reconstruction. In the 1950s and 1960s the priority was the expansion of the city’s housing. In the 1970s the focus shifted to the restoration of decaying inner city residential districts. And, in the 1980s and 1990s the city’s “re-imaging” by means of the development of new cultural and recreation uses, with the expansion of the city’s center across the river, has completed a long-term process of regeneration and reconstruction.
Case Study 2: Development Plan of Rotterdam: Kop van Zuid.

A short overview on the project:
Rotterdam, besides being the most important port city in Europe region, is also play another major role in the Dutch metropolis city network of Randstad. The connection of Rotterdam to the Randstad is done by the network of motorway system, which covers the Netherlands and meet in radial lines on major cities. The first project bring to discuss in this paper is the expansion plan of Rotterdam South, or Kop van Zuid. The Kop van Zuid area is a former harbor area across the river in opposite to the current city center. As the port of Rotterdam grew and moved more to the west away from the city, the old harbor in the center of the city were abandoned. In the late eighties, the municipality planed to develop this area as a part of the city center. (McCarthy 1998) The Kop van Zuid plan was first planed to redevelop the abandoned post-port area for social housing. The plan was later changed due to the master plan, which the developments in the area also develop the ambition to make change for the whole city. (McCarthy 1998) In order to apply the compact city policy, the master plan that contains many projects was complex and ambitious. The Erasmus Bridge was built in order to encourage the people to move back into the city. This strategy is to combine a mix of complementary uses in the new development area, which maximize the use of available facilities and infrastructure in the city. Several high-rise projects are part of the master plan; 400,000 m² of new office space, 5,500 dwelling units, 60,000 m² of retail shops, and hotels as well as a convention centre. (Informatiecentrum Kop van Zuid 1995 cite by McCarthy 1996) The Kop van Zuid was aimed to create distinctive architectures strategic to create new jobs in the area. Kop van Zuid has just now reached the first phase of the project. The municipality estimated that in 2010, there will be 15,000 inhabitants living in Kop van Zuid and 18,000 jobs available. (Informatiecentrum Kop van Zuid) While not everything has worked as the first intention of the plan, the municipality has proved flexibility in the plan to accommodate the changes.

The Intention:
Except the main aim of creating (by regenerating) the new economic icon of the city as well as strategic to linked two sides of the river banks together, we can see the plan in the more complicated way. As described in McCarthy (1996), from the proposal of Kop van Zuid, the further ambition of the plan intend to create further effects on the surroundings as all these issues:
1. Linking Kop van Zuid and its suburb in the south to the city center of Rotterdam. (By the Erasmus Bridge, new Metro station and the extension of Tramline)
2. Creating an attractive mixed-use district of; offices, residential, leisure, and education by;
   - Addressing high quality design architecture throughout the public realm.
3. Developing a program of ‘Mutual Benefit’ to ensure that residents of poor areas alongside Kop van Zuid benefitted from the scheme. The plan has been added the strategy to ensure that the local inhabitants can benefit from the facilities in the area.

Design components & Methodology:
From above, each aims of the plan require specific strategy to achieve. In every phases of the realization of the plan (Informatiecentrum Kop van Zuid), strategy as a striking tool for all aims of the plan can be seen as followings:
1. Urban regeneration; The new tram line was built in advance in order to promote the area for regeneration as well as promoting mass transit usage.
2. Strategy; using existing historical elements (Meijer and Reijndorp 1988)

The plan has shown the intention of reusing existing left-over landmark where ever it is possible. The reason is that, to enhance identity to the new place. Furthermore, McCarthy (1998) has specified the examples such as; the former Holland America line terminal has been converted into the atmospheric Hotel New York, and the oldest dock in the area has been turned into an industrial museum. The Entrepot building became a supermarket and a series of restaurants with food from around the world, so as to retain some of its previous character.
3. Using high profile architects to design the area. Despite the reason of to give the distinctive identity to the area, by doing this, is also imaged the project as a regional investment attraction.
4. Mutual benefits; the Kop van Zuid project was intended to involve social benefit as an element of the project for the surrounding residents. Therefore, the plan was also included many new jobs, commercials, retails, as well as culture and recreation facilities. However, the city recognized that the local unemployed people might not benefit from the plan, unless specific action is being taken.

Result (Meaning):
1. A connected cities; Before the plan of Kop van Zuid, the river Maas was seen as a barrier for the city. The Erasmus bridge, the new metro station and as well as the extension of the tram system have linked and extended the existing city center to the south of Rotterdam and further to the suburb area around it.

2. New image of the city; Number of stunning buildings were designed by leading architects such as Renzo Piano, Norman Foster and Rem Koolhaas. This has given the global dimension to the project as was intended in the plan.

3. Re-positioning Rotterdam; In the 1980s the city feared that it could never compete with Amsterdam or The Hague as an economic centre. What has succeeded in a big way is the new housing, and it has helped in attracting people with good jobs to live in the city. 40% of the residents of the area come from outside the region. The elite facilities and convenience of the location attract these people to live in the area.

4. Mutual the Benefits; although the main aim of the plan was to bring the global dimension into the project, the plan also included functions which facilitate the local people in the area. The examples can be seen as the cultural and recreational facilities, which located side by side to the luxurious developments.

Case Study 3: Development plan of Maastricht: The Ceramique Project

A short overview on the project:

As it is in Rotterdam, the high-value medieval historic city center located on one side of the river while most of the urban regeneration lies on another side. Maastricht has exceeded the demand for housing supply, and the municipality planned to concentrate the new development in the central area rather than expanding the city to the green zone. After the former ceramics factory closed down, the Ceramique area has become the most important new site available for new development in the central area of Maastricht. The development scheme consists of 70,000 m² of office space, 20,000 m² of hotel, 20,000 m² of cultural use area, 5,000 m² of retail shops, and 1,600 housing units. By concentrating new developments in the central area of the city with mixed land use pattern, the Ceramique project was applied follow the compact city concept with the strategic aim is to provide a functional link between two sides of the river.

The Intention:

The proposal of the Ceramique was intended to address all these issues:

1. Maastricht was aimed to compete effectively in industrial and commercial investment, and the Ceramique project is aimed to bring the city to achieve this. Not only creating a center of business investment, the municipality also included the concept of having pleasant place in which to live integrated in the same area.

2. Supply the housing demand, especially in the central area. By doing this, the city can prevent (and release the pressure) of extend the city to the green field.
Design components & Methodology:

The project of Maastricht has a very top-down approach (Vercauteren 1996) however, it was implement by Public Private Partnership (PPP) between the city of Maastricht and all involved authorities. Three high profile architects have been designated to design the key elements of the project in order to intend to project the image of Maastricht as a center of business investment in the region. The project also intended to attract the city life in the area by adding a pleasant place to live, a high quality design for all elements; environment improvement along the River Maas, public spaces on both banks, and a pedestrian bridge links both sides.

Result (Meaning):

Although the project is realized, evaluation on how the project has achieved specific goals is considerable to early. McCarthy (1996) has pointed out the (Preliminary) evaluate result as followings;

1. PPP: As in the Kop van Zuid project, the Public Private Partnerships method of investment was also applied to this project. Since the “Key Projects” have subsidies from the central authorities, the investments have also applied to the other development plan in the Netherlands, which might have risk in costs due to the problem of over-large scale investment. (McCarthy 1996)

2. Integrated land use; the project has shown high level of internal functional integration. The role of the government has been significant for this, by encouraging mixed use planning of the “compact city” policy.

3. Wider regeneration effects and integration with surrounding areas; It was mentioned as one of the main aims that, the project was developed as a strategic linkage between different function areas of the city. The example of this aspect can be seen through the extended commercial area across the river as well as the linkage from the pedestrian bridge.

From the examples of the development projects to regenerate the economic function and re-positioning of the cities, we can summarize the common and, as well as the differs, tools been used to achieve the goals as followings.

Rotterdam and Maastricht, things they share:

1. City expanded (of the regeneration projects) by ambition to make links across the river as well as keeping the sense of a city center area development and also aimed to achieve polycentric development model.

2. Both of the schemes are nationally designated ‘key project’, which is intended to provide a functional and physical link between the two banks of the river. It therefore includes infrastructures link across the river, and provides a functional link by extending the commercial uses, which predominate on the opposite bank.

3. Once the both projects were understood as much potential for (re) developed the city center, the various sectors needed support from one another, which both municipalities used this as a guideline principle for cooperation’s between every authorities. (Schrijnen 2003)

4. Both project are strategic to give the whole new image for the city by selected high profile architects to design the buildings in the area.

5. Both projects have used existing historical left-
From the previous sections, we can clearly see the continuity relations of the policy through the examples in the 3 Dutch plans. The actions in different scales plans have responded to different hierarchy levels of the specific common goals of the regional planning. It is clear that the common goal of the “Key Projects” is to create the missing connection in terms of economic of the city to the network of cities region. In the national level, the key projects policy shows the intention from the big scale level planning to concentrate such developments in the potential metropolitan areas. In the city scale, the example plan of potential cities shows that re-positioning by re-imaging the city is a significant tool, which widely used concerning this development. Zooming into the local scale plan of the city center revitalization plans, various strategies were applied not only to bring the global dimension into the place but also concern the integration to the locals.

Since the planning (and also re-planning) of the city center area is consider long-term cycle (as a plan cycle described in Hulsbergen and Kriens, 2000), the current result of the plans are difficult to be evaluated. To analyze this process, we can firstly overviewing to see the overall picture of the regional planning concept and policy achieving the network city concept in the Netherlands that, the plans and methodology has shown intentions of the government to drive the development in such the direction. The key projects policy can be a good example for this. As mentioned in the previous section that the intention of the Dutch government on the policy planning of the “Key Projects” is that, to minimize fragmentation (in concept and direction) of the local scale developments which have national interests. The policy works in two parts; in the local aspect, the partnership set up with all authorities intended to link such big scale development to the local uses. Examples can be seen from both projects of Rotterdam-Kop van Zuid and Maastricht-Ceramique that, the plan was also included mixed-use area and as well as some cultural and recreational facilities.

Secondly, In the global dimension, the top-down decision making from the government can give the meaning of a ‘national project’ to the plan as well as enhancing the investment capacity of the project to reach the global level. For both plans, this aspect of the policy has worked perfectly as we can see the end product was delivered in an excellent designed buildings and urban planning for high profile architects team. Another meaning concern the global impact on the city development plans is the role of the area as a place being used by both locals and people who are not living in the city. As described by Rooij (2005) about the strong relation between “The place in the city” and “The node-inter connection to the network”, it can be implied that, the major function development of the city center has a direct impact on the city’s position in the network region. In the comparison of the two city center renewal projects, McCarthy (1996) has complemented the plan of Kop van Zuid that has repositioned Rotterdam to re-connect to the network of the regional level of economic. Contradict to the Ceramique project which similar in scale and ambitious aims, the project seems not well connected to the network of the city in its region. The research of Rooij (2005) has shown one of the major issues to be concerned regarding the connection of the function in the city to the network of the region. His design workshop resulted in the new development concerning transfer point in the network region should be positioned near the A2 highway as it is the most potential area in Maastricht.

Finally, zooming in to the local scale, some failure of integrating the local usage in the programs. In Figure 6.2: The Structure plan of Maastricht
Source: The Mobility City

Need of global and local integration:

Contents in this part contains some part of the ARU022 Theory of Urbanism and ARU020 Urban Design Methods and Theories (Roj Kanjanapanyakom, 2010)
fact, Jauhiainen (1995 cited by McCarthy 1996) has also indicated that the lack of effective community partnership is a crucial factor in explaining of shortcoming of many attempts in the global dimension scale development. As reflected in the program of the Kop van Zuid, various functions operate in different scales and contexts. The problem that has emerged in Rotterdam South is one of the increasing contrasts of two worlds existing side by side (or in 'layers' that pass over each other without meeting each other). (Read and Rooij 2008) To be précised, they have portray the area within ten minutes of the motorway around the Kop van Zuid such as the business complex, the Ahoy, the Ikazia Hospital, the Zuidplein shopping mall, Maas Silo entertainment complex, the Luxor Theatre and the regional bus terminal. (Fig. 6.1) These places are attracted by a large group of people who in general not live in Rotterdam South but would use them in a certain way. Read ad Rooij (2008) has concluded in their research concerning mobility environment aspect that, without the local integration of mobility environments, spatial fragmentation could be occurred. Infrastructure can become a physical barrier for the locals to access to the urban programs. Barbieri U. (1993) also stated in Rassegna (1993) supporting the idea that, the major issue in the urban planning of Rotterdam is the difficult relationship between continuity and renewal.
Theories in Urbanism are a cycle knowledge accumulated by practices over time. Particularly in the Netherlands, rich history in urban planning gives a significant meaning to the Dutch planning culture, which reflects on the planning policies and perspectives. It does not contain only individual great ideas like the “Network city”, but more concerns about the overall process; policy planning, the hierarchy of aims, and the specific delivery mechanism. As the way we understand our city has changed and the practice needs to change along with it. Urban places we understood was defined by their geometries and the people they brought into relations. Today, the relation with the far-off places and the connections in between is defining the contemporary cities. (Rooij 2008) From the three cases illustrated in this paper, it is surprising to see a huge step in the transformation of the role in the city center, from a concentration of local functions to a place that has interrelation to the wider other places and people. The acceleration and complexity in social and technological transformation brings a new challenging question of “What will the future network city looks like?” Some groups tend to foresee the problematic issue which is a resource ready for the next generation of the city regeneration. One of the dangers of the Network City is that places can become a series of stereotypes and everywhere can become like everywhere else. (Roberts, 1999 cited by Rooij, 2005) Comparing to the other science discipline, urbanism is a continuous progress in cycle, which results paving to the new starting point, as described as a plan cycle. (Hulsbergen and Kriens, 2000) As we are now in the middle of this process, it is crucial to learn what we have done in the past and use it for our future. And yet, it is excited to see what will be our next steps.

**PAPER REVIEW**

What can we applied for the project?

1. **Mobility allows us to jump through scales**
   From the case studies in the literature research, urban project or urban planning from the mobility point of view, allows us to overview the project between different scales. As described by Rooij (2005) about the strong relation between “The place in the city” and “The node-interconnection to the network”, development in the node of transport implicates to the changes in the urban dimension. In this project, as mentioned in the methodology part, this concept will be applied to the future scenario part. After finish the design part, the proposal will be translated into the implications that make changes to the city’s urban development. The two scenarios will be created in this part to evaluate for the perfect situation for Bangkok.

2. **A synergy of coherence objectives in different planning levels**
   From the conclusion in the above topic, mobility point of view allow us to jump through scales. In terms of planning, different scales means various types of action plans. From the national policy to the city scale development vision and to the project intervention, all scales of plans should be seen in a coherence objective. This concept will be applied to create the discussion of different scales plan, urgencies and policy in the next chapter, in order to place the intervention in the right place. (The modal selection in chapter 3)

3. **A cyclical planning and strategy in a long term development**
   Approach in urbanism point of view is long term. This continuous progress using the results to pave for the further steps of the same development field. Like what have mentioned in the paper, the Planning cycle (Hulsbergen and Kriens 2000) has explained how this development cycle works in pragmatic. Regarding this concept, the time line of the project (which is called the delivery mechanism in the chapter 4) will explain more in how the concept is applied for the intervention in Bangkok.

**Contents in this part contains some part of the ARU022 Theory of Urbanism and ARU020 Urban Design Methods and Theories (Ruj Kanjanapanyakom, 2010)**
3. THE CITY
- What is Bangkok?

- What will Bangkok be, From the Government point of view

- Which mobility mode should be selected to implement?
What is Bangkok?
The chapter of the City profile contains of 3 parts:
- What is Bangkok?
- What will Bangkok be?, From the Government point of view
- Which mobility mode should be selected to implement?

The aim of this chapter is to describe the comprehensive research and analysis of the city hope to give a clue for making decision on the intervention. As described in the methodology part, the process will start from an interpretation results of the city’s physical analysis to define the city’s urgencies for development. In the second part, the current national structure vision (issue 11th) and the city development plan will be brought to discuss together with the city’s analysis to define which mobility mode should be selected to implement.
**BANGKOK**

**General information**

- **Area:**
  - City: 1,588.3 sq km
  - Metropolitan: 77,631 sq km

- **Inhabitants**
  - City: 8,516,522
  - Metropolitan: 10,081,716

- **Registered:** 5,689,976

- **Density (Avg.)**
  - 4,025 persons/km²

- **Districts:** 50

- **Infrastructure**
  - Airport: International, 1 regional
  - Port: 1
  - Highways: 6 major highways
  - Expressways: 8 lines cover 213.4 km
  - Metro: 2 lines
  - Subway: 1 line
  - Airport rail link: 9 line
  - Railways: 9,346 km
  - Bus: 7,064 buses, 427 routes
  - Minivan: 5,319
  - Canal network: 9 express boat routes

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**50 Districts**

**Density**

Population Density (person/sq m.)

- More than 30,000
- 25,000 - 30,000
- 20,000 - 25,000
- 15,000 - 20,000
- 10,000 - 15,000
- 5,000 - 10,000

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**Urgency 1:**

- Adapt the city development to mitigate the water problems
The River Delta Capital City

Bangkok, the capital city of Thailand, is located in the delta area of Chao Phraya River. Although Bangkok has been a capital of Thailand for over 200 years but it has just experienced “city” in the last 100 years. Bangkok begins with informal settlements along river and canals. (Pattanaek, 2000) Today, Bangkok is the biggest concentration of urban population of the country, consist of 60% of overall urban population. (Achawanichkul and Prasartkul, 2005) The illustrations above show general information of Bangkok; Districts, Density, Infrastructure, and problem of land subsidence. As announced by the BMA (2009), Bangkok is now facing the problems regarding the water issue of polluted canals, flooding, land subsidence, and drought in the summer. These problems have direct affect on both physical and economical of the city for example; land lost in the south part of Bangkok vicinity area, and flood in the business district of the city. It is urgent for Bangkok to find the solution to mitigate and adapt with the problems of water infrastructure. The current policy and projects from the BMA regarding this urgency can be found through numbers of urban regeneration projects in the waterfront districts. (BMA, 2010) However, most of the projects are big scale and long term planning. Within the contemporary globalizing economical context, Bangkok needs to adapt the city development to mitigate the water problems.

Source & Reference : Annual year population report (2007), Planning department, Bangkok Metropolitan Administration, Military map and survey Department, Ministry of Defence, Transportations network map, Planning Department, Bangkok Metropolitan Administration, Expressway Authority of Thailand, Demographic report 2007, Mahidol University
The Primary City

Consisting of 60% of urban area of the whole country and producing half of the GDP of the whole country, Bangkok can explain how Bangkok dominates the country. Although the National Structure Vision at least in the last ten years has been focusing on dispersing the development to the other parts of the country (NESDB, 2010) but, there is still no promising result. The size of Bangkok, both by population and economy, is so far bigger than the rest of the secondary economic cities in the country for example; Chiangmai, Phuket, or the second largest province Nakornrachasima. The consequence is, every kind of development is poured into Bangkok to support functions which driving the country’s economic. Another feature of being the primary city in the developing country is “the migration processes” from both national and international. In 2009, Bangkok is expecting the population of 11 million, however, the registered population has never exceed over 8 million in the last 20 years. (BMA, 2007)

The research below pictures shows tolerant in opportunity to find jobs in Bangkok for immigrants. These “informal” sector jobs has become a part of daily life for the Bangkokian until today. As argued in Tunas (2008), for developing countries in particular, the informal sector play role as a “reserve army” in terms of economic. Many researches (ex; Tunas, D. 2008 and Gouverneur, D. and Grauer, O. 2008) has shown that the formal part of the developing cities cannot live without these informal economy. On the other hands, in the national planning level, the intention of the national vision shows intentions to bring the development into other parts of the country. But, the realization of the “polycentrization” can takes long time. It is urgent for Bangkok to admit and adapt to this phenomena. Bangkok has to expand the capacity of the city and its facilities for the metropolitan region.

Common Jobs for the Immigrants

- Street Vendors
- Mobile Market
- Motorcycle Taxi
- Garbage Collector

Registered Population (Thai)
Non-registered Population (Thai)
Thai-Chinese
East-Asians
Indian
Others
Immigrant Population of Bangkok
Urgency 2:

- Expand the capacity of the city and its facilities for the metropolitan region
5 Types of Green in Bangkok

1. COUNTRYSIDE AREA
2. PROTECTED GREEN AREA
3. FLOOD PROTECTION OPEN SPACE
4. PUBLIC URBAN PARK
5. PRIVATE GREEN AREA

Accessibility to Green in Bangkok (Public Parks in Bangkok)
The 0.70 sq.m./capita of Green

Although Bangkok has approximately 60% of urban area, but the accessibility to green area of Bangkok resident is very low. In 2007, the government has reported that Bangkok has 0.70 sq.m. of green area per capita in which the number should be 15 sq.m., according to the international standard. (BMA, 2007) The research map shows locations and sizes of Public Parks in Bangkok. In the Development Plan of Bangkok (2008), Bangkok aimed to increase the accessibility to the green area for the resident of Bangkok by 0.70%. (From the current 0.25% in 2010) According to the Land use map of Bangkok (BMA, 2010), Bangkok which has approximately 60% of the urban area and 40% of the green are mostly the countryside area in the out skirt of Bangkok. From the “Green Criteria Report” from BMA (2007), Bangkok aimed to increase the green area by 10.4 sq.km. in the long term planning (20 years). By the market orientated planning system (Graham, S. and Marvin, S. 2008), it means that Bangkok will have to expropriate the land back to build the green area for its residents. This solution seems difficult to be realized, especially in the central districts of Bangkok where the land price rising up every year. In recent years, except prevent the city expand into the countryside green areas (the green belt of Bangkok), the current solution from the government is to build numbers of pocket size parks around the city areas, where the price of land is too high to afford for the big scale “green investment”. It is urgent for Bangkok to increase accessibility to the green area for the residents of Bangkok. For the short term plan, Bangkok planed to optimize uses and accessibility to the existing 5 types of green areas in Bangkok; the countryside area, the protected agriculture area, the flood protection open space, the public urban park, and the private garden. (Pongpoon, S. 2007)

Urgency 3:
- Increase the accessible green areas in the city

Reference: Planning department, Bangkok Metropolitan Administration
MARKET ORIENTATED URBAN PLANNING

The Market Orientated Urban Planning

Rapid urbanization since 1970 forced Bangkok to grow without precise planning. As mentioned in Graham, S., and Marvin, S. (2008) that the planning process in Bangkok is the “Market orientated urban planning”. That is to say, most of urban planning structure has to rely on private land developers and the infrastructure provider which follows by and from each other. The consequence of this phenomena is that, Bangkok is having over supply of facilities and infrastructure in some areas and lacking of those in the others. (Graham, S. and Marvin, S. 2008) The result is untidy urban structure and infrastructure networks in Bangkok. The research shows analysis on Space syntax map which indicate that, although in the center area Bangkok has grid structure network but majority of the area (mostly from the rapid urbanization period) shows less integrated street system. The fragmented inner roads and streets are also problematic in the planning for mass transit system as well. As a consequence, people who are living in this less-integrated area tend to use personal vehicles instead of public transport. It is urgent for Bangkok to provide equity accessibility to the public transport for the residents in this majority living areas of Bangkok.

Urgency 4:
- Provide equity accessibility to the public transports in all areas
What is Bangkok?
What will Bangkok be?

From the Government point of view
This part of the thesis, the development plan of Bangkok will be brought to analyze the objectives of the plans in the different scales level from the project areas. The objectives will be the parameter to test the synergy in the design project and the plans in the evaluation part (Chapter 5). The analysis will start from the overall structure plan of Bangkok and zoom-in to the key projects in each development themes.
Relation of the project and the Government’s plan

Development direction for each zone
The plan has distinguish 10 areas in Bangkok which, in each zone, key projects were created according to the development directions.

A Synergy in the plan and the design
From the conclusion we have made in the previous section, one of the key factor to have a successful urban (and mobility) development project is all scales of plans should be seen in a coherence objective. The research (section 2) shows that, from the case study in the Netherlands, the development project in the city scale extract the objectives from the bigger scale plans. By doing this, the design project can develop a synergy with the plans from the government. Therefore, the project will be harmonized with the development direction of the whole city, and country.

In this part, we will bring The Bangkok Development Plan to analyze the objectives of the plans and the projects areas.

The project to improve the public space along the road in the dense urban area of Bangkok. In the project detail (on the right page), the bicycle lane is planned on the footpath which was widen from the existing. The project also shows intention of the design to make the public space more pleasant to use with comfort and safety.
The landscape design were applied in the key project to improve the public space along the canal. The project also strategic to increase the green area for Bangkok.

The key projects in the historical city center mainly aim for preserve and protect the historical architecture sites and the old urban neighbourhood. The development areas selection pay attention to the development on the riverside of both sides of the riverbanks.

The map shows the development master plan for transportation which will focus on the development of the metro lines. Three urban complex in the transport interchange locations were developed as the key projects to solve the problems in transport.

The key project in the sub-centrality area focus on the development at the big scale public functions. The project shows intention to strengthen the area by improvement of the existing facilities.

From the structure plan of Bangkok, the new public park locations will mainly be in the periphery areas of Bangkok.

Reference: Bangkok Metropolitan Administration
Office of the National Economic and Social Development Board
Which mobility mode should be selected to implement?
Since the beginning of the first chapter, the challenge, the problems, the theory, and the city profile, the interpretation has framed the intervention area until this point to analyze and then make a selection for an appropriate modal to make a design project. This is where the MIM (Metropolitan Informal Mobility), the name of this thesis starts. This part will first start with the overviewing analysis of the multimodal in Bangkok focusing on the “NO-Land”. The “NO-Land” stands for the urban areas which has; NO public transport route and NO plan for public transport development yet. In the final part, the introduction of the “Motorcycle taxi”. For the people who does not know Bangkok, this chapter also contains relevant information of the motorcycle taxi which will link to the following design chapter.
The NO-LAND

Public transportation in the NO-Land

The public transportation map implies that, in the super block area, there is no transport development plan available yet. These areas, which have no formal transport model and no development plan available, are called the NO-Land.
Public transports in Bangkok

In this part of the thesis, we will define the intervention area by selecting the mode of transport from the public transports which are in-service in Bangkok. The public transport system of Bangkok can be divided into 4 different scales, based on the service distance and also the development policies. Within all scale of public transports, the S scale is the public transport systems developed by the informal sector. The service type of these modes is flexible but, mostly used as a feeder to the inner streets. (Author’s personal experience and the Lonely Planet: Bangkok city guide, 2006) For the NO-Land in Bangkok, these flexible modes are the only service provider for the multi-modal passenger in the areas.

Accessing to the areas in Bangkok

Zooming-in to the block scale of the No-Land areas, there is a hierarchy of node sizes categorized by mode of transport. The XL, L, and M node of transport are around the block while the S node is scattered in both outside and inside the block. (See the map on the previous page) The development in this smallest scale of mobility mode is significant for Bangkok, in order to promote people to travel conveniently from the place of origins to the destinations. In this thesis, the small scale system which is operated flexible as a taxi is chosen to research and design for a future implementation of the mass transit systems of Bangkok. The mode is called “Motorcycle taxi” which usually found in a group of 5 to 30 motorcycle gathered in specific places which are called “Micronode”. (Author’s personal experience and the Lonely Planet: Bangkok city guide, 2006) According to the survey from the BMA in 2008, Bangkok has more than 6,000 micronode networks with more than 200,000 motorcycle taxis in operate.
Motorcycle Taxi and the Micronodes in Bangkok
Which mobility mode should be selected to implement?

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
The Motorcycle Taxi Model

The Motorcycle taxi of Bangkok

The model of motorcycle taxi is one of the most popular informal para-transport in Bangkok that has been developed along with the urban development of the city. In the 1930s the first model of the para-transport was started with the three-wheels bicycle (Sam-Lor). (Tuk Tuk Thailand, website) In 1966, the model has adopt the three wheel trucks from Japan to use as transport purpose which was called Tuk-Tuk. The latest development of these paratransit mode is in two-wheels (1983), The motorcycle taxi, in order to adapt to the faster moving stream of the city. (Siriwan Somnuk, website)

The analysis of the model can be divided in 3 components;

1. The operator; the motorcycle taxi rider and the motorcycle which is regulated to have at most 150 cc. engine. We can spot them on the street by looking at their colorful jerseys. (Red, Orange, Purple, Green, Pink, etc.)

2. The Micronode system; the micronode is a group of motorcycle taxi of 2 or more (sometimes up to 30) with or without settlement. The micronode is located in the same location, when the motorcycle taxis delivered the passenger, they will come back to the same spot waiting for the new passengers.

   The micronode also have its own network, the far away location where is not reached by walking distance will have a few motorcycles waiting for passengers.

   Within the district area scale, there might be more than one micronode, which they usually have an agreement not to fight for the passenger in their own areas.

3. The settlement; the settlement is mainly for giving shading to have a comfort condition in a hot climate. Things in the settlement are varies, but usually found are; drinking water, bench, and price list board.
The Micronode in City level

- Comparable to Bicycle Distance (In the Netherlands)
- Walking Distance (Preferable in Bangkok)

The Micronode in Street level

- Small scale, require small space
- Small investment
- High Accessibility
- Chance to merge with locals
- Negotiation power
- Flexible & Response to urban's dynamic
- Easy to convert to electric motorbike

The Micronode in District level

- Against the traffic law
- Low class image
- Non registered/illegal
- Low safety
- Non-system

Motorcycle taxi micronode in the surrounding

Because the system is the people based, the service of the motorcycle taxi is also varies. The diagram above shows relation of the micronode and the surroundings and also the riders with the social network. The example of various kinds of service we can ask from the motorcycle taxis are; messenger service, delivery goods, paying bills, and many kinds of labor jobs.

The model to be improved

From the analysis in this part, we found that the motorcycle taxi model has potential to be developed to promote multi-modality in Bangkok. The analysis shows the strength of the model that is grain (6,000 nodes), flexible, fast and highly accessible. The model is small scale in terms of size and investment for developments. For the environmental issue, switching motorcycle into electric motorbike is more feasible and easier to be realized, in terms of economic affordability of the city.

Although the motorcycle taxi and the micronode model has potential to be a tool for promote multimodality in Bangkok, on the other hands, the model is not comfort to use, informal image, non-safety, and unreliable. In the design part, we will define the strategy to improve these conditions of the motorcycle taxi and the micronode in Bangkok, in order to promote multi-modality.
4. MIM
- What type of components should have a mobility environment as the Motorcycle Taxi micro nodes in Bangkok, in order to enhance Multi Modal interactions?

- Design Summary

- What does this development means to Bangkok?, What will Bangkok looks like in 2020?

- How can we do it?, What?, When?, Where?, Who?

- What kind of the future Bangkok can we imagine?, And can MIM be designed to response those future?
What type of components should have a mobility environment as the Motorcycle-Taxi micro nodes in Bangkok, in order to enhance Multi Modal interactions?
The design chapter of this thesis contains 5 parts:
- What type of components should have a mobility environment as the Motorcycle Taxi micro nodes in Bangkok, in order to enhance Multi Modal interactions?
- Design Summary
- What does this development means to Bangkok?, What will Bangkok looks like in 2020?
- How can we do it?, What?, When?, Where?, Who?
- What kind of the future Bangkok can we imagine?, And can MIM be designed to response those future?

The chapter will first start with a research part which is according to the research and design method. The research and analysis will result in the conclusion of the design parameters for applying to most of the micronodes in Bangkok which is the main idea of this thesis. Providing designs solution for 6,000 micronodes in Bangkok is impossible to be done with in one thesis study. Therefore, the conclusion for the design part is a design strategy as a guideline for designing micronodes in Bangkok. The way to test and criticize the strategy, in this thesis, is to use design as a testing mechanism. The design proposal will be summarized in the "Design Summary" part with 5 prototype design schemes which represent 6,000 micronodes in Bangkok.

Having 6,000 nodes formalized in a city might have affects on the city. Next in the design part, the implications of the motorcycle taxi and the micronodes will be used as ingredients for the future scenario of Bangkok. In the last part of the chapter, the implications of the proposal will be used to make the reflections on the project testing on how it response to the urgencies of the city (Analysis from the chapter 3).
The Design Research Questions

From the analysis of the current motorcycle taxi model in the previous chapter (3), we have concluded with the overall conditions of the modal (Mobility Environment) and the opportunity to implement it. In this chapter, we will start the design process of this thesis study. As mentioned in the methodology part (Chapter 1), we try to design the project with the question; “what is possible to be done?”. During the middle of the thesis study (2010), the government project trying to formalize the motorcycle taxi was introduced. In 2010, the project of “motorcycle station” has launched, aimed to improve the motorcycle taxi conditions of reliability and recognisibility. (BMA, 2010) The project of motorcycle station has selected 60 potential micronodes around Bangkok to formalize with a station, accident insurance, and certificate from the government. This project has shown the intention from the government concerning this mode as a potential of the development of transport in Bangkok. However, the projects have many requirements and hard to applied and match with the needs of the motorcycle taxis. From the interview, in many areas, the station is not in use and the micronode return into the informal conditions as usual. This can implies that although the proposal has good intentions but still lack of flexibility.

From the research and analysis (chapter 1-3), together with the lesson from the mistakes in the motorcycle station project, the research questions for design were asked;

“What type of components (activities, programs, spatial configuration) should have a mobility environment as the Motorcycle-Taxi micro nodes in Bangkok, in order to enhance Multi-Modal interactions?”

with the sub-research question;

“Which are the parameters of a flexible model?”

to encourage:

1. A model able to respond to the different conditions of all the micro nodes
2. A model able to adapt through time and different users
3. A model able to negotiate the requirements and necessities from the different stakeholders, (government, service provider and users)

Designing the Mobility Environment

From the literature research and the analysis in chapter 1, ten conditions of the mobility environments which influence people in selecting the modal were addressed. For the case of the motorcycle taxi, these conditions are uncertain due to the flexibility in location, service type, person, user, etc. The design of mobility

| Safety |
| Comfort |
| Speed |
| Ease |
| Accessibility |
| Additional Function |
| Reliability |
| Recognisibility |
| Experience |
| Price |

Condition in transport mode selection (Mobility Environment)
environments for motorcycle taxi should start with defining the parameters which can be applied for the as many micronodes as possible.

From the Mobility environment concept proposed by Bertolini (1993), mobility environment is consisted of 3 components; Activity place, Service, and Institutional arrangement. Compare to the motorcycle taxi mode, these 3 components can be found in the model as shown in the diagram below.

Within the 3 components contributed to the mobility environment, compare to the model of the motorcycle taxi in Bangkok, there are three actor groups involved for each topic of the mobility environment; The activity place can be translated to the locality of the micronode location, The service is the micronode system, and The institutional Arrangement is the Settlement which is regulated by the BMA.

As mentioned in the sub research question, to be able to negotiate the requirements and necessities from the different stakeholders, we decided to start with the interview of two main actors in this model development, which are the motorcycle taxi and the BMA. The conclusion from the interview will be translated and used as design parameters. The interview of both actors have the criteria and aims as followings;

1. Motorcycle Taxis
   - Interview Motorcycle taxis in different location which have differ in; density, urban fabric typology, and users.
   - Aim of interview: To be able to explore how these people integrate themselves into the socio-spatial pattern of Bangkok.

2. BMA
   - Interview the Director of Traffic and Transport Department, Bangkok Metropolitan Administration (Mr. Winai Limsakul)
   - Aim of interview: To be able to get grip on how complex tasks the problems are from the government’s perspective point of view. To know policy, vision and practice on the case-this has conflict between formal and informal. To know practice concept of “Motorcycle taxi station” (the recent project on flexible mode mobility from Bangkok)
### Conditions

**Locality** (USER)
- Mobility Environment
- Locals

**Micro node system** (MOTORCYCLE TAXI)
- Mobility Model
- Urban System

**Settlement** (BMA)
- Mobility Environment
- Surrounding Fabric

### Interview Questions

1. How the passenger access to the motorcycle taxi, in different time span? (Wait at the node, Switch node, Patrol)

2. What is/are the most frequent destinations called by the passengers?

3. Do you provide any other kind of service? If yes, what kind?

4. Where do you do your personal activities?
   - Meals during the day
   - Toilets
   - Buying goods
   - Filling gas

5. What do you normally do during waiting for passenger?

6. What time do you normally go back home?

7. Where do you live?

   1. Does BMA have vision and policy to develop the informal mode of mobility?

   2. Have BMA ever launch any project for those vision or policy?

   3. Within the viewpoint of BMA, what is/are the main obstacle to develop this mode of mobility?

   4. Do you have any suggestion on this proposal in a master study?
### Answers

<table>
<thead>
<tr>
<th>HISTORICAL CITY CENTER</th>
<th>DENSE RESIDENTIAL</th>
<th>CBD</th>
<th>PERIPHERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning (Rush hour): At the micro node</td>
<td>Residence, Office, Market, Stations, Inner streets, Places</td>
<td>Main road, Offices, Stations, Inner streets, Places</td>
<td>Market, Main road, Residence, Long destination, Inner streets</td>
</tr>
<tr>
<td>Evening: Patrol but cannot go beyond border between micro node networks (Border define by landmarks in the area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special case: Regular passenger call for pick-up</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Market, Stations, Places**
  - Pay bills, Buy food/goods, labor, sending newspaper

- **Pay bills, Buy food/goods, labor, sending newspaper**
  - Residence, Office, Market, Stations, Inner streets, Places
  - Pay bills, Buy food/goods, labor, Messenger service, sending newspaper
  - Messenger service, Pay bills

- **Any nearby hawker**
  - Regular nearby hawker
  - Nearby Gas station
  - Regular, any nearby hawker
  - Regular Gas station

- **Nearby Gas station**
  - Cook, Any nearby hawker
  - Nearby Gas station

- **Regular, any nearby hawker**
  - Regular, any nearby hawker
  - Nearby Gas station

- **Any Gas station**
  - Regular Gas station
  - Nearby Gas station

- **Resting, Chatting, Sleeping, Play chess**
  - 9-10 pm.
  - Closely

1. Yes, but **within the law**. We were just started to develop this mode of mobility for Bangkok. The first project was just launch in 2006. Now we are trying to map all of 4,000 micro nodes.

2. Formalizing motorcycle taxi in 2006 (jersey system), Motorcycle taxi helmet in 2007, Motorcycle taxi go green in 2008 (limited 150 cc. motorbike), Motorcycle taxi station in 2009 (Insurance and Quality standard)

3. The **settlement is illegal by law**. In some cases, they were involved in crime, drug dealing, and mafia.

4. Careful think of **the law** and the **conflict between stake holders**.
Micronodes Classification

To be able to apply the design to every micronodes, the design proposal needs to have parameters which response to different hierarchies or to design with a “Catalog”. To be able to make the design catalog consist of components to improve the mobility environment of the micronodes, firstly is to divide all the micronodes into categories. From the excursion to interview the motorcycle taxi in many districts of Bangkok, the micronodes have certain characteristic, which is possible to be categorized.

The micronode settlement size (and also the number of motorcycle taxis) is different in each urban fabric and land use characteristics. Regarding this issue, the micronode can be categorized by 4 different sizes; S, M, L, and XL.
The settlement ground of the micronode can be categorized by 4 characters; 1) on the road, 2) on the footpath, 3) on the inapplicable area, and 4) on the uninhabited area.

The location of the micronode can be divided into 4 types; 1) at the corner of the main road, 2) at the highest intensity of flow area, 3) in between two micronodes, and 4) at the transport node.

The classification matrix of the micronodes
Integration strategy

Integration Design Alternatives

As its informal condition, the micronodes are settled on the grey-land (the land that the ownership of the land is unclear). Most of the time, these kinds of locations cause the problem of mafias, bribes, and also reliability of the mode. From the analysis of the spatial relation to the surrounding in the previous chapter (3), in this part we will try to find the strategy to integrate them in the surrounding. The strategy is to propose an integration design of the micronode with the other functions in order to have a clear land ownership and also aim for create/enhance new patterns of services and activities. The diagram below shows testing of the various ways that the micronode can integrate with the surrounding functions.

The integration strategy is aiming for a further reaction when two different functions are mixed together in one place. In the design testing part, we hope to see one or more of these reaction (or more) as another result from the design.

1. The modal will gain extra facilities from the function that is integrated with
2. The modal will benefit from the security protection from the place
3. The modal will work in synergy with the integrated place and may generate new type of service.
4. The node will be recognizable from the integrated function which is well known
5. The integrated function, together with the mobility node in it, will expand the ability of the service

The Integration Design Techniques

The mobility environment should be integrated with the local surrounding. (Read, S. and Rooij, R.M. 2008) From the literature study of the architectural design concept of “Anti-Object” (Kuma, K. 2008) and “Studies in Organic” (Kuma, Kengo 2009), the concept was visualized as the diagrams showing above. The diagrams show various integration design techniques in order to link the mobility environment to the wider surrounding of the function that the micronode integrate with. The next part of the design testing, we will test the techniques in the design process.
Basic Design Requirements

**Complexity Approach**

Designing public transport have to avoid seduction plan, a plan with out considering real lifestyles. (Urban Design Methods and Theories, Lecture 2008) The promises since the P1 is that, the design of the project should include different scenarios that might occur in the real situation such as;

1. Day time/Night time
2. Worst case weather scenario (ex. raining)
3. Multipurpose usage
4. Flexibility of the design scheme
5. Used by different age groups

**Safety**

Designing for a safety trip on the motorcycle taxi can be easily done by applying a separate lane from a busy traffic of Bangkok. However, this might be a tricky task. The reasons are;

1. Lesson from the bus and bicycle lane of Bangkok
2. Improvement on the (low-class) image of the motorcycle taxi
3. After Implementation, motorcycle taxi might compete with bus and metro
4. The same standard will be required from the other kinds of informal mobility modal

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Reference: Bangkok Mass Transit System Co. Ltd.: www.bts.co.th
Mass Rapid Transit Authority of Thailand: www.mrta.co.th
(Illustration by the author)
# The Inventory of the Micronode Design

<table>
<thead>
<tr>
<th>Category</th>
<th>Feature</th>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comfort</strong></td>
<td>Weather Protection</td>
<td><img src="image" alt="Weather Protection" /></td>
<td>Temporary Structure: Settlement (Low traffic area) at Near Public function (Walk 5 min. and wait for 5 min at the Micronode)</td>
</tr>
<tr>
<td></td>
<td>Resting</td>
<td><img src="image" alt="Resting" /></td>
<td>Walk 5 min. to the Micronode</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Accident</td>
<td><img src="image" alt="Accident" /></td>
<td>Micronode + Vendors = Mixed-use urban function area (Walk 5 min.)</td>
</tr>
<tr>
<td></td>
<td>Crime</td>
<td><img src="image" alt="Crime" /></td>
<td>Micronode + Gas Station = Park &amp; Ride Station</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>Interchange</td>
<td><img src="image" alt="Interchange" /></td>
<td>Walk 5 min. to the Micronode</td>
</tr>
<tr>
<td><strong>Ease</strong></td>
<td>Info</td>
<td><img src="image" alt="Info" /></td>
<td>Handicap Friendly</td>
</tr>
<tr>
<td><strong>Additional Function</strong></td>
<td>Shops</td>
<td><img src="image" alt="Shops" /></td>
<td>Micronode + Vendors = Mixed-use urban function area</td>
</tr>
<tr>
<td></td>
<td>Street Vendor</td>
<td><img src="image" alt="Street Vendor" /></td>
<td>Micronode + Gas Station = Park &amp; Ride Station</td>
</tr>
<tr>
<td></td>
<td>Gas/Electric (future) Supply</td>
<td><img src="image" alt="Gas/Electric Supply" /></td>
<td>Mixed-use urban function area</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Systematized</td>
<td><img src="image" alt="Systematized" /></td>
<td>MIM Ven Bus Boat BTS (Sky Train)</td>
</tr>
<tr>
<td></td>
<td>Standardized</td>
<td><img src="image" alt="Standardized" /></td>
<td></td>
</tr>
<tr>
<td><strong>Recognisability</strong></td>
<td>Signs</td>
<td><img src="image" alt="Signs" /></td>
<td>Micronode with color and sign (with info and map)</td>
</tr>
<tr>
<td></td>
<td>Symbolic</td>
<td><img src="image" alt="Symbolic" /></td>
<td></td>
</tr>
<tr>
<td><strong>Experience</strong></td>
<td>Architectural Design</td>
<td><img src="image" alt="Architectural Design" /></td>
<td></td>
</tr>
</tbody>
</table>
The inventory, or the catalog of the design components shows different requirement issues to improve the condition of the mobility environment of the micronodes. Combining with the micronode classification, the design components are also divided into 4 action intensity. The inventory works in the matrix together with the other classifications of; the micronode types, the integration schemes, and the land use characteristics. Next, we will test how these different design elements match with each type of the micronodes by using the design strategy matrix on 4 selected sites around Bangkok.

Notes: Images of logos from the internet (Companies' web sites)
How the Design Strategy Matrix works?

The catalog of the design components shown in the previous part works in the matrix together with the other classifications of; the micronode types, the integration schemes, and the land use characteristics. This matrix is more like a design process. That is to say, the process first starts from classifying the micronodes in the matrix (see the micronode classification part) and assemble the micronode’s components from the inventory based on the level of the action intensity. Second, match the assemblage with the integrate scheme to see the response to the urban fabric. Finally, mixing all the ingredients with the design techniques.

Although the design method still needs to be condensed in terms of practical uses, but what we can learn from this first draft method can be widely applied in the future. The example of this is, the method of designing the micronodes allows us to create 6,000 different testers on different areas of Bangkok which during the process we can see the most potential model to use with the other locations.

The next part of the thesis will show how this design strategy matrix works by designing the existing micronodes in the selected potential locations. 8 sites in 4 different areas of Bangkok were selected to test the design methods. The specific criteria also applied as a methodology to select the sites which are the most potential sites to promote multimodality. The sites were selected from the collection of many micronode sites collected from the excursion and interviewing. The selection criteria are;

1. Main Micronode in the “network”
2. Micronode at the transfer point is the priority
3. Transfer point with multi modes of transport
4. Micronodes with various conditions

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
4 selected location in 4 zones of Bangkok and the micronodes in the area.
Micronode in the Historical City Center

The Historical city center area of Bangkok is known as the name “Rattanakosin Island”, the area which contains numbers of historical architecture sites in the protection code of the National Fine Arts Department. (BMA, 2010) Although the area is the main tourism spot of the city among the foreign tourists, services of public transport in the area is inconvenient. The reason that almost the whole area are the protected sites, the plan for having metro in this area is now still in the debate. (BMA, 2010)

With the respect to the strict protected regulations, in the architecture scale, we tried to test this area with the temporary structure micronode. The temporary structure micronode will not only response to the regulations, but also response to the dynamic of the intensity of flows. This micronode type can also be applied to the area which has events or lacking of the major public transport. In the design test, we also test the model with on of the bus stop in the area which is heavily used during the rush hours by the local and being occupied by the Tuk Tuk when the tourists come to visit the area later of the day.

Apart from the implementation in public transport that is difficult in this area, the new construction projects also facing with this complexity in the protection laws and regulations. The design criteria for the micronodes in this area should consider these issues as the first hierarchy.

For the informal public transport, the famous Tuk Tuk place itself in the highest popularity among the foreign tourists. What we have noticed in this area through the interview is that, Tuk Tuk can park everywhere in the area without any restrictions from the traffic police. In contrasts, the motorcycle taxi (which is used more by the locals, from the interview) is allowed to park in only some local facility places. The site which we selected, is the micronode next to the local famous market called “Tachang” which also next to the boat pier and the famous tourism site like the Grand Palace.

For the design process, the author tried to link the components from the micronode inventory with the existing as much as possible. From the excursion, we found the empty bicycle lane which can be used for the project. Regarding the sustainable tourism plan, in 2008 the BMA has created the project “The Green Bicycle” for the tourism uses. The bicycle lane has been routed through major tourism sites around the area. However, the project and also the bicycle lane was not so popular used regarding the hot weather and dangers from car traffic.

With the respect to the strict protected regulations, in the architecture scale, we tried to test this area with the temporary structure micronode. The temporary structure micronode will not only response to the regulations, but also response to the dynamic of the intensity of flows. This micronode type can also be applied to the area which has events or lacking of the major public transport. In the design test, we also test the model with on of the bus stop in the area which is heavily used during the rush hours by the local and being occupied by the Tuk Tuk when the tourists come to visit the area later of the day.

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
The design scheme conclusion

The design proposal for the micronode in this area of Bangkok should be flexible in terms of structure, location, size, style, and multi purpose usage. The selected testing sites show that the proposal of the temporary structure micronode is fitted most in the context. The location to place the micronode should be in the area that has the components which can match to the mobility environment of the micronode. With this way, the micronode would integrated to the urban fabric functionally.
Micronode in the Dense Urban Area

Most of the area is planned follow by the western cities’ grid pattern with the components of square and small scale open spaces which later were built over by the buildings. (Pattanaek, W. 2000) The most common typology in this area is row buildings with narrow streets which was created for pedestrian uses in which nowadays, insufficient space for the car traffic.

Result from the lacing of the road surface, the traffic pattern in this area of Bangkok is one-way in most routes. We can noticed from the excursion that the motorcycle taxi and the micronodes in this area are a part of the traffic problem. The problems (from the interview) such as; running reverse the traffic, and parking on the footpath or road are common in this area.

From the interview we also found the interesting information that, some of the micronodes in this area are located in the inner streets and sometimes in the parking space of the department stores or hotels. This shows that the micronode has the potential to integrated with the other functions which can benefit to each other. That is to say, the micronode will not located against the traffic laws and the same time, they also serve as an informal labor for the business they integrated with.

With all the information we got from the excursion and interviewing the micronodes in this area, the design question for this area is focus on how the micronode’s size and settlement can be minimized (due to the lacking of spaces) and how can the micronode benefit to (and from) the local enterprises. In terms of safety, applying the lane in this area is difficult. The proposal is to promote the usage of the inner street which connected to most of the areas in the district and have less-traffic.
The design scheme conclusion

Optimizing the space is a crucial part in the design scheme of this area. The testing sites show that there is a limited choice for the micronode except settle on the footpath or on the street which against the traffic law. The proposal tested the micronode’s ability of flexible to integrate to the public functions in the area which can work together socially and economically. The design also test the micronode integrations match with both big and small scale facilities, in this case; the minimart and the hotel.
Micronode in the Central Business District

From the author's point of view, it is hard to define the boundary of a business district in Bangkok. As also mentioned in Marling, G. (2008) that Bangkok does not have the business district but the recent development of the sky train tides up the mixed-use urban area together which has the concentration of the business sector than the other areas of Bangkok.

The service of the motorcycle taxi in this area play an important role in connecting the huge amount of passenger to the offices in this scattered business district. What we found more from the interviewing is that, most of the motorcycle taxi in this area also do messenger service for the offices in the area during the day time.

The design scheme for this area needs to emphasizes in the issue of comfort and improvement the image of the motorcycle taxi. In terms of the micronode location, the micronode has potential to be integrated to the public buildings in the area and the metro station. For the issue of safety, the proposal tried to match the new image of the motorcycle taxi service in the business district to the materialization of the area by testing with the transport glass tube. The glass tube also give the protection from the weather and heavy traffic on the roads in the same time.

Another issue to be considered in this design scheme is the improvement on the service speed of the motorcycle taxi. In the selected site, the author tested the design to integrate the micronode to the sky train station and the motorcycle taxi can run on the glass tube without the car traffic. Just in case that the motorcycle taxi was not successful to bring more multimodal passenger, the glass tube should designed to be able to convert into the monorail tube.(As originally planed in this area from the BMA in 2010)
The design scheme conclusion

The design proposal of the micronode in this area is focused on the ability to improve the image of the modal, as well as to improve the economic competitiveness and efficiency through mobility implementation. The testing site show the proposal of the micronode integrated to the major public transport node and travel through the glass tube, in order to have safety, weather protection and more rapid services.
Micronode in the Periphery Area

The character of the living area in the periphery of Bangkok is that the big plot scale area were planned together in one package of a mixed-use living complex. (Graham, S. and Marvin, S. 2001) This typology of a big plot which some places are a gated community some places are not, are connected to the main road which the public transports are available. Within the complex, the motorcycle taxi is the most common modal used to get to places in the area.

From the interview, we found in some micronode that the motorcycle taxi also deliver food or goods from the shops which normally located near the main road. In some cases the motorcycle taxis were also asked by the people living near the micronode to hand the money to pay the bills for water and electricity costs. These results show he potential of the micronode to be integrated to different places in the complex, in order to create a network of mobility and other services opportunity.

The design schemes in this area were tested in the biggest gated community in Bangkok, Muangthonthani. The size of this gated community is 12 sq.km. (Half size of Delft) and consist of many kind of facilities such as; schools, shops, restaurants, sport complex, convention hall, university, etc. The proposal focused on testing the integration of the micronode to different facilities and see the response result which hope to create new creativity kind of the way we use motorcycle taxi. The process of generating a new kind of service need time and participation from the people in the area. With this strategy, we also hope that the reliability on the motorcycle taxi system can gradually built up over time.
In most of the residential area in the periphery zone of Bangkok, motorcycle taxi is the only public transport available in the area. The design proposals shown in the testing sites were tried to create a network of mobility through the integration of the micronode with places in the area which has high intensity of multimodal passenger flows. The further result that expected to see is the micronode, together with the integrated functions, can create new kind of service type. In the testing case, we tried to introduce with the park and ride function to the micronode at the gas station.
Design Summary
From the previous part, the research and analysis has resulted in the design strategy and the Matrix of the design mechanism to apply for most of the micronodes in Bangkok. The testing by designing has shown various alternatives of the design solution in different areas, land use characteristic, and users. However, the formalized design scheme for all micronodes in Bangkok could not be done within this thesis. This part of the report will summarize the possible design schemes and a conclusion of the design strategy.

We will conclude with five design schemes and the function/typologies that have potential to integrate the micronode with. The functions/typologies, which are selected to test the integration, are the function which consequence from the market-orientated multimodality in Bangkok. The selected functions are the big transport nodes, the gas station, the public functions, and the minimart. These functions were created and located all over the city, especially the area that has multimodal passenger interchanges. Integrating the micronode into these functions is strategic to promote multimodality in the most potential areas of Bangkok.
Current view from the Sky train station “Asoke”
The Micronode Integrated with the Transport Node

Having the micronege integrated with the mass transit node will reduce steps in mobility chain transit. This integration is strategic to reduce time and exhaustion from walking within the interchanges.
Current view of the Micronode next to a gas station
The Micronode Integrated with the Gas Station

Having the micronode integrated with the gas station will relocate the micronodes to the potential areas that might increase the multimodal passenger from car users. This integration is also strategic to adding mixed-use function from the minimart in the gas station to the micronode.
The Micronode Integrated with the Public Building

Having the micronode integrated with the public functions is to increase and provide accessibility to the potential multimodal passenger of now and in the future. This integration will also strategic to create and enforcing the other kinds of services, which come from social network between the motorcycle taxi and the people around the micronode.

Micronodes which have potential to be integrated with public building

Legend:
- Public Function
- Urban area
- Bangkok area
- Public transport route
The Micronode Integrated with the Mini Mart

In reality, the minimart and the micronode are located in the same location, consequence from the demand of the multimodal passengers in that area. Having the micronode integrated with the minimart around Bangkok is aimed to increase comfort and safety in the mobility environment of the motorcycle taxi.
From the place of origin to the micronode

With integration of the micronodes to the 4 functions, the location of the micronodes in Bangkok will be easier to access, faster transit and more reliable. It is possible for the resident of Bangkok that can access to the mobility network within 5 minutes walking distance. However, there is still some areas which have mono function of residence area cannot be reached by this scheme.
From the micronode to the destination

From the mass transit mode or either in front of places, the motorcycle taxi can bring the passenger conveniently, fast, and safe to every destination in the neighborhood (radius 2 km.) within 5 minutes. By promoting this modal, Bangkok will no longer a city with a proximity of a walking distance from the transport node. The study in the next section will investigate about the future of Bangkok with the development of the motorcycle taxi.
Current view the Micronode in Historical protected site (Rattanakosin island area)
The Portable Micronode

Within the “un-catch” area of the micronodes, the solution for these areas is to propose with the temporary micronode. The proposal of the temporary scheme of the micronode is also possible to applied for; events, restrict protected areas, conflict areas, and the areas with uncertain flow of passenger.
"The 5 Minutes City"

The summary of the design strategy proposals result in the potential of connectivity. Bangkok is now totally connected by Motorcycle taxi collaboration with all kinds of public transport. Within 5 minutes (or less), residents of Bangkok can connect and being connected by the public transport network which will bring a lot of opportunities in terms of economic, social, and yet, urban developments.
Another Implications from the Intervention

The connectivity of the motorcycle taxi in the 2km. radius means that, the implementation of the motorcycle taxi micronode will directly improve the accessibility from the mass transit systems and the transport corridors. This impact on the urban and city scale we found during the design part will be elaborate more in the next part of the thesis. The next part of this thesis will study furthermore on the implications of this implementation that have impacts on the urban and city development of Bangkok.
The Design Strategy

From the design testing, we show how the design strategy matrix works to create variety of combinations in matching the components to the designs. Regarding the fact that the locations of the 6,000 micronodes are different in city fabric, land use character, users, surrounding, etc., the strategy helps to integrate the mobility environments of the micronode into its surroundings. For the 6,000 sites of micronodes in Bangkok, the matrix strategy will also help the designer to test the intervention with various alternatives of solutions. By this benefit of the strategy, we hope to find the better solutions that perhaps can be applied to the other areas. In terms of flexibility of the strategy response to the uncertainty of the future, the design parameters in the inventory can be adjusted to the dynamic of the context without changing any of the objectives. The strategy contains layers of the parameters in hierarchy that are possible to be adjusted.
What does this development mean to Bangkok?

What will Bangkok look like in 2020?
Although the design of the micronode needs to be further study, what we have seen through the proposals is a starting point of the opportunity for Bangkok to make a significant steps in urban and mobility developments. In the beginning part of the thesis, the hypothesis of improving the micronode’s spatial condition to promote multimodal in Bangkok has set and being developed to the design proposal. This part will test the proposal to see what kind of quality it will give to Bangkok. The conclusion of this part will also create the argumentation compare the desirable future and the hypothesis.
INTRODUCTION
Scenario Methodology

Scenario by Design
To investigate the future of Bangkok with the development of the motorcycle taxi, the 2 scenarios will be made in this part with the different contexts to compare which should be the better future for Bangkok, in terms of multimodality interaction. That is to say, the scenarios’ design aim is to provide accessibility and connectivity to public transport for all Bangkokian. The methodology of both scenarios is to use “Trends” from both local and international (of the developing countries) to simulate the possibility of the future city shape. To be explicit, the international trends will be cited from “Unsustainable Transport: City transport in the new century” (Banister, D. 2005) and the local trends will result from the analysis of mobility development of Bangkok in the next part. As mentioned in the methodology part (chapter 1), the methodology we will use to build the scenarios is designing. The scenario will be displayed in 2 scales; the city scale and the street level, to be able to see the clear picture of what might change in both the city fabric and the streetscape. In the city scale, the scenarios will formulate on the principle of how the mobility development has affects on the urban dimension. In the street scale, the impression at the node of transport is selected to display in order to evaluate the distribution of the urban development around the node which the intervention of the motorcycle taxi has direct affects on. In each scenario, the process will start from the estimation of the future urban size and plan for the public transportations. The process will continue to translate the implication of the new transport plan into the spatial meaning to estimate the urban quality.

Probable Future/Desirable Future
To have an explicit result in the comparison part, both two scenarios will share the same design principle of optimizing the public transports for all urban areas in the future and limited the variable to the implication of the MIM intervention. The two scenarios are;

1. The Probable future
This scenario is formulated by using the trends and the current development projects from the BMA to see the autonomous future scheme of Bangkok without the intervention of the MIM project. With the existing context, the scenario will try to design the synergy plan of public transports to improve in connectivity and accessibility for Bangkok.

2. The Desirable future
This scenario is formulated by using the trends as the same starting base as the first scenario, and intervenes by the motorcycle taxi project to see the impact of the project to the city of Bangkok in various dimensions. The only variable that is changed in the second scenario is the implication on the MIM intervention.
Before starting the scenarios, we would like to give a short brief on the urban development type and characteristic of Bangkok. The nature of the city development of Bangkok is market orientated. (Graham, S. and Marvin, S. 2001) The result is that infrastructure influence in the city form, sometimes leading and sometimes following. This cycle of action and reaction process can be elaborated in different scales approach as followings;

1. The regional scale

In the regional scale, Bangkok is in the middle between three major industrial estate cities. The expansion development of the city in the last decades was following by the freight routes especially towards the east of Bangkok which has the biggest industrial cluster of the country, the Eastern Seaboard. (Pattanaek, W. 2000)

2. The metropolitan scale

By located in the strategic location between three development poles, the urban development of Bangkok also expanded from the city center along the corridor towards the industrial cities.

From these two scale approaches, Bangkok is structured as a mono-centric city.

3. The city scale

The diagram of major functions in Bangkok together with congestions, and density shows the city center area dominant the rest of the area. Later, the model of Bangkok can be created as seen above. Different colors stands for the land use character of Bangkok that have the development in facilities disperse over the city.

Reference: Bangkok Metropolitan Administration: www.bangkok.go.th
In the city scale development, the infrastructure development of the expressway network project in 1989 has an impact on the urban form of Bangkok. The diagram above shows the network of the expressway centered in the city center area and connected to the living areas in the periphery zone. The investment from the land developers around the exit areas of the expressway, with the support from the residential areas, has create new urban sub-centralities in Bangkok. This model of the expressway infrastructure development was later called “The Bangkok Model” (BMA, 2010).

Reference: Bangkok Expressway Co. Ltd.: www.bec.co.th
Splintering Urbanism, 2001
What does this development means to Bangkok?

Development cluster in Bangkok and the infrastructures

The result of the market-orientated development has shown in the expressway network connecting to the resident areas in the out-skirt of Bangkok. These locations attracted to and by the developers for big scale facilities and housing projects. In the current situation, now Bangkok has extended the expressway network into the further periphery areas and develop the sky train in the city center area which has created the shift in the market. The area which can be reached by the metro, the land price is higher than the other areas which also results in the types of facilities that attracted to the area. On the other hands, the outer area also have the development in the lower economic profile.

From this point of the analysis, Bangkok cannot be seen as a mono-centric city anymore. We conclude that, the model of Bangkok urban planning should not be defined by the physical appearance but should be defined by the cycle of this marker-orientated planning process which creates dynamic pattern of developments.

The Local trends in Bangkok

From the analysis on the urban development of Bangkok from the mobility point of view, the trends can be defined as followings:
- Market orientated planning results in two ways: Infrastructure follow the urban development or Urban development follow the infrastructure provider
- Over supply of the infrastructure in some area and lacking of service in the others
- A Pattern of large scale package development (by taking advantage of the infrastructure intersection)
What does this development mean to Bangkok?
PROBABLE FUTURE OF BANGKOK

The Projective Scenario

**Scenario Principle**

1. **The Population**
   - The population of Bangkok Metropolitan will reach 14 million in 2020 (BMA, 2006)

2. **The Urban Expansion**
   - The urban expansion will continue to develop along the transport corridor. (Due to the land price market system and infrastructure provider)

**Scenario Abstract**

Bangkok will continue growing and urbanizing along the corridor towards the direction of the industrial districts. The urban development of the city will lead to create the infrastructure projects. The result is Bangkok with the annexation of the urban expansion develop along the corridor in radius shape with a concentration of the major functions remains in the city center areas. The city center area will also strengthen by various kinds of transportation modes, consequence from a huge demand of travel into the city center from the periphery inhabitants. Therefore, the transport node will develop into a huge complex node with the mixed-use package development. The city center areas of Bangkok will be the highest materialized with all the first-class facilities. In terms of mobility, all residents of Bangkok will prefer to use the various types of public transport organized in hierarchy of different area’s demand. Bangkok will develop to be the “Patch Metropolis”.

**Trends**

1. **General trends in the developing countries**
   - Cities will grow rapidly as a mega city form
   - Expanding of the labor market
   - Increasing car ownership with highly traffic congestion
   - In-migration of the population from countryside
   - Degradation of the urban landscape
   - Globalization and relocation of industries result in transport intensity
   - Development pressure result in spatial segregation

1.1 **Trend of the Policy in the developing countries**
   - Reduce the need of travel
   - Reduce the absolute levels of car use and road freight in urban areas
   - Promote more energy efficient modes of travel
   - Reduce noise and vehicle emissions at source
   - Encourage a more efficient and environmentally sensitive use of the vehicle stock
   - Improve safety of pedestrians and all road users
   - Improve the attractiveness of cities for residents, workers, shoppers, and visitors

2. **Local trends in Bangkok**
   - Market orientated planning results in two ways: Infrastructure follow the urban development or Urban development follow the infrastructure provider
   - Over supply of the infrastructure in some area and lacking of service in the others
   - A Pattern of large scale package development (by taking advantage of the infrastructure intersection)

*Reference: The General Trends was cited from “Unsustainable Transport: City transport in the new century” (Banister, D. 2005)*
In order to cope with the urban expansion areas of Bangkok, the plan for public transport has to extend together with building up the new road networks. The diagrams show the future public transport network map of Bangkok with various modals. The higher demanded areas will be served with the more advance public transport mode as a nature of the city development that is follow the market. In contrast, the lower profitable areas will have less public transport services. The map shows catchment areas of the public transport systems of Bangkok in the future. (of the distance of 250 m. radius-or 5 minutes by walk) The center area will be well served but lacking in the periphery areas.
The new transport map of Bangkok 2020

Legend:
- Bus
- Metro
- BRT
- Future Bus
- Future Bus on new built road

What does this development mean to Bangkok?
The Implications

The scenario simulation diagrams show that the development will heavily concentrate within the proximity by walking distance from the transport node. The station will soon over demanded by the development of the area greater than the walking distance. People will still use informal public transport without any other choices. The result in the land use pattern around the station will be in radius.

The development of the informal modal will be popular among the residents who live the area far off the distance from the station. The modals will be found in combination with other private investment public facilities, which share the profits.

Urban developments concentrate at the major transport nodes which has high level of multimodal interchanges.

The informal mobility modes (ex. motorcycle taxi) brings the urban developments further than the walking distance of the node area. The urban form development process simulation shows that the urban area is bigger than the capacity estimated for the node.

The urban expansion will continue along the transport corridor. The scenario simulation of the government decision shows that the government will select to provide “expensive” transport mode development wherever it is profitable. The city shape of transportation will be rings of various modals which has the metro as a backbone connect to one big center area.
The corridor will appear to be used by various kinds of transport, of both formal and informal—both fixed and flexible. In contrast, the other areas without high demand of travel will remain far back develop with less connectivity by public transport.

The urban development size and typologies around the node will also vary by the conditions given by the modal.

The size of development area around different nodes; MRT, Mono rail, BRT and Bus

The size of development area around different intersection of nodes with MRT lines; MRT, Mono rail, BRT and Bus

The mixed-use functions around the station will be directly linked as a part of the station.
The Development around the transport node

The development will continue to concentrate around the transport node, especially the most convenient mode for example; the sky train. The node will develop into a huge complex of a mixed-use function. Investment of the advance infrastructure for Bangkok is still unaffordable. Except the center areas, the city will plan for the less advanced modal as a priority and bet with the development from the private land developers. When the area is profitable for the more advanced modal, the city will start to implement with a better modal on the same corridor.
What does this development mean to Bangkok?
What does this development mean to Bangkok?
What does this development mean to Bangkok?
What does this development mean to Bangkok?

Desirable Future Urban Form of Bangkok
What does this development means to Bangkok?

**DESIRABLE FUTURE OF BANGKOK**

The Prospective Scenario

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**Scenario Principle**

1. The Population
   - The population of Bangkok Metropolitan will reach 14 million in 2020 (BMA, 2006)
2. The Urban Expansion
   - The urban form will not be expanded but densifying in a disperse pattern of developments (Due to the accessibility provided by infrastructures)

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**Scenario Abstract**

With the implementation of the motorcycle taxi mode, Bangkok will extend the capacity of the city further than ever. The motorcycle taxis provide connectivity to the far-off areas around the proximity of 2 km. around the stations. The result in the urban form is that Bangkok will be denser and has opportunity to remain the same size as it is. With the convenient and fast connection from the station, the mixed-use function will start to develop in the area further than the walking distance from the station. When the proximity of 500 meters around the station is no-longer important issue to consider in investing on the land, everything will be everywhere in Bangkok. By the amount of more than 6,000 micronodes, Bangkok will be totally connected and highly accessible. The MIM development, working in synergy with all kinds of public transport, has provided ability for Bangkok to develop the city with highest flexibility. Bangkok will develop to be the “Homogenize- polycentric Metropolis”

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**Trends**

1. General trends in the developing countries
   - Cities will grow rapidly as a mega city form
   - Expanding of the labor market
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   - Improve the attractiveness of cities for residents, workers, shoppers, and visitors

2. Local trends in Bangkok
   - Market orientated planning results in two ways:
     - Infrastructure follow the urban development or Urban development follow the infrastructure provider
     - Over supply of the infrastructure in some area and lacking of service in the others
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---

Reference: The General Trends was cited from "Unsustainable Transport: City transport in the new century" (Banister, D. 2005)
Motorcycle taxi is operating as a feeder modal with flexible destinations. By having this, Bangkok has a potential to create approximately same density in every area plus with the mixed-use functions. Bangkok will not plan to expand along the corridor but, planning for having grids of public transport cover all areas and let the motorcycle taxi feed the passengers to all destinations. With the motorcycle taxi integrated to the node, the transport development area is possible to be extended to the proximity of the motorcycle taxi service distance. (Approx 2 km.) This means, the whole area is also possible to access to the public transport. As a consequence, the node and the transport corridor need to be enhanced in capacity.
What does this development mean to Bangkok?

The diagram shows the maximum size of the transport grid, which can be served by the motorcycle taxi. In the future, public transport in Bangkok will have to plan in grid with the maximum size of 4x4 sq.km.

The motorcycle taxi creates the connection and accessibility of the far-off distance places which results in the changing of the economic condition of the land.

The diagram shows the increasing in demand for the major public transport on the main corridor. The MIM requires flexibility in the capacity of the major public transport.
Public transport of Bangkok with the distance of 5 minutes (2 km.) radius by motorcycle.

Legend:
- Catchment area of the public transport (by motorcycle taxi)

The map shows catchment areas of the public transport systems of Bangkok in the future. (of the distance of 2km. radius, or 5 minutes by motorcycle) Every areas in the city will be equally connected. In order to design public transport route in grid, there are 3 possible schemes. Each scheme of the transport grid also leads the urban development into different forms and density. The implementation in Motorcycle taxi will help Bangkok reduce the plan of public transport routes into the 4x4 km. grids. Bangkok can choose to plan public transport by fill in all potential grids with the most flexible system. (ex. BRT)
The new transport map of Bangkok 2020

Legend:
- Bus
- Metro
- BRT
- Future BRT

What does this development mean to Bangkok?
The Preferable Mobility Chain

When have the motorcycle taxi integrated to various mobility chains, all trips in Bangkok will be highly flexible and accessible. For long distance travel, the bus will not be the good choice in terms of speed. The first priority choices for residents of Bangkok to travel by public transport will be the MRT and the BRT.

Capacity of the Node

If we are success in promoting multimodal in Bangkok, the multimodal passenger will be increased as a consequence. The capacity of the mode and yet, the node will have to expand to serve the rising demand. The calculation on the right shows the scenario if the metro service extend to the highest capacity passengers comparing to the existing situation per station. The example case bring to calculate in this part is the metro line of Bangkok (MRT) which runs across all zones in the city. With this preliminary calculation result, we can estimate how big the micronode will be in the future.
The simulation of what might happen in the grid shows different possible types of density.

**Urban Development Density**

The map shows different public transport grid sizes with different possibilities of developing the area into different levels of density.

Legend:
- 1x1 km. grid
- 2x2 km. grid
- 3x3 km. grid
- 4x4 km. grid

The simulation of what might happen in the grid shows different possible types of density.
The Development around the transport node

The implication of having motorcycle taxi integrated to the city is that;
1. Extend the development proximity area around the station
2. Accessibility of the whole area to the public transport
3. Connectivity of the whole area
4. Extend the capacity of the public transport

The development will still continue to concentrate around the transport node but, some will disperse to the further distance from the node by the strong connectivity provided by the MIM development.
What does this development mean to Bangkok?

Existing road (Future transport node area)

Impression on the development at the major transport node
Levels of Connectivity

The map shows the overlaying of public transport in Bangkok. The result we found is the MIM creates potential for a bigger urban development area by providing connectivity. The map also shows different levels of connectivity by numbers of public transport routes that can access to the area. With the connectivity map, it can imply that in which area will suitable for which type of program, according to the levels of connectivity.
Connectivity and Intensity

When mapping the grid-density map with the public transport catchment area map, the scenario shows various types of potential areas for the future development response to different intensity of connectivity. The process maps below will show how this phenomena was constructed.

Connectivity and Intensity

When mapping the grid-density map with the public transport catchment area map, the scenario shows various types of potential areas for the future development response to different intensity of connectivity. The process maps below will show how this phenomena was constructed.

BRT or either MRT = Normal Connectivity
BRT and MRT = Super Connectivity
BRT and MRT x2 = Extreme Connectivity

Catchment area of BRT or either MRT
Catchment area of BRT and MRT
Catchment area of more than 1 line of BRT and MRT

Normal Connectivity in different densities
Super Connectivity in different densities
Extreme Connectivity in different densities

What does this development means to Bangkok?
What does this development mean to Bangkok?
What does this development mean to Bangkok?
# SCENARIOS EVALUATION

What should be better for Bangkok?

<table>
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<tr>
<th>TARGETS</th>
<th>QUALITY OF THE URBAN AND LIFESTYLE</th>
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| **Environmental**  
Low carbon emission city in 2020 | Mobility and the city in general |
|  - Total mobility remain the same as the current trend, but with wider range of service providers and destinations  
  - City will grows as a form of condense mega-city  
  - Infrastructure built slightly increasing (Following the current plan)  
  - Road surface and road usage increased by (mainly) public transport  
  - Longer in average travelling time |

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<th>Limited Infrastructure building</th>
<th>Impact on Urban</th>
</tr>
</thead>
</table>
|  - Concentration of development in the city center with less facilities in the outer areas  
  - Mixed use developments along the transport corridor  
  - Patch model, lack of development in some areas  
  - The size of the city will keep expanding towards the development axis. |

<table>
<thead>
<tr>
<th>Equity and Distribution</th>
<th>Accessibility and Proximity</th>
</tr>
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</table>
|  - Average travel distance in increased  
  - Large scale of mixed use functions around the station  
  - Public transport price is market competed |

<table>
<thead>
<tr>
<th>Efficiency and Innovation</th>
<th></th>
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</table>
|  - City as a various kinds of transport provide from many private investors  
  - City development concentrated at the stations  
  - The cost of implementation in infrastructures is high |
Environmental
Low carbon emission city in 2020

- Total mobility is higher than the current trend (increased in short trips)
- City will slowly start to decentralized in a homogenize mega scale
- Road surface remain the same as current
- Shorter in average travelling time

Limited Infrastructure building

- Polycentric with homogenized dense urban fabric
- Development is on both corridor and in the grid
- The size of the city will be less expanded but densifying around the potential sub centralities

Equity and Distribution

- Average travel distance is shorten
- Mixed-use functions is developed in the wider areas
- Public transport price is organized but higher than the current trend

Efficiency and Innovation

- The city will operate with few kinds of transport in coherence
- City development will be at both around the station and in the other areas
- The cost of implementation in infrastructures is lower

What does this development means to Bangkok?
What does this development mean to Bangkok?
The MIM Development and Bangkok’s Urban planning

With the method of making scenario by designing, the project’s implications show the ability to gain many opportunities for Bangkok. As we mentioned that this project is the starting point for further studies in the MIM, it is too soon to limited ourselves in the concrete conclusion. We hope that we will discover more in the future so, in this thesis study, we will conclude with the examples of the opportunities that the MIM will bring to Bangkok as followings;

- Strengthen/Create opportunity of accessibility to the urban areas.
- Strengthen/Create accessibility to the potential urban centralities in Bangkok
- Improve connectivity from the public transport systems
- Create opportunity to adapt the urban development in the flexible future
- Create development potential for the urban areas
- Create flexibility in the urban development
- Create synergy within public transport system and also with the urban fabric
How can we do it?

What?
When?
Where?
Who?
One of the reflections from the previous design and the future scenario of the proposal is that, this intervention will not be possible without its related components. Although this thesis study did not investigate deeper in those components, this reflection part will be the beginning phase for the further study in the future. This part will start with the definition of the MIM development and the related component and end with the delivery mechanism concept.
WHAT, WHEN, WHERE, HOW?

Suggestion in the Delivery Mechanism of the MIM Project

What is the definition of the MIM

At the beginning of this project, we first start the project with the aim to improve the spatial conditions for the micronodes. However, the process has shown the complexity in the relation of the mobility and the urban study that influence from each other. Therefore, the concept of the MIM project has been changed and needs to be redefined. As we mentioned in the beginning, along the study process, we found that the MIM project has to be designed and study with more aspects. In this part of the thesis, we will try to summarize the aspects which have to be done in synergy of the project design. We will first start to give the examples of what components create the definition of the MIM:

- The system of the motorcycle taxi and the micronodes which have to work in synergy together with other kinds of the public transport systems. The density of the micronodes indicates the intensity of the multimodal passenger in the area, and so the more mixed-use the area is.

- The effective public transport systems which are planned with the accessibility of the motorcycle taxi. From the study in this thesis, the grid size of public transportation should not be bigger than 4x4 km.

- Distributed plan of public transport over the urban areas.

- Hierarchical plan of public transport modes, according to the potential urban development centrality.

- Mixed-use urban development pattern planning

- Development in the potential areas and sub-centralities

- A synergy with the other disciplines to create the effective development plan

- Improvements in the modal; for the environmental concern, the motorcycle taxi should switch into electric motorbike

Market oriented multimodality
Where should be applied with the project first?
Regarding the main aim of the project that trying to promote multimodality in Bangkok, the starting location for the project should be the locations that have high potential to strengthen/bring the multimodal interchanges. The examples of the potential locations are;
- The micronodes in the area that have high intensity of multimodal passenger interchanges.
- The micronodes in the high density area
- The micronodes in the sub-centrality area
- The micronodes in the area that have potential of the future centralities (The extreme connectivity area)

When should we start?
In order to start the project, deeper study in every aspect needs to be done and test the concept. We believe there is still a long way to develop this project until that point. What we can make suggestions in this study is the cycle of the development in the project. We tried to match the MIM with the formalizing projects that have been realized before to see possibility to make a synergy development plan. The diagrams show the repetition of tasks to formalize and develop the motorcycle taxi model in an example of a time-working plan.

Example of Delivery Mechanism: Time Working Plan
What kind of the future Bangkok can we imagine?

And, how can the MIM be designed to response those future?
According to the approach concept of this design project that aimed for a high flexibility strategy, the design should not respond only to the problems but also to the challenges of the city. With this approach, we have the chance to generate cycles of this research-design process in a long term to be able to deal with the political and economical uncertainty. In chapter 3, the city profile, the analysis has opened 4 statements of the city’s urgencies as challenges for Bangkok’s future developments:

Urgency 1:
- Adapt the city development to mitigate the water problems

Urgency 2:
- Expand the capacity of the city and its facilities for the metropolitan region

Urgency 3:
- Increase the accessible green areas in the city

Urgency 4:
- Provide equity accessibility to the public transports in all areas

In this part of the thesis, the design proposal will be tested to see how it responds to the city’s urgencies. The author has chosen to use the test method of making scenarios by designing which can also test the design strategy matrix within the same time.
Potential Sites Selection Process

Water front sites in Bangkok

Major facilities in Bangkok

Water front sites and the 2 km, proximity radius

Major facilities and the 2 km, proximity radius

Water front sites and the micronodes in 2 km, proximity radius

Major facilities and the micronodes in 2 km, proximity radius

Water front sites and hierarchy of development preferable areas

Major facilities and hierarchy of development preferable areas
How can the MIM be designed to respond the future of Bangkok?
How can the MIM be designed to respond the future of Bangkok?
Reflection & Testing

From the previous chapter (3), we have defined four urgencies of the city according to the contemporary urban development trends and problems. The awareness of the fact that the future of the city is uncertain (regarding the basic issues of political, economical, social, technology, etc.). The reflection and evaluation of the design project should be able to test the project’s responses to the future development regarding the city’s urgencies. The reflection of this research and design package is therefore, chosen to use the design method to be able to answer the basic issues as followings;

- The ability of the project to response to the city’s urgencies
- The flexibility of the design proposal and the design strategy
- The opportunity that the project gives to Bangkok
- The potential of the project to be implemented further together with the city’s development models

These issues will be elaborated in this part. The process started with the site selection method (in the previous page) which using the same method as the site selection in the design testing part. In each urgencies theme, we will try to portrait the project in the future scenarios.

The four urgencies (from the analysis in chapter 3)

Urgency 1:  
- Adapt the city development to mitigate the water problems

Urgency 2:  
- Expand the capacity of the city and its facilities for the metropolitan region

Urgency 3:  
- Increase the accessible green areas in the city

Urgency 4:  
- Provide equity accessibility to the public transports in all areas
The Venice of the East and the MIM

Urgency 1:
- Adapt the city development to mitigate the water problems

Why go back to the River and Canals?
By having canals network and rich history of the water front lifestyle, Bangkok used to have a nickname of “The Venice of the East” given by the merchants during the over seas trading in the 18th century. In 2020, living with the water will be the most popular trend for the metro lifestyle in Bangkok. By numbers of regeneration projects from the government, Bangkok can finally go back to live with the water. All canals will be used as a transport corridor for both everyday and leisure use. Chaopraya River and the famous canals network of Bangkok will be the top sites tourist’s attraction, which can be accessed from any kinds of public transport in the area.
How can the MIM be designed to respond the future of Bangkok?

Existing Situation

Impression on the future of the area in with MIM Intervention

Asoke Express boat pier

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
Why have to be grand?

It is the pride of Bangkok and its residents to be the primary city of the country. As the only metropolitan in the country that concentrates all the top-class facilities, Bangkok will be the city that services the whole country. People from the other provinces and in particular, from the metro area, will be invited to use the facilities in the city. Access to major facilities in Bangkok from outside of the city is as convenient as normal everyday trips. From place to place in Bangkok, will use at most 2 interchanges in the mobility chain.
How can the MIM be designed to respond the future of Bangkok?

Existing Situation

Bangkapi dense commercial and residential Sub-Centrality

Impression on the future of the area in with MIM Intervention

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
Why Green?

After many years of collecting pocket size parks around Bangkok, finally the BMA has success to provide enough accessibility to the green areas for the residents of Bangkok. Residents of Bangkok can find the green area everywhere; along the road, under and over the expressway, and in the former car park buildings. Bangkok will be the healthiest city in the world. Residents of Bangkok can access to the green area from everywhere in the city and connected to the big scale public park within 5 minutes.
How can the MIM be designed to respond the future of Bangkok?

Chatuchak Park (JJ. Weekend Market)

Existing Situation

Impression on the future of the area in with MIM Intervention

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanmakom
The cityscape of Bangkok in 2020

Micronodes which can reach big events related facilities in Bangkok within 5 minutes

Why Big Events in the City?

After 5 times of bidding attempt, finally our dream has come true. The 2024 Summer Olympic games will first come to the South East Asia. Bangkok is ready to welcome the World’s most spectacular event with the lightest preparation in the city. It will be the first time in the history, that the game is held in the city areas. No new metro lines or roads will be built; the city can manage the event with all kinds of available public transport and facilities. Every sport facilities will have excellent connection to the public transport and easily access to all kinds of the top-class facilities in Bangkok. Can we imagine that Bangkok will move the Olympic games with Motorcycle taxi?
How can the MIM be designed to respond the future of Bangkok?

Rachaprarop Airport link metro station

Existing Situation

Impression on the future of the area in with MIM Intervention

Images and information of the micronodes is a part of this research-design package and were done by Pattara Kanjanapanyakom
Project Evaluation

Emissions of carbon dioxide per capita by Thailand

According to the main aim of the project, reducing the CO2 emission level, the motorcycle taxis have to switch to electric motorbikes. The study also shows that the impact of the project on the urban scale can help in reducing trips distance by the distribution of the urban developments into the sub-centralities.

The city development plan from the BMA shows the strategic areas for the key projects which aimed to solve the problems such as: traffic congestions, polluted canals, lacking of green area, etc. The location for each project was selected based on the current potential of development and/or current problems.
How can the MIM be designed to respond the future of Bangkok?

With the design strategy matrix, the design solutions can be flexible. The design components can response to the different context of locations of the micronodes in Bangkok. The design proposal of the portable micronode also shows the flexibility to response with the city’s dynamics. However, the design strategy requires tailor-made design in almost every sites we tested in the design part of this thesis. The design strategy needs to be balanced with the practical uses.

The MIM shows that the project can integrate the design of the new development into the existing fabric and surroundings. However, some of the design schemes could not response directly to the problems. The MIM concept needs to be developed with the other disciplines to create a synergy development plan.

The potential development locations, by the MIM synergy development plan, were similar to the city development plan by BMA. The proposal of the MIM has the potential to be further study to develop in the same direction of the city’s development.
5. CONCLUSION
- What have we gained for Bangkok? And what is next?
What have we gained for Bangkok?

And, what is next?
The conclusion of this thesis contains mainly 2 parts;
- What have we gained for Bangkok?
- What is Next?

The intention of the conclusion is to conclude (as well as having critical evaluation) on both the process (the methodology) and the design proposal. This conclusion part will give the answers to the basic questions;
- Have this thesis response to the aims?
- What should be the next steps?
- What are recommendations to suggest?
As mentioned in the chapter 1 that, the methodology we used in this thesis were adjusted and changed along the process due to the changes in the aims of the project. The thesis was first start without a clear definition and the framework of the design project. The result is that; along the process, we have tried and errors in many times which makes the work progress inefficient. In contrast, with the challenge as the main goal of the study, we found flexibility in terms of finding the solutions as well as the methodology to achieve it. Comparing to the conventional way of looking at the problem and find the solutions, this way of seeing the problem as a challenge can help the designer come up with new approaches to the solutions. For the design chapter (MIM), the design-testing methods was widely apply to many parts. (Ex. scenario visioning, reflection, etc.) The methods allow us to test the concept and delivered the end-product of a design with flexible solutions.

**Recommendation**
- Challenging in the problems can create flexible and variety in solutions

The theory study research topic for this thesis was selected according to the methodology that, we would like to have case study sites in the Netherlands to be able to compare and study at the real environment. The problem we found was the difference in context of the two countries, in terms of urban development pattern, urban planning nature, climate condition, etc. The adaptation in theory and case studies’ parameter have to be done to apply the knowledge to the project in the different locations. This we found interesting, in the different ways we can apply and adjust the classic theory for a various conditions.

**Recommendation**
- Challenging the design project by apply the theory to various context
The selection of the project area was the method which aimed to create the argumentation against the hypothesis. We tried to use the information from the city analysis to select the project area which is appropriate for Bangkok, in terms of economic affordability, urban development characteristic, social and spatial condition, and the government’s policy. As mentioned in the introduction part, this method is useful for the case of developing countries. Most of the mistakes we found in the developing countries is that, the adoption of the project from other countries with a different context.

**Recommendation**
- Interpretation of the policy and the city profile to make the appropriate framework of the project

We created the design strategy matrix in order to deal with the complexity of the project and for the flexibility in solutions for 6,000 locations. The matrix turned out to be too complicated to apply for the design. Further study in terms of urban strategy to design with multiple sites location needs to be done, in order to balance this concept with the practicing.

**Recommendation**
- Balancing the flexibility in the strategy with practical way of working
MIM
Metropolitan Informal Mobility
Closing
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