Urban-Landscape Transformation along CBL Canal
1. INTRODUCTION

2. BEKASI DISTRICT
   Intensive Agriculture Land, Home for Biodiversity, Cultural Heritage
   The Turning Point

3. METHODOLOGY
   Problem statement
   Relevance
   Aim
   Research question
   Methods
   Expected Products
   Research Structure

4. LITERATURE REVIEW
   The Two Networks
   Urban Metabolism
   Ecosystem Services

5. ANALYSIS
   Historical Development
   Urban Structure
   Ground System
   Flows
   Spatial Analysis

6. FIELD TRIP
   Photographs
   Interviews

7. URBAN PLANNING

8. PUBLIC PARTICIPATION

9. PROJECTION

10. COMPARATIVE STUDY

11. DESIGN PROPOSAL
   Vision
   Design Idea
   Concept and Principle
   Structure Plan
   Strategy Component
   Zoom in Project

12. REFLECTION

CONTENT

5
15
25
33
41
57
91
109
121
125
135
141
176
1. INTRODUCTION
ABSTRACT

Indonesia is projected to be the world 7th largest economy country by 2030. This could be achieved by maximising the utilization of natural resources as well as infrastructure development. One example is the infrastructure development of Jakarta with its surrounding metropolitan area (JABODETABEK). Here, we see a rapid development of logistics infrastructure and one of the key project is the utilization of Cikarang-Bekasi-Laut (CBL) canal as inland waterway. Due to its topographical condition and soil type, the surrounding area of CBL has high potential for agriculture. Moreover, mangrove forest located in the north coastal area protects land from abrasion as well as a home for biodiversity. Those potentials are also contributed by rivers crossing over this territory, including CBL Canal. The transformation of CBL canal from floodway system into an inland waterway that connects Jakarta Port and the Cikarang industrial area has a strong prospective to trigger urban sprawl from Jakarta and industrial investment along the canal. At the same time this development threatens the landscape diversity and the identity of today’s territory. This research aims to investigate the possible impact of the transformation of three related systems: urban, production and nature. Two concepts are applied as research method: The Two Networks by Sybrand Tjallingii and Urban Metabolism. The outcome of this research is a structure plan for the regional area of the CBL canal and design principles on the local scale that aim to find possible synergism between urban, production and nature developments.

Key words: Bekasi, Jabodetabek, Inland Waterway, Two Networks, Urban Metabolism.

MOTIVATION

The thesis begins with a desire to investigate the current development in Jakarta city and its surrounding area (Bekasi District). In recent years, Jakarta as capital city of Indonesia is massively developed especially in port development and water connection. The development in Indonesia can not be detached from the fact of current planning tradition where infrastructure is used as carrying structure for each development while space for nature is often being forgotten. As a result, degradation of environmental quality as well as living quality is unavoidable.

This condition motivate to further thinking of urban planner or designer’s role in directing the sustainable development where nature can be the carrying structure for urban development.
Fig. 1.1 Jakarta, The Capital City  
source: Rukmana, 2014

Fig. 1.2 Asian and World's Population  
Source: Coordinating Ministry for Economic Affairs, 2011

Fig. 1.3 Port Ranking in the World Container  
Source: Coordinating Ministry for Economic Affairs, 2011
Indonesia is the world’s largest archipelago country with more than seventeen thousand islands. It has an estimated population of over 260 million people which make it as fourth most populous country in the world. Laying in between world’s largest market (Dubai, Singapore, Hong Kong, Shanghai) and passing by the most active sea lane of communication (SLOC) makes Indonesian archipelago as an important region for trading activity (Fig. 1.2 & 1.3). In 2012, Indonesia was positioned as 16th largest economy in the world with 53% of population in cities producing 74% of GDP. This condition is equipped with 55 million skilled workers in Indonesian economy that result 0.5 trillion USD market opportunities in consumer services, agriculture and fisheries, resources and education.

The study conducted by McKinsey Global Institute predicts a dramatically increase. By 2030, Indonesia is projected to be 7th largest economy in the world with 1.8 trillion USD market opportunities in the same sectors mentioned above (Fig. 1.4).

In order to make the most of this opportunity, there is much need to be done. One of them is the urgency of infrastructure development related to trading and resources distribution. In this case, development of port and the enhancement of economic corridor become priority.
INTRODUCTION

Handling more than 50% Indonesia’s trans-shipment cargo traffic, Port of Tanjung Priok is the busiest and most advance seaport in Indonesia. To ensure the sustainable and continuedness economic growth and maximize Indonesia’s potential reported by McKinsey, upgrading project of this port has been conducted. By 2023, the capacity of this port will be tripled from existing capacity and increase 20% shipping efficiency. As a complimentary to this project, the connection between this port an industrial area has been considered. Currently, containers from seaport are transported by trucks and trains which cause a large pressure on Jakarta infrastructure. Moreover, this condition results delay due to heavy traffic and slow means of transportation which cause in effective and inefficient container transport. In order to increase the efficiency of container transport, the idea of transforming existing canal called Cikarang-Bekasi-Laut (CBL) into an inland waterway has been proposed.

CBL is located in Bekasi district, one of satellite city of Jakarta metropolitan area. Together with three other cities, they structured the administrative boundary called Jabodetabek (Jakarta-Bogor-Depok-Tangerang-Bekasi). As the core of this territory, Jakarta is the biggest megacity with total population of 10,075,310 and density 15.052/km². The population of Jakarta itself is increasing over years and overflow towards the other district of Jabodetabek as shown in picture (Fig. 1.6). The whole territory is a conurbation with a huge natural and human resources base. It is also a major economic hub and an intense market place. Besides, having a strategic geographic location and thus being a major international hub, it is the major foreign-investment destination in Indonesia.
2. BEKASI DISTRICT

Intensive Agriculture Land, Home for Biodiversity, Cultural Heritage
BEKASI DISTRICT

Bekasi district is located in the eastern of Jakarta. It has an area of 1,224.88 km² with 2,828,767 inhabitants (based on census 2014). Due to its topographical condition and soil type (alluvial), this area is highly potential for agriculture land which is covering the majority of this district. Moreover, mangrove forest located in the north coastal area is functioning as abrasion protection as well as a home for biodiversity. Likewise, the combination of fish farming and rice paddy field as well as sylvo fishery (combination of mangrove forest and fish farming) enhance the potential of this district. The diversity of landscape in this territory also contributed by rivers crossing over this region. There are 16 rivers used as water resources, including CBL.

Beside its landscape diversity, urban kampung scattered within the intensive agriculture land become another added point of this territory. Within this urban kampong, local heritage and strong local identity shaped by local community enrich the potential of this territory. As one of the biggest rice supplier to Jakarta, Bekasi District in the past can be seen as a wealthy rural area, quiet zone for living and agriculture production environment as well as a center of cultural heritage.

Fig.2.1 Bekasi District in 1866
Source: http://www.lib.utexas.edu/

Fig.2.2 Bekasi District in 1942
Source: http://media-kitv.nl/

Fig.2.3 Illustration of Landscape System in West Java
Source: Author, based on Cruz, 1992
Fig. 2.4 Muara Gembong Village, Bekasi District
source: Triana, 2015
Fig. 2.6 Swamp Area in Muara Gembong Village
Source: Triana, 2015

Fig. 2.7 Agriculture Land in Bekasi District
Source: https://bersapedahan.wordpress.com/2015/02/

Fig. 2.8 Saung Ranggon as Cultural Heritage of Bekasi District
Source: Bonbon, 2016

Fig. 2.5 View of Bekasi South
Source: https://bersapedahan.wordpress.com/2015/02/
Fig. 2.9 Fish Farming Activity in Muara Gembong
Source: Triana, 2015

Fig. 2.10 White Winged Tern Bird in Muara Gembong
Source: Triana, 2015

Fig. 2.11 Little-ringed Plover in Muara Gembong
Source: Triana, 2015
3. BEKASI DISTRICT

The Turning Point
PROBLEM ANALYSIS

CBL as one of the canal lies in this territory was constructed in 1985 to divert water run-off from Bekasi, Cisadang and Cikarang river (Fig.3.1). The diversion aimed to use the canal as irrigation system for surrounding agriculture area and drainage system to prevent flooding. The historical map shows the condition of Bekasi District in 1942 in which agriculture, mangrove forest and fish farming activity are dominant (Fig.2.2). Meanwhile, urban settlement was taking place along river, using waterfront as part of their front yard.

In the late of 90’s, after the construction of CBL canal, industries and urbanization started to expand, resulting a transformation of landscape structure of this territory. The urban settlement started to growth rapidly from city center (south) toward canal side (north). Based on the data derived from central statistics agency of West Java, it is shown that the built area is increasing while mangrove, fish farm and agriculture land are decreasing (Fig.3.2).

Fig.3.2 Land Use Dynamic in Bekasi District
Source: BPS, 2007

Fig. 3.1 Location of CBL Canal
Source: Author

Fig 3.3 Land use Transformation in Bekasi District
Source: Author, based on Anjani, 2010
The development of industrial area also contributes to water pollution. The study of water quality done by Environmental Impact Management Agency in 2016 shows the heavy contaminated water coming from the industrial area in the city center towards CBL canal (Fig.3.5). As a result, irrigation from this canal is not possible anymore, causing the degradation of agriculture and fish farming potential.

The conflict brought by industrial activity in this area also related to change of urban form where informality related to home business is appearing to serve the workers from industries. This informality produces waste and generate environmental degradation. Over years, the informality become permanent residential area and expanded along the canal. Some of them are found built in the canal bank, changing the landscape structure of this area and threatening the existence of the canal as water resources and flood prevention (Fig.3.7). This degradation is shown in the current situation where flooding in this area has become a severe problem (Fig.3.6).
Urban development of Bekasi District is strongly linked to the infrastructure development. A natural plain with strong potential of agriculture production and rich ecological system is slowly pressured by industrial and infrastructure development force from Jakarta City. The needs of efficient production and economic growth overpower the potential and the necessity of natural system. In this case, traffic network becomes the prior and carrying structure for urban development. The need of more space for urban development is often solved by occupying spaces that belongs to nature. Consequently, informality and urban sprawl are taking place in the river/canal bank, threatening the existence of this natural system. In this case, the water network is no longer becomes the carrying structure of different elements [biodiversity, food production, recreation, etc.] but becomes the carrying structure for informality.

What Bekasi District face now is the transition where the context change is happening. The current tendencies explained before shows how the development taken in this place try to control and manipulate the nature. As a result, the increasing loss of natural power. A sustainable approach thus need to be considered in order to maintain the integration of each system and subsystem and provide a robust as well as adaptive system. Finding new relationship and balance condition is something that is fundamental in which each different systems work in synergism and supporting each other potential. In the case of Bekasi District, a balance and synergic system between port development, environmental management, flood defense system and urban development is something that will be focused in this thesis project.

As a conclusion, the canal currently is not working as it should be in the past. Due to pollution from industry and informal settlement, the canal is no longer able to operate as both water resources and flooding prevention. The transformation of this floodway system into inland waterway potential to bring further challenges such as the industry expansion that can caused more pollution, the change of land use, and informality along the waterway.

TOWARDS SUSTAINABLE DEVELOPMENT

Fig.3.8 Current Condition along CBL Canal
source: google map
4. METHODOLOGY

Problem statement
Relevance
Aim
Research question
Methods
Expected Products
Research Structure
PROBLEM STATEMENT

The CBL inland waterway project is one of strategic project to enhance the economic condition of Indonesia. Due to its potential location, it seems that this canal is promising enough to increase the efficiency of container transport and port activities.

However, due to current condition and some tendencies, the transformation of CBL canal from floodway system into inland waterway for industrialization will further change the interaction between each system (urban, production and ecological system) which caused severe problem: flooding, decrease of land productivity, water and soil pollution, informalities and social segregation.

RELEVANCE

This issue has both academic and societal relevance. There has been much discussion about the urgency of CBL project as written in articles and newspaper. However, very limited discussion related to the future possible impact both for urban and natural environment has been delivered. This research aims to contribute to the discussion by providing the study of possible impact and the design guidelines to direct the future urban development stimulated by this project.

Fig.4.1 Witteveenbos Article

source: http://www.witteveenbos.com/

Fig.4.2 Maritime News

source: https://maritimenews.id

From the societal point of view, the research aims to contribute to the changes of perception and cultural planning in Indonesia in which today society is less aware to sustainable way of living and have less appreciation to natural environment. This study is expected to gain awareness and open up the idea of sustainability to the society. Moreover, this study is expected to provide a result in which can be used to solve social issue such as the increasing of informality, weak community power, and lack of room for social interaction.

AIM

This study aims to explore possible impacts of transforming CBL canal into inland waterway. In order to answer this question, the complete understanding of current system (ground layer, flows, driving forces) will be conducted. The study then will be further explored to find possible solution where synergism can be implemented to enhance ecological potential, water and land quality, land productivity as well as human resources. As a result, the guidelines as spatial solution together with urban planning policies for sustainable urban development will be delivered in relation to the future impacts of CBL transformation project.

RESEARCH QUESTION

Based on the problem statement mentioned above, main question arose in this study is:

“What kind of strategy in relation to CBL inland waterway project that need to be provided in order to maintain CBL canal as carrying structure of different element, providing better synergism between urban, production site and natural environment?”

In order to specify the focus of this study, three sub questions are examined in correlation with the main question:

1. How do the present systems [ground layer, flows] work? What are the driving forces?

2. What are the possible impacts of transforming CBL Canal into inland waterway?

3. Which are the essential elements need to be considered in order to create synergism of CBL Canal as water resources, flood prevention and inland waterway?

4. Which urban pattern/principles need to be embedded in order to create sustainable urban development along the waterway?
METHODS

In order to achieve the aim of this research, some methods are identified in correlation to each sub research question:

Q1. How do the present systems (ground layer, flows) work? What are the driving forces?
Several methods applied to this question are:
• Literature study
• Mapping of existing ground system and flows

Expected products from this study is a set of maps showing how the current systems work

Q2. What are the possible impacts of transforming CBL Canal into inland waterway?
Methods applied to this question are:
• Historical development study
• Mapping analysis showing the morphology of the territory and the current trend
• Projection (probable future due to current trend)

Expected products: Map showing projection in several steps. The projection then will be assessed with assessment tool: Ecosystem Services in which the result will determine the design proposal.

Q3. Which are the essential elements need to be considered in order to create synergism of CBL canal as inland waterway as well as water resources and flood prevention system?
Methods applied to this question:
• Spatial analysis: zoom in analysis using three perspectives concept: area, flow and context
• Field trip and interviews

Expected products from this study are:
• Schematic plans, diagram, 3d illustration to show the relationship between urban, production and nature in three perspectives: area, flow, context.

Q4. Which urban pattern/principles need to be embedded in order to create sustainable urban development along CBL Canal?
Method applied to this question:
• Comparative study in order to find possible solution that is applicable in the context of Bekasi District

Expected product derived from this study are the collection of design principles for designing sustainable development along the corridor

EXPECTED PRODUCTS

The design principle will be then implemented in final products. There are two expected products:

1. Structure plan in Jabodetabek scale: showing steps of development, policies and stakeholders involved
2. Detail Project in several strategic areas with development timeline and technical details
Main question: strategy in relation to CBL inland waterway project that need to be provided in order to maintain CBL canal as carrying structure of different element, providing better synergism between urban, production site and natural environment.

Fig. 4.3 Research Structure and Methodology
source: Author
5. LITERATURE REVIEW

The Two Networks
Urban Metabolism
Ecosystem Services
Safe and sustained use of resources:
reduce, re-use, recycling

Fig. 5.1 Three action-oriented integration perspectives
Source: Tjallingi, 2016

Based on problem analysis stated in the previous chapter, it is clearly understood that current development in Jabodetabek area is strongly led by infrastructure force. This phenomenon results in neglected urban environment and abusive used of nature potential that brings conflicts in ecological system. Particularly in water network that dominates the area of Jabodetabek, rivers which play important role have been misused by informality that triggered by massive urbanization. Enormous number of waste pollution coming from industries and informality in unavoidable and increase due to the lack of regulation and proper development plan.

This problem field lead to the selection of theory used in this project. First, the role of Two Networks, water and traffic as carrying structure of urban development and how these Two Networks implies integrated ecological system. Secondly, the city has to be seen as a set of systems and each system is related to other system and subsystem. Urban Metabolism approach is then selected to further examine the relationship and flows between each system while ecosystem services will be used as assessment tool to evaluate spatial quality of projection and proposal.

INTEGRATED ECOLOGICAL APPROACH: TWO NETWORKS

Steiner in the writing titled Nature and City stated that urban ecology is seen as an interdisciplinary concept which helps ecologist as well as urbanist to understand driving forces, pattern, process and outcomes in the making of urban landscape and urban ecosystem (Steiner, 2009). Urban ecosystems itself are characterized by complexity, heterogeneity and hybridity. Many researches and exercises were done which focus on maintaining the ecological potential. The main idea was to develop a spatial structure which able to cope with diversity and complexity of urban and ecological landscape while in the same time allowing the integration of urban and ecosystem. In the early 1990s, the idea of using water and traffic network as carrying structure was proposed by Tjallinggii as conceptual guiding model for planning and design projects particularly in urban landscape practices. In addition, the Two Networks concept aims to produce a frame for integrated urban development (Tjallingii, 2016).

The concept of two networks is further explained by Tjallingi in three perspectives: area, flows and actors. In area perspective, the focus is durable diversity. This perspective emphasizes on the utilization of local identity and landscape potential for economic development as well as biodiversity preservation. This perspective also aims to see whether those diversity of spatial elements fit together or the other way around. The flow perspective is focus on the idea of sustainable way of resources consumption. Thus, the proper management of upstream and downstream flow is considered as key strategy together with the concept of ‘reduce, reuse, recycling’. Flow perspective also deals with the question whether all of the flows are integrated to each other and adaptable to local conditions. Lastly, the actor perspective questions a comprehensive commitment from all actors involved in the urban planning process. Together, those three aspects structure a condition that promote synergism (Tjallingii, 2016).
In "Planning with Water and Traffic Networks" Tjallingi introduced the use of two networks as guiding model in three different scales. The Poptahof project in Delft, for instance, showing the application of Two Networks guiding model where several design options are produced based on different combination of Two Networks. The area produced provides opportunity to develop a park located in the quiet zone with multifunctional purpose, a place for relaxation, recreation and to store water run-off. Another implementation of Two Networks guiding model showed in Fig. 5.3 which is applied in medium sized city (100,000 inhabitants). From area perspectives, the model accommodates condition for long quiet edge with attractive residential environments located nearby urban services and green areas.

As a regional model, the Two Networks strategy is introduced through elaborated project in the research and teaching program of IUAV university in Venice. In this project, Two Networks strategy is used to construct design scenario related to the decreasing of permeable surface due to increasing number of cars and trucks. This condition results both fragmentation of space and the threat of flood. The idea is then to upgrade and downgrade roads and watercourses. The thick black line in Fig. 5.4 represent the upgraded road to accommodate heavy traffic, while some watercourses will be upgraded to accommodate water storage and purification. At the same time, green blue network opens up the possibility to provide green space to serve residential area (Tjallingi, 2016).
Starting with network layer

The practice experiences explained previously shown clearly how this strategy used as guiding model of carrying structure. But how does it start? Traditionally, planning activities is often program oriented that starts with occupation layer then further developed the infrastructure layer and investigate ground layer which has to be adapted to the design it self. In this way, design resulted is more object oriented rather than process oriented. As a result, development tends to generate environmental problems. Working differently, Two Networks strategy start with network layer. For water structure, it is started with ground layer and hydrology system as a result of nature-culture interaction. For traffic structure, it is started with occupation layer to find out which programs were used as driving forces of the development process. In this way, Two Networks strategy plays an important role in balancing interaction between activities (urban occupation) and ecological system (Tjallingii, 2016).

Two networks: Industrial ecology and landscape ecology

Fig. 5.6 shows the overall Two Networks strategy as guiding model. Two criteria are embedded in this strategy, slow lane and fast lane. Fast lane related to competitive profit oriented zone where production efficiency is the key issue. In this condition, traffic network is used as carrier. On the other hand, slow lane is strongly related to non-profit oriented zone that linked to water safety, landscape and heritage, biodiversity, recreation and local food production. On this platform, water network is used as carrying structure. Based on this explanation, it can be concluded that traffic network plays important role in industrial ecology while slow lane is connected to landscape ecology.
The concept of metabolic rift explained further in current planning activities, introduced in IABR 2014 curated by Dirk Sijmons. Sijmons started the explanation by seeing the current phenomena of rapid urbanization all over the world. By 2050, the world population is expected to increase to nine billion people. This fact is followed by the current trend in many places in the world (especially in developing countries) where massive urbanization tends to weaken the relationship between urban and nature. This fast, unpredictable, and unbearable changing in urbanization over last centuries encourage urban practitioners and experts to further thinking of a new model of sustainability. Curator Dirk Sijmons for IABR 2014 concluded that a new era has come, where the integration and synergism between man and nature has to be seen as a key factor for future development, in which they are spatially overlapped and built by functional interaction. As a result, it is important to shift the current paradigm from conflicting nature to positioning and embrace nature together with urban environment.

Looking through the lens of landscape architecture, in current urban planning activity, there is a strong urgency to redefine the city and urbanity, to analyze and re-conceptualize the relationship between city and nature, in order to produce a guideline for a better planning and governing of urban landscape complexity. In order to understand the relation of city and nature, the city itself has to be understood as natural ecology in which structured by several systems including the process of its material flows. By understanding this concept and apply to design practice, the city can be more resilient and more sustainable in the future world (IABR, 2014).

The idea of understanding relationship between human and nature can be detached by its history, in which, from the beginning of urbanization, natural elements such as gardens have been part of the city. The establishment of this relationship resulted in the concept of garden city, urban arcadia and the idea of nature conservancy.

Regarding the idea of maintaining relationship between human and nature, several tasks need to be used a guiding principle as described by Sijmons as follow (IABR, 2014):

1. Securing the access of city dwellers to flows of daily necessities such as water, food, communication and energy.
2. Creating cohesion between urban flows.
3. Maximizing the positive effects on the quality of living environment.
4. Taking advantage of the urban landscape spatial order.

In 1965, the very first application of metabolism concept to urban planning activities was published by the engineer and geographer Abel Wolman. This idea came from as a response to on going phenomena in America at that moment where air and water quality was degrading. He then used metabolism concept to analyze the assessment of various inputs (water, food, and fuel) and outputs (sewage, solid disposal and air pollutants) while in the same time tracking their transformation and flows. Wolman further explained metabolic system as materials and components which are needed for inhabitants to sustain their live in every sector (Wolman, 1965).

The term "metabolism" was developed in the early 19th century in Biology field. This term was used to describe the process of chemical changes within living cells which then introduced and broadly used in biochemistry territory to explain the process of organic separation and combination within bio-organism as well as to its surrounding ecosystem. Since then, metabolism concept is used and developed into more comprehensive approach to investigate the systems involved in the making process of ecosystems (Dinarès, 2014).

In 1970s, metabolism concept started to spread its influence in ecological study. Promoted by H.T. Odum's (1983), this concept was used to conceptualize energy flows in ecological system. Using Urban Metabolism concept, H.T. Odum pioneered the application of biological metabolism notion to describe metabolism process in relation to solar energy equivalents.

Back to 19th century, Urban Metabolism was widely used by agricultural alchemist to understand the cycle of organic matter and nutrients in order to restore interchange between city and food production. This study resulted a new agricultural fertilization source produced from re-using of urban population excreta (Barles, 2010). This invention brought a dramatically change in the perception of waste mobility. Moreover, this fertilizer revolution opened up the use of metabolism concept in larger field, which is known as Urban Metabolism.

In 19th century, metabolism concept was used by Karl Marx to explain social phenomenon. Using this concept, Marx explored further the relationship between human society and nature referred to cycles of plant nutrients in relation to fertility conditions, agricultural production system and urbanization. Going further, Marx explore the concept of "metabolic rift" to analyze the separation process between human and natural environment. This term explained the changes of relationship between social and natural environment implied by industrial agriculture and urbanization which caused the fact where capitalist society, in particular, have become dissociate from their natural condition that effected its existence (Foster, 1999). Based on this exploration, Marx concluded urbanization as a key process leading to "metabolic rift" due to the reduced interaction between human and natural environment as a result from migration from rural to urban area (Martinez-Alier, 1987).

Urban Metabolism concept has been introduced in the practice of urban planning and design in recent years. This concept has been believed as a way to strengthen current understanding of urban-nature relationship. Urban Metabolism allows further exploration of interactions between environmental, social and economic aspects that contribute to the process of urban shaping phenomena. Therefore, Urban Metabolism can be seen as a tool to understand urban process and relationship between the driving forces or systems that shaped the urban process itself (Rapoport, 2011).

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Contemporary understanding of Urban Metabolism

Dinares, based on Broto et al. (2012) and Rapoport (2011), gave a strong metaphor which describe clearly the concept of urban ecology. The concept of urban ecology used to interpret the city as biological ecosystem which constructed by system and natural component. In this notion, cities are interpreted as organism which during its establishment, certain amount of resources area consumed from its environment and wastes are produced at the end of the process (Decker et al., 2000). As a system, the city itself is attached in a larger system and in this scale, metabolism concept is used to explore the interaction between each subsystem in the regional scale in order to understand the way the energy processed and its relation to its surrounding natural environment.

Urban Metabolism in ecological point of view explore the flow of particular materials in urban system which aim to optimize metabolism that result in making cities less dependent on their larger system in terms of resources generation and waste disposal. The outcome is a shift from linear to a circular metabolism, in which output (wastes) are recycled back into the system as inputs (raw material). This will create a sustain and viable urban settlement (Rapoport, 2011).

The understanding of Urban Metabolism begins by seeing city as a complex, sprawling and active system that is unceasingly working to provide the needs of its occupants. This system further seen as organic system rather than just an artificial element. Just as human body, that breaths, drinks, eats, uses its senses and excretes waste, the city also structured by same system that can be traced within the city. All of those activity require flows such as water, food, waste, energy, people. These flows are strongly related to everyday live of city inhabitants. Each of them is un-detachable for the functioning and the wellbeing of the city.

According to Holmes and Pincetl (2012), urban metabolism concept can be defined as a multi-disciplinary and comprehensive approach that can be used as a tool to explore material’s flows within the city. The material’s flows itself are formed by many forces such as social, economy and environmental aspect. Additionally, the rate of metabolism will be determined by another factors such as urban structure, building formation, climate change, the provision of urban green and infrastructure technology.

Specifically, every material flow has its own infrastructure (network, electricity network, etc.) which has to be integrated and cohesion with one another. The design of infrastructure itself is potential to direct future urban expansion. The lack of integration and coordination of infrastructure to existing system are potential to generate disorder spatial configuration that often result in malfunction of city’s system and degraded environmental potential (IABR, 2014).
ECOSYSTEM SERVICES AS ASSESSMENT TOOL

According to Millennium Ecosystem Assessment Board, ecosystem services can be defined as all of benefits that can be obtained from ecosystem for daily basis. It includes provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling (MEA, 2003).

In order to make use of the potential from ecosystem services, human tend to modify its current condition without further thinking the impact of future natural’s ability to provide desired services. Thus, it is crucial to provide methods to assess this ability of natural ecosystem in term of providing services in order to maintain this potential for future development. This assessment can be done by using qualitative and quantitative approach. In addition, within this assessment process, an integrated approach need to be delivered in order to help planner to decide which services has higher value and need to be maintained or which services has lower score but crucial and need to be enhanced to provide sustainable ecosystem. Sustainable in this case means development that satisfy current needs without declining any potential for future generations (MEA, 2003).
CONCLUSION

Both Two Networks and Urban Metabolism concept can be seen as integrated approach where the main goal is to use ecological aspect as a basis of urban planning activity. Both concept produced its own guiding model, explaining the importance of seeing city as complex system. Two Networks approach leads to the understanding of water and traffic networks as carrying structure and how this Two Networks integrated and produced synergism. On the other hand, Urban Metabolism sees the city as complex system, with the analogy of organism, consists of many subsystems and examine the relationship between each system.

In this thesis, the concept of Two Networks will be used to analyse the carrying structure of urban development in the selected area while Urban Metabolism will be used as a concept to understand the relationship between each system, the flows. Together, these two concepts are complimentary in order to produced synergism of urban, production and ecological system as main objectives in this research. Those two concepts will also be implemented in design proposal and assessed by ecosystem services’ principle.

Despite the fact that both theories produce useful guiding model for design practice, the context aspect has not been really elaborated. For example, Urban Metabolism concept in the practice of urban planning seems to merely used as quantitave and technological approach rather than integrated approach. Major criticism coming from urban and industrial ecology experts claim that although necessary, this quantitave and technological aspect of urban metabolism are not enough to promote synergism. Less inclusion of social and historical context as well as political and cultural changes makes this concept failed to be considered as integrated approach for contemporary urban development.

Based on this critic, it is important to pay attention to context aspect during while using these two concepts. As a result, new matrix is developed as a tool for analysing the context of selected case study in relation to area and flows that are formed by interaction of different activity: urban, production and natural environment.
6. ANALYSIS

Historical Development
Urban Structure
Ground System
Flows
Spatial Analysis
ANALYSIS

The analysis is divided into three parts. First, historical study of Jabodetabek Metropolitan Area that consist of urban development analysis and urban structure analysis. Second part will be focused on the analysis of current system (groundsystems) and flows particularly in waste and water flows. The third part will be spatial analysis which is divided in intermediate scale analysis and zoom in analysis using the matrix mentioned before. The result from each analysis will be elaborated with the principle derived from case study in order to produce design guideline which will be applied in final design products.

HISTORICAL DEVELOPMENT OF JABODETABEK METROPOLITAN AREA

Jakarta is one of the largest capital city in the world which perhaps can be seen as huge melting pot where various people with different ethnic, races, and religion live together in such overcrowded city. The development of Jakarta continues to rise significantly without any sign of slowing. The size of Jakarta has expanded from 180 square kilometres in 1960s to 590 square kilometers in 2001 (Peresthu, 2002). Today, Jakarta has massively expanded beyond its former territory. Together with other four districts: Bogor (in the south), Depok (in the west), Tangerang (in the west), and Bekasi (in the east), Jakarta formed a new metropolitan area that is well known as Jabodetabek (stands for Jakarta, Bogor, Depok, Tangerang, and Bekasi).

The conurbation of Jabodetabek area was started since 1960s, lead by an annexation with neighbouring districts around Jakarta City. In this period, first satellite city project called Kebayoran Baru was initiated due to the overcrowding of old city center (Roosmalen, 2008). In 1980s, under Soeharto’s administration, the creation of first highway called Tol Jagorawi (Jakarta-Bogor-Ciawi Highway) ultimately lead to the annexation with Bogor. During this period, massive infrastructure development lead to broader urban sprawl and triggered many developers to initiated sub urban complexes to accommodate the rising population (Fig. 6.1).

During 1984-1988, another highway connecting Jakarta to western and eastern neighbouring city (Tangerang and Bekasi) were built. Along with this development, new towns in suburban area of Tangerang and Bekasi were extended while in the same time, the connection inside Jakarta city is enhanced by development of inner ring road and outer ring road connecting air port, port and industrial area. Since 2010, intensive infrastructure development was continuing in order to improve the connection from Jakarta port to the industrial area in Bekasi and Tangerang. More residential project was developed to accommodate workers of industries. In this period, urban sprawl was developing stronger to eastern part due to land price increasing in Tangerang area.

The development of infrastructure and shift in global economy implies industrial agglomeration in Jabodetabek area. Due to the increase land price, many industries developed along the arterial road and river bank (motivated by the desire to have easy access for disposal outlets). As another impact, many sub-urban complexes were developed which followed by enormous migration flows of construction labours from other areas in Indonesia. These migrant labours triggered many informal settlements that occupied unregistered land and often found located in the river bank. These informalities at the beginning seemed to be temporary built and inhibited. However, over years these settlements were evolved, well-established and diffused into surrounding area which then considered as part of urban kampong (Peresthu, 2002).

The development of new estates was continuing but in different scale and more complex equipped by many amenities such as supermarket, sport facilities, school, hospitals, etc. These new emerging cities then function as a magnet, attract Jakarta inhabitants to live in neighbouring cities instead of dense and congested city like Jakarta, creating severe congestion problem due to increase commuter’s flow inward and outward Jakarta (Fig. 6.5)
Figure 6.2 Population Growth in Jabodetabek Area
Source: Author, 2017 elaborated from CMEA 2012

Figure 6.3 Commuter Flow to/from Jakarta
Source: Author, 2017 elaborated from CMEA 2012

Figure 6.4 Development of Jabodetabek Area
Source: Peresthu, 2002

Figure 6.5 Number of Estates in Jabodetabek
Source: CMEA 2012
Due to overcrowding of old city center (Batavia), the annexation of Jakarta to neighboring villages and districts was proposed by President Soekarno to further expand Jakarta’s boundaries. The first satellite city, Kebayoran Baru was initiated during this time period.

Under Soeharto’s ambitious development plans, the creation of highway networks was triggering urban sprawl and eventually lead to the annexation of neighboring districts. In this time, the first highway called Tol Jagorawi was built (light red line).

Infrastructure development in this period led to broader urban sprawl in the periphery of Jakarta City. Around this time, many suburban complexes were developed in this newly annexed areas to accommodate the increasing population of Jakarta.

During year 1984-1988, new highway connecting Jakarta to western and eastern neighboring city (Tangerang and Bekasi) were built. Along with this development, new towns in suburban area were extended.

Intensive infrastructure development came with the need of connectivity improvement from Jakarta Port to the industrial site in Bekasi and Tangerang. As a result, outer and inner ring road were built in the heart of Jakarta.

The improvement of connection by ring roads development provide more efficient and easy access for private vehicles. Many residential projects were developed especially in Greater Jakarta area to accommodate workers from industry. Together, these two aspects increase commuter flows inward and outward Jakarta. In this period, urban sprawl was developing stronger to eastern part due to lower land price.
Before the end of 1960s, when Jakarta started to be more urbanized, Bogor, Tangerang and Bekasi were still constructed by vast paddy fields which has an important role as major rice supplier for Jakarta.

Looking back to 1942, within this extensive agriculture land, small clusters of urban kampong which were farmer villages scattered along water networks, use the potential of the river as water resources. On the other hand, city development was carried by infrastructure development. In between agriculture and urbanized area, enormous amount of forest and green area can be seen as a filler element, protecting the ground system.

Due to massive development and urban sprawl triggered by expansion of Jakarta city, these agriculture potential has been decreased and transformed into urbanized area. On the other hand, Indigenous settlement which is called “urban kampong” become more isolated and pushed towards the periphery of Jakarta city. During this period, most of urban kampong settlements not longer followed water network but rather dispersed and adjusted to industrial and real estate development.
The massive development of Jakarta city implies also to the changing perception of rural inhabitants. The agriculture activity seems not promising anymore while moving to the metropolitan city became another prestige. Many immigrants then triggered to move to Jakarta without any expectation of difficulties. High land price and strong competition on finding job cause many immigrants chose to live in informal place. As a result, urban kampong settlement was developed in the periphery of Jakarta city and penetrate towards the inner part in the form of informality. In this phenomenon, industries and formal settlement followed infrastructure, while water network was used as carrying structure for informality and small scale industries.
GROUND LAYER SYSTEMS

Currently, based on the topographic imaging from Digital Elevation Model (DEM), only 22% of JABODETABEK area is located 10 m above sea level while around 73% of the rest is below sea level. Most elevated area is located in the southern part of the region which only represents 7% of the 22%. The average slope of the studied area is approximately 7°, which means the region is a generally flat area. The location of most major cities, including Jakarta and Bekasi within flat low-lying areas makes them vulnerable to flood, or generally called flood-prone areas.

The southern part of Bekasi District is structured by gently sloping alluvial fan with 50 m maximum elevation in the southern border. The area is identified by a moderate to low relief with rivers crossing over the alluvial fan deposits. In the northern half of the district, the fluvial deposits form a flat flood plain with the rivers flowing above the surface. The flood plain area then slowly transformed into the deltaic complex towards seashore (Dirks, et al., 1989). The nutrients-rich soil condition in the vast alluvial plain in this district make this area fertile enough for many types of native vegetation which form forest ecosystem in the northern part of the district. However, the clearance of native vegetation into dry land agriculture cause soil nutrients degradation which result in unproductive land for future food production in this territory. Additionally, a waterlogging area lies between the alluvial fan and flood plain area has been threatening agriculture activity. Lack of knowledge and proper water management due to waterlogging problem often cause failure of agriculture production especially during wet season.

Groundwater system

There are two main groundwater systems can be identified in this territory as described by Dirks (Dirks, et al., 1989) as follow:

1. Phreatic/ semi confined groundwater system associated with volcanic / alluvial fan deposits in the southern Bekasi District. Those layers of the fan that have a relatively small clay content, act as thin aquifers. These aquifers are separated by more clayey horizons. The phreatic water level is found at 4 to 8m below the surface. Actual infiltration of precipitation and recharge of groundwater takes place here.

2. Confined system without recharge in the central part of Bekasi district. In this area, above the confining layer, alluvial fan deposits are found and covered by flood plain clays. Actual infiltration is quite low, while water discharge is high due to the transition from alluvial fan

This ground layer systems are strongly related to ground water quality in this area. The calcium-bicarbonate water type in shallow groundwater located in the southern part of the district. This groundwater type closely resembles the quality of rainwater. In this area, most urbanization is taking place due to the potential of ground water. On the other hand, most ground water of the northern part of this district is a sodium-chloride water type. The high salinity is caused by the presence of water of marine origin and by evaporation (shallow phreatic aquifer). The clearance of native vegetation into dryland agriculture also contribute to the salinity problem. In addition, mangrove deforestation increase land erosion as well as salt water intrusion coming from the sea. As a result, drinking water quality from ground water is very low. (Dirks, et al., 1989).
4.4 FLOWS

Traffic

Studies performed by Coordinating Ministry of Economic Affairs (CMEA) predicted that JABODETABEK region will be the world’s biggest metropolitan area in 2030. This area consists of capital city of Jakarta and surround- ed by Bogor, Depok, Tangerang and Bekasi. During the past decades, the population of this region was multiplied by almost one-half based on the census data of 1990 and 2005. Consequently, economic activities and private transportation ownership will contribute to the region’s traffic. Until now, JABODETABEK’s traffic is still heavily relied on the road (98% as reported by CMEA), meaning that people movement in the region are mostly based on private cars or buses. That is the reason why only in six years (2000-2006), the official car ownership increased almost two and half times. Additionally, the shift of bus commuters to scoter creates another pressure to JABODETABEK’s traffic which then leads to traffic congestion.

It is well known that JABODETABEK’s regional traffic congestion causes significantly economic loss. The Indonesian Institute Center for Public Policy Research (2010) predicted that Jakarta suffers almost 1 billion USD loss per year due to the traffic congestion (IICPPR, 2010). In addition, World Bank predicted that in 2016, Jakarta loss nearly 3 billion USD due to the same problem (World Bank as quoted by Aditiasari, 2016). This loss is also contributed by the region people who seek job in the capital and increasing the traffic towards capital in the morning and vice versa in the evening.

To overcome this issue, Indonesian central government and JABODETABEK governor are working on the implementation of integrated railway-based public transportation.

Water Run-off

Water run-off management in Jakarta Region (JABODETABEK) is crucial. There are three systems that function as flood prevention in the region: rivers and canals, floodways, and polders.

However, those three systems are poorly maintained and increase the potential of flooding in this territory (Fig. 6.18). The major causes of flood in Jabodetabek, as described in CMEA (2012) have been identified as follows:

- Poor urban drainage combined with substandard removal of solid and liquid waste,
- Land subsidence, especially in the northern part of DKI Jakarta,
- Change in upper catchment management resulting in urbanization, deforestation, erosion, and reduced water storage,
- Improper application of sufficient spatial planning, and
- Climate change, in particular rainfall intensity and rise of sea level.
As reported in "Master Plan for Establishing Metropolitan Priority area for Investment and Industry in JABODETABEK Area" by Coordinating Ministry for Economic Affairs, around fifty percent of current domestic water in Jakarta are supplied by a state-owned clean water provider company named PDAM. In the same report, it is also indicated that only ten to twenty percent of consumers in the area of the same region are served by PDAM. While, the other eighty percent relies on non-hygienic water sources such as shallow well and stream (CMEA, 2012).

Jakarta, Bekasi and Karawang water demand is supplied from West Tarum Canal (WTC). In this region, Jasa Tirta II, another state-owned enterprise, oversees the distribution. Besides, WTC also supplies water to industrial area (Fig. 6.19).

**Sewerage system**

The sewage utilization in JABODETABEK as reported by CMEA consists of only 2% sewage system (off-site treatment), 20% individual treatment plant (ITP), 68% septic tank and the rest (±10%) direct disposal to river. Further analysis shows that in the sewage systems and ITP, only 34% of suspended solid are removed while the rest is disposed to the river (CMEA, 2012).

The region depends on several small wastewater treatment facilities in Tangerang and Bogor. These facilities were part of pilot projects which were funded by foreigner. However, these wastewater facilities only process small portion of region waste water while the major waste water produced are treated via small scale sewage system or direct disposal (CMEA, 2012).

Looking at map showed in fig.6.20 there are four areas which its water resources are contaminated by pollutants. Based on its pollutants, it is identified that the pollution resources area mainly from industries and household waste water.
Waste flow

Municipal solid waste flow in JABODETABEK region starts from the collection from each houses, usually with small waste cart or truck to the deposit points. From deposit points, the solid waste then is delivered to the final treatment/disposal point. In each deposit points, sorting activities were observed which were then sold/carried to small recycling centre, for example the plastic waste. Jakarta has contract with some private-owned enterprise for solid waste treatment. One of biggest is PT Godang Tua Jaya located in Bantar Gebang in Bekasi City. While, the other municipalities in the region do not have any contract regarding the solid waste treatment. On the other hand, industrial waste disposal is part of the responsibility of each company. However, due to limited land availability in the city centre, many of the landfills are located along water network which often cause seepage that pollute the water quality in the surrounding area. The current waste stream in Jabodetabek is shown in Fig.6.22 (CMEA,2012).

As reported by Coordinating Ministry of Economic Affairs (CMEA), the waste management problem in Jabodetabek area can be identified as follow:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited area to be used as final waste disposal</td>
<td>The provision of landfill site and any other treatment facilities require a large area. However, massive urbanization due to increased population has led to a problem of land availability for final solid waste disposal facility. Together with the increased land value, the government is unable to provide such landfill nearby the city center. Thus, empty land located in the rural area has been selected to provide such facilities which then caused problem of efficiency of transporting.</td>
</tr>
<tr>
<td>Community vs landfill</td>
<td>Negative response among society towards solid waste management inhibit people to further engaged in waste management system.</td>
</tr>
<tr>
<td>Poor financial mechanism</td>
<td>Due to lack of proper services by waste collecting provider and increase of illegal waste dumping activity, many inhabitants avoid to pay waste collection service fee.</td>
</tr>
<tr>
<td>Awareness of “3R” (reduce, reuse, recycle) activity concept</td>
<td>Lack of education and practice in waste separation and awareness of recycling activity, the waste manager faces more difficulties in managing the solid disposal.</td>
</tr>
<tr>
<td>Poor community engagement in waste management</td>
<td>Although training and education of recycling program by involving local community have been implemented in several areas, the unsustain and lack of commitment from community and local authority lead to the failure of solid waste management. In addition, there is no clear policy of responsibility division between authority and community.</td>
</tr>
</tbody>
</table>

Waste Management Problem in Jakarta metropolitan Area
Source: CMEA, 2012

Fig. 6.22 Diagram of Waste Flow
Source: Author, based on many sources

Fig. 6.23 Landfill Site Condition in Jabodetabek
Source: https://ilustrasirohani.wordpress.com/2015/01/20/bapaku-pemulung-ulung/
SPATIAL ANALYSIS

Intermediate Scale Analysis

Intermediate scale analysis has done to further understand spatial condition in the territory of Bekasi District. Two Networks concept again used in this analysis to explore the carrying structure of recent development.

Bekasi District is generally structured by three components: industrial area, agriculture and mosaic delta area. Lies in these diverse landscape, urban kampong, new estates and informalities are mixed without any integration to each other, threatening the potential of existing natural ecosystem.

Looking at the urban structure and its development pattern in metropolitan scale, it has been discussed that industrial activity has been driven by infrastructure development. The small industrial cluster started this agglomeration and over years, it expanded along water network in order to get easy access of water and disposal outlets.

There are three main industrial clusters in this district. First, Cikarang, the capital of Bekasi District as biggest industrial cluster consists of mixed of industries such as automotive, cosmetics, food and pharmacy. Second, is the small cluster industries attach along CBL canal mainly consists of coal fired power plant as well as oil and gas industry (PT. Pertamina). In the delta area, another power plant is located together with cluster of containers platform net to the Jakarta Port. In this industrial development, CBL canal can be seen as an axis that connect this three clusters.

Together with the industrial development, new estates were developed in the periphery of industrial cluster, following the existing local infrastructure. The development of new estates is more related to industrial and infrastructure development. Water networks in this case has no relation to these type of settlements.

Looking at the current landscape layer, here the water networks plays important role as a provision of irrigation system and green corridor. Most of the major water network in this district has a natural potential for green blue infrastructure. However, the potential of green blue corridor is used as a visual barrier to the informality along the canal. Through time, this green blue infrastructure is losing its potential due to heavy pollution coming from informality and industries located in the upstream. In addition, disconnected green corridor located in the urban kampong as well as green pockets inside the city adds more fragmentation to this territory. In this sense, water network failed to be used as carrying structure for sustainable urban development.

Fig. 6.24 Current Condition and Future Plan of Bekasi District
Source: Author based on Bekasi District Spatial Plan 2011-2033

Fig. 6.25 Industrial Cluster in Bekasi District
Source: Author

Fig. 6.26 Urban Fabric
Source: Author

Fig. 6.27 Landscape Fragmentation
Source: Author
Zoom-in Analysis: Area, Flow and Context

In order to understand the analysis derived in the intermediate scale, several zoom in analysis is conducted. Two areas are selected. First is the area located in the city centre to further explore the mixed of informality, industries and formal settlements. Second area is located in the middle part of CBL canal in order to explore the relationship between informality, agriculture, former settlements in relation with CBL canal.

The analysis applied the concept of integrated ecological approach where flow, area, and context for each location are explored to see the relationship between urban and production, urban and nature as well as production and nature.

Based on zoom in scale analysis, it is more evident that CBL canal is diminishing due to unresponsive activity from each sectors. From flow perspectives, the mixed of slow and fast mobility due to street culture of local people creating such an unsafe environment. Urban kampong as quiet zone is transformed into busy area as an impact of infrastructure development and economic shift. On the other hand, unsustainable water and waste management transformed natural environment into negative area.

From area perspective, it is obvious that in this area, fragmentation and segregation are the substantial issue. Green area and water network are occupied by informality that formed both visual and spatial barrier to the natural ecosystem. Even worse, the natural ecosystem was treated abusively as sewage system without considering any potential of this element. In addition, green patches scattered within several areas such as urban and formal settlements and industrial area are left underused and disconnected.

From actor/local context perspective, the lack of participation from all related actors lead to unhealthy living environment where gentrification, separation and isolation become more intense. Lack of local community participation, irresponsible production company as well as unresponsive government can be seen as another factor of low living quality in this area.
Fig. 6.30 Site 1: Mixed of Industries, Urban and Agriculture
Source: Author

Fig. 6.31 Location 1
Source: Author

Fig. 6.32 Location 2
Source: Author

Fig. 6.33 Location 3
Source: Author
Fig. 6.34 Site 2: Mixed of Urban and Agriculture
Source: Author

Fig. 6.35 Location 1
Source: Author

Fig. 6.36 Location 2
Source: Author

Fig. 6.37 Location 3
Source: Author
Fig. 6.38 Location 4
Source: Author

Fig. 6.39 Location 5
Source: Author

Fig. 6.40 Location 6
Source: Author

Fig. 6.41 Location 7
Source: Author
Fig. 6.42 Site 3: Mixed of Urban, Wetland, Mangrove and Fish Pond
Source: Author

Fast Mobility
Slow mobility
Water Flow
Sewage Flow
Waste Flow

Fig. 6.43 Location 1
Source: Author

Fig. 6.44 Location 2
Source: Author

Fig. 6.45 Location 3
Source: Author
7. FIELD TRIP

Photographs
Interviews
FIELD TRIP

The field trip in this project aims to clarify and strengthen the analysis done off site. The information gain from field trip will be used in combination with other analysis, particularly in spatial analysis, to complete the missing information in terms of spatial quality. In addition, this fieldtrip is expected to have input from local’s perspective related to CBL project and their involvement/participation in this project. Therefore, two major activities during this fieldtrip are site observation and interviews/talks with local inhabitants.

Site observation

The trip was started from northern part of Jakarta where Jakarta port is located and continue by following highway towards the northern part of Bekasi District. Along this section, the atmosphere of industries, heavy infrastructure and congestion was experienced. Before reaching northern part of Bekasi District, precisely where the mangrove village is located, the scenery was mixed between industry and wetland, which is belong to private company and the condition was found poorly treated. On the other hand, the mixed of vehicles and pedestrian on the street created unsafe street experience in this area.

Fig. 7.1 Field Trip Route
Source: Author

Fig. 7.2 Tanjung Priok Port (Jakarta)
Source: Author

Fig. 7.3 Wetland and Industry
Source: Author

Fig. 7.4 Waste and Wetland
Source: Author

Fig. 7.5 Street Condition Towards Bekasi District
Source: Author
Arriving at mangrove restoration center located in north Bekasi, the atmosphere was changed dramatically from monotonous and gated street experience into green and natural environment. However, the lack of management of this restoration center lead to an empty and unattractive place regardless its potential.

Right before entering one of the Urban Kampong, the condition was mixed between kampong and industrial activity. People gathering on the canal side using the informal facilities and trucks on the narrow street mixed with pedestrian was a common experience in this area, contrast with the landscape potential that can be offered in this territory.
Arriving at one of Urban Kampong, the condition was emptier and quiet with massive agriculture land spread throughout the territory. From distance, industrial activity can be seen, generate contrast panorama and appear as iconic element in the middle of vast agriculture land.

The intervention of industrial activity together with irresponsible behavior of local inhabitants generate poor living and environmental condition in the whole territory. Landfill along the canal, polluted irrigation system, the clearance of wetland vegetation and informalities were evident and considered as common things by locals.
The street experience along CBL canal was monotonous with orchard and agriculture filled up the canal bank. The banana orchard was a major element can be found covering the canal bank, resulting visual barrier and uneasy access toward the waterfront.
At the end of CBL canal, the city center with local market spread along the street contribute to a total different experience. Congestion, crowds and street vendor filled up any possible space that can be used for economic activity.
Moving into the outskirt of the city center, nearby big industrial cluster, CBD was developed and provided a totally different experience compared to others. Greenery along the street contribute to better micro climate, proper pedestrian, luxurious residential area, public water front facilities, neighborhood park and different type of shopping street can be found in this CBD. It is strongly evident that social segregation and gentrification has become another issue that add more complexity to this territory.

Due to a very limited time and other circumstances, several interviews were conducted and focused on local’s perspective and opinion regarding CBL project and their position. Most of the respondent did not agree with CBL inland waterway project due to land acquisition which inflict financial loss. Moreover, the loss of agriculture land and limited job provided in industries add more disadvantages for local inhabitants. Some of the respondent were also concern with the issue of clean water scarcity which have been worsen the agriculture production activity during the last decade. Moreover, the opinions of local people were not accommodated by the authorities. The locals can be seen as the most powerless party that is usually forced by more powerful actor such as government, elite, and developer.

(fruit seller)
“Most of these fruit does not come from this district. The land here is not fertile anymore,....... In the past, many people from city come here to buy our products directly from farmer, but today, I am glad enough even if only few people buy my products with cheap price and majority the buyers are the industrial workers.”

“I can not say I agree with CBL project. But I can do nothing. The positive thing is maybe more people will come to this district and I can sell more.”

(stall owner)
“I live here since I was a child. Previously the fish ponds here were full of fish and very productive. Today, I gave up working on this fish farming because of the water quality that cause it is not beneficial anymore. Now I just raise small amount of fish for people who like to fishing while running this small shop. We do not have many option for job opportunity.”

“I know that the majority of inhabitants in this district disagree with CBL project. The compensation given by the company is less than the value of the land and we are forced to hand over our property.”

(labor)
“We are not from this district. We just come here because of the construction work offered by developer. We are building a house here from the left over material so we can have a place to stay.”

“About CBL project, I only know that they will widen the canal. I don’t really care if later this area is affected by this project. I have a building here and they have to give compensation.”
“The land along this canal is given to the inhabitants. If we are diligent enough, we can work on this piece of land for cultivating like what I am doing although I know I am not supposed to cultivate this area because of flooding. I do it so I can get higher compensation if they take over this land.”

“I have to use fertiliser because the soil here is not fertile enough. The water is also heavily polluted, but we have no choice and keep using it. Three weeks ago there was flooding and all my plants were destroyed, I have to plant it over again.”

“Of course I disagree with CBL project. Although we will get compensation for the land property, we are gonna lose our land for cultivating and have no job. We just want to have a piece of land for agriculture since that is the only skill we have.”

“People here can not protest about the project, they [the developer] will bring police.”

“I am trying to find any fish in this ditch. I can sell it and usually children here like to have small fish for playing or decoration. If I am lucky enough, I can get bigger fish.

“I don’t know much about CBL project. If they build it for more industries, maybe I can have more job although the fee is small.”

“This mangrove restoration and learning centre is run by scholars together with local community for mangrove preservation. Formally, this area is under Government concern but we rarely have financial support to maintain and develop this area.”

“Mostly, the financial come from self funding by local community.”

“Every afternoon this area become a fish market, many people from Jakarta come here for leisure or to buy fresh fish.”

Based on the interviews and site observation, it is understood that local inhabitants particularly farmers are the most disadvantaged actor. Land acquisition due to non-certified land together with industrial and real estate development taking over agriculture land inflict loss of financial and limit job opportunity of locals that mostly qualified in agriculture field. On the other hand, unsustainable industrial development and un-responsible way of living from locals lead to constant severe environmental degradation.

Despite of the problems indicated above, the local inhabitants in this territory wished to be able to have land where they can work with regarding their skill in cultivating with the betterment of water and soil quality. In addition, more job opportunity has become another concern due to the economic fluctuation and urbanization forces.

According to this conclusion, three aspect need to be considered in the design proposal are the empowerment of farmer, provision of more job opportunity and nature restoration.
8. URBAN PLANNING
URBAN PLANNING ACTIVITY IN INDONESIA

Urban planning activities in Indonesia are managed and regulated under three different levels: national, provincial, and city. The first urban planning act was established in 1992 which is the Law No. 24/1992 (Spatial Planning Act). Since the political reformation occurred in 1998, the government decentralization was introduced and thus requires this act to adapt to the new regime. Therefore, after 15 years of its first establishment, this act was amended with the introduction of decentralization as major changes (Law No. 26/2007).

Indonesia National Spatial Plan was established in 2008 under Government Regulation No. 26/2008. It covers a 20 years term and can be reviewed in 5 years term. During the discussion to establish this law, National Spatial Planning Coordination Board was responsible to prepare the draft while the whole process was led by Coordinating Ministry for Economy Affairs (MLIT, 2017). During that period, Directorate General under Ministry of Public Works was in charge for the national spatial planning execution. Later, when Mr. Widodo started his administration, he formed a new ministry, Ministry of Agrarian and Spatial Planning, which takes care of this matter (Ministry of Agrarian and Spatial Planning, 2014). In this plan, cities are categorized into four: national central city, inter-region central city, regional central city and national strategic central city (Law No.26/2008).
THE PLANNED DEVELOPMENT OF JAKARTA METROPOLITAN AREA

The spatial plan that regulates the whole Jakarta Metropolitan Area was established after the amendment of Spatial Planning Law (No.26/1997) and after the establishment of National Spatial Plan (Law. No. 26/2008). This regional spatial plan is regulated under Presidential Decree No.54/2008 that was signed by former president Susilo Bambang Yudhoyono. This regional plan still works similar with the national plan, which covers 20 years term and can be reviewed every 5 years term. In the decree, it is mentioned that the local (provincial/city/regency) government are obligated to establish the smaller scope spatial plan that consider this decree as the guidance.

This Jakarta Metropolitan Area Spatial Plan aims to develop economic while maintaining the surrounding environment which popular as sustainable development. There are three strategies to achieve the goal of this spatial plan:

1. Boost the development of metropolitan area towards an integrated development instead of segregated development
2. Encourage the sustainable development which includes the preservation of surrounding environment (e.g. accounting environment capacity, water and soil preservation, etc.)
3. Considering public welfare as well as sustainable urban development, improve regional economic development by enhancing efficiency of productivity which should be translated into spatial structure plan and land use management plan.

The new urban-structure plan in essence takes over the urban structure of each cities in Jakarta Metropolitan Area. However, there are some additional aspects included in the plan such as the “New Jakarta Orbital Highway”, new integrated urban transport network (Bus Rapid Transit, Mass Rapid Transit, Light Rail Transit, etc.) which is the key element in this urban structure. In addition, new suburban centres are proposed in between the cities, especially along the highways and public transport network. Lastly, southern Bogor in the new urban-structure plan is proposed as the regency for water preservation (MLIT, 2017).

The new spatial plan which based on the decentralization policy is expected to boost the development from the bottom and act as a guideline for the local government. However, this does not seem to be the case. Decentralization offers a greater power and authorities for the local government especially in managing the region urban spaces. Nevertheless, fact shows that this greater authorities often lead to manipulation and corruption during the planning activities (MLIT, 2017).

Fig. 8.4 Structure and Spatial Plan (Zoning) of Jakarta Metropolitan Area
Source: Bakosurtanal, 2008
PROVINCIAL SPATIAL PLAN

Planning activity in provincial level is derived from national spatial plan. The documents of provincial spatial plan generally contain objectives, policies, provincial spatial planning strategies; provincial spatial structure plan; provincial spatial pattern plan; determination of provincial strategic areas; focus of provincial spatial utilization; and the management-control systems. Additionally, determination of strategic area based on national plan also included in the provincial spatial plan which also become a framework for detailed spatial plan in district/city spatial plan.

DISTRICT/CITY SPATIAL PLAN

Planning activity in district/city level is derived from provincial spatial plan which consists of objectives, policies, spatial planning strategies; spatial structure plan; spatial pattern plan; determination of regional strategic areas; detail plan of regional strategic area; focus of district /city spatial utilization; and the management-control systems in district/city level.

District/city spatial plan supposed to contain more developed plan based on structure plan in provincial level such as strategic regional spatial plan and detail spatial plan. Some of developed city such as Jakarta is equipped by specific guidelines/ plan such as building height, open space ratio, etc., in the scale of 1:5000, while in other city or district like Bekasi, it is limited only in zoning plan.

**LAMPIRAN II PERATURAN DAERAH PROVINSI JAWA BARAT**

PETA RENCANA STRUKTUR RUANG PROVINSI

**NOMOR :**

**TANGGAL :**

**TENTANG :** RENCANA TATA RUANG WILAYAH PROVINSI JAWA BARAT TAHUN 2009-2029

GUBERNUR JAWA BARAT,

AHMAD HERYAWAN

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**Fig. 8.5 West Java Provincial Spatial Plan**


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**Fig. 8.6 Bekasi District Spatial Plan**

Source: Badan Perencanaan Daerah Kabupaten Bekasi (Regional Planning Board of Bekasi District), 2008
SPATIAL PLAN ESTABLISHMENT PROCESS

For further enhancement of spatial planning, “Ministry of Land and Spatial Planning” was established (2015). Reflecting the increased authority of local governments along with decentralization, the ministry has been functioned as main actor who is responsible for administrative work related to spatial planning including coordination of interests among local governments upon enhancement of local planning capacity, development/implementation of plans etc.

In the national level, Ministry of Land and Spatial Planning and House of Representative are in charge in preparing the draft of national spatial plan which later will be assessed by the President before it is established as National Spatial Plan.

In the provincial level, the Ministry of Land and Spatial Planning and Ministry of Home affair are in charge in assessing the draft of local regulation concerning planning activity (done by Governor and representative in provincial level) before it is established as provincial spatial plan. In this process, the provincial spatial plan is strongly monitored to be coordinated with national spatial plan.

However, the intervention of Ministry of Land and Spatial Planning is stronger in provincial and national level while being less in the city and district level, while the authority is fully submitted to Governor and Regent. In this sense, the uncoordinated spatial plan in this level to provincial level is more potential to be happened compared to spatial plan in provincial level which is still better coordinated to national spatial plan. Spatial plan violations in this level are mostly associated with local governments that exploit their assets and natural resources for generating more local revenue.

ISSUE

The process of provincial spatial planning is institutionally weak. Available spatial plans and its implementations are unclear (Brown, 1999). Hidden agenda and interests from public and private sectors are reported able to topple down current legal spatial plans particularly in provincial and lower authority level. Unless there is a strong commitment from the authority to refuse illegal intervention, the implementation of certain projects spatial plans is often found ignoring the legal document or even revised to suit the intervention requests.

Additionally, the conflict between planning agency in provincial and national level also contribute to disruption of planning activity but stronger occurred between local government institutions at the provincial and district level. Based on report provided by NRM Program Secretariat (Brown, 1999) it is reported that the changes of provincial spatial plan were often uncoordinated to district spatial plan. In this case, it is concluded that there is lack of integration between different levels of authorities. The lack of coordination also results ambiguous and unclear information regarding spatial plan map/document between each level that sometimes-found mismatch.

Another issue is the lack of proper planning document. In the spatial plan of Bekasi District for instance, the spatial plan document is limited only to spatial zoning plan without followed up by more detail strategic plan. The zoning plan itself is interpreted differently with metropolitan spatial plan which then cause misunderstanding and finally this type of information misleading the whole planning process.

The weak implementation of spatial planning is also contributed by the current establishment process. In general, spatial plan establishment process in Indonesia involves only the formal authority without involving public or community in any stage of the process (making, implementation, supervision and evaluation).

RECOMMENDATION

Related to CBL inland waterway project which is regarding as national strategic project, the provision of structure plan particularly along CBL canal is needed. The structure plan should show not only zoning plan (what and where to put on certain project) but completed also with more detail direction on how (tools and concept), when (timeline) and who (stakeholder) to deal with in developing this strategic corridor. This structure plan later will be followed up by more detail plan showing the design intervention that can be use as precedent in the future development.
Fig. 8.7 Diagram of Current Spatial Planning Activity of Bekasi District
Source: Author, based on many sources
9. PUBLIC PARTICIPATION
THE ROLE OF PUBLIC PARTICIPATION

International Association for Public Participation defined public participation as an important key in planning process in which any parties that are affected by any decision have a right to be involved in the decision making process. Public participation is explained as a process that bridging the communication among affected individuals, organizations and government before the decision is proposed. Public participation has to be seen as two-way communication and collaborative problem solving process which aims for better and more acceptable decisions for any stakeholders affected by certain project (IAP, 2007).

Community engagement is introduced as a term to further explain public participation concept. Community engagement is a part of public participation process in which inclusive participation is conducted to supports mutual respect of values, strategies, and actions to enhance sense of community of people in similar condition towards any issue that threatening the existence of their living environment. Further explained by IAP, community engagement is a significant element of any research and practices with community. It requires academics to become part of the community and community to become part of the research organization in order to creates better working and learning environment as a result of dynamic process.

In the implementation, community engagement requires power sharing, maintenance of equity, and flexibility in pursuing goals, methods, and time frames to fit the priorities, needs, and capacities within the cultural context of communities. Community engagement in research is often operationalized in the form of partnerships, collaborative, and coalitions that help mobilize resources and influence systems; change relationships among partners; and serve as catalysts for changing policies, programs, and practices. Public participation particularly in design by research also allows the dynamic during the design process. The main purpose is not limited only to find out what is expected by community or agreement of design proposal. on top of that, public participation can trigger public debate that enrich the design process itself.

The pictures above show the example of public participation of the studio project in Oderzo (Italy) on January 2017. The goal of public participation in this case was to gain public interest and trigger debate and discussion as part of design and research process rather than finding a final design decision.

This event was attended by several actors such as locals, professionals, students, researchers, and local government. The debate gained during the process help decision maker to re-thinking the design product and more importantly to have deeper understanding of the complexity from community point of view. Public participation opens up the possibility of dynamic design process.
10. PROJECTION
Projection is developed to see the possible urban development along CBL canal in relation to CBL inland waterway project. Projection in this project shows possibility that could be happened if there is nothing being done, following current trend. This projection is developed based on the analysis of historical development, current systems (ground system, water and waste system) and recent structure plan proposed by Bekasi municipality.

The projection is developed in several stages. By transforming CBL canal into inland waterway, it is projected that first, the existing industrial area will outgrow and small industries take place along small water network nearby CBL canal. In addition, some roads will be upgraded to connect industrial area in the inner city with new terminal barge. Following this condition, informalty triggered by industrial development will take place in vicinity area.

In the second stage, new real estate will be developed to accomodate the need of housing for industrial workers whowere formerly live outside Bekasi District in order to stay close to their working place. This development has a strong potential to trigger informality to accomodate construction labors.

In the third stage, new CBD (Central Business District) will be developed in order to accomodate the need from industrial elite. This CBD will consist of luxurious facilities such as gym center, shopping center, offices and residential area.

The massive development of industries will continue by the emergence of industries equipped by individual terminal, taking the advantages of CBL inland waterway. This development then repeating the former stage where informalty and real estate will be developed as a result of industrial development.

In the last stage, Jakarta port will be expanded due to the increasing of logistic needs and the surrounding area will be filled by industries and container port. The massive industrial development then triggered more estates and more urbanization in this area. Finally, the remaining area around industries and estates will be filled by informalties. From environmental aspect, this will cause more natural degradation, the tremendous loss of agricultural site and extinction of mangrove ecosystem in delta area. As a result, more severe flooding due to increase pavement area and sea water intrusion.
1. Enhancement of existing industrial cluster
2. Industrial Development around New Terminal
3. Informality

1. Real Estate Development
2. Informality

1. Industry with individual terminal
2. Real estate
3. Informality

1. New CBD
1. Tanjung Priok Port Expansion/ New Port

THE CHANGED AXIS

Looking at JABODETABEK scale, the transformation of CBL Canal into inland waterway together with the proposal of new railway connecting Jakarta to Bogor (southern city) will affect the change of industrial axis from west-east development into north-south development. This changed axis has potential to promote massive urbanization triggered by industrial activity. On the other hand, the southern city is part of natural protected zone which function as absorption area as well as room for food production such as agriculture, orchard and tea plantation. In correlation, the uncontrolled urbanization will strongly transform the whole system in the territory.
Fig. 10.10 Industrial Development
Source: Author

Fig. 10.11 Residential Development
Source: Author

Fig. 10.12 CBD and Informality
Source: Author

Fig. 10.13 Overall Projection
Source: Author

ECOSYSTEM SERVICES

<table>
<thead>
<tr>
<th>REGULATING</th>
<th>CULTURE</th>
<th>PROVISIONING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Recreation</td>
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<tr>
<td>Climate</td>
<td>Aesthetic</td>
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<td>Education</td>
<td>Fresh Water</td>
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New CBD and site estate
Informable landfill, polluted canal
Informable polluted canal
11. COMPARATIVE STUDY

Banjarmasin, Indonesia
BANJARMASIN, INDONESIA

River and Road as Warp and Woof: Interweaving Ecologies and Economies in Banjarmasin’s Delta

In order to produce alternative design proposals, several comparative studies are initiated. One of the example selected is located in Banjarmasin, Indonesia. The project titled river and road as warp and woof applied the concept of interweaving ecologies and economies in Banjarmasin’s Delta area. Banjarmasin is the capital city of South Kalimantan, Indonesia. The city itself is located in the crossing of Barito River and Martapura River which makes this city has a strong relationship to water. Due to massive urbanization, currently Banjarmasin is facing a transformation from water city into road-based city. As a result, new type of urban fabric with different scales and heavy infrastructure is predicted to control future urban development without any clear direction in this territory.

An international competition called “The River City of Banjarmasin: Urban Eco Planning Concept and Ideas” was then organized in 2009 to seek solutions in order to avoid the degradation of living quality due to possible fragmentation of the city. One of the project delivered was proposed by RUA. The aim of the proposed project is to revitalize and strengthen the water based structure of Banjarmasin as its origin. The concept of interplaying waterways and roads then applied to the design proposal. The idea is focus on using road and water as complementary infrastructure which potential to be used to interweave economics and ecologies in the delta area. Moreover, the proposed idea tried to maintain and improve the qualities of this region: deltaic landscape of mangroves and swamp that link to the natural rhythms of Java Sea and the edges of hills to the east. The idea proposed aim to bring back the vibrant green blue systems and strengthen the landscape potential to restructure existing urban fabric and guide future urbanization.

Banjarmasin:
A Clearing in the Swamps
The southern region of Borneo is characterized by a rich water mosaic, a deltaic landscape of mangroves and swamps that link to the ebb tide of the Java Sea. Banjarmasin functions as a raised platform in a clearing of swamps and mangroves, strung together by different regional infrastructures.
An interplay of waterways and roads

As explained before, the design investigation explores the city future development through the concept of interplaying water and road infrastructure. The interplay of different elements of structure generates development opportunities and responding to a variety of needs. Their hierarchy is defined by Shannon and Meulder as follows (Shannon, K., & de Meulder, B., 2013):

1. Barito River as the crown
2. Martapura River as civic spine, collecting all elements of civic importance
3. smaller rivers and canals
4. regional highway and Bashir Bridge superimposed on the landscape, as collector-con
5. main street
6. industrial axis.

1. Wetland Park and Mangroves. The mangrove and wetland ecosystem is functioned as natural water cleaning system to encounter environmental degradation caused by industrial development.
2. Banjarmasin Central Park. The park in the city scale which functions as attractive entrance towards the city.
3. Masjid Sablah Mubahad Park. Space in between existing road and river is established as park with broad canopy to provide shading and better community space.
4. Banjarmasin Central Park. The park in the city scale which functions as attractive entrance towards the city.
5. Orchard promenade. New recreational promenade is installed and integrated with exiting productive landscape such as orchard.
12. DESIGN PROPOSAL

Vision
Design Idea
Concept and Principle
Structure Plan
Strategy Component
Zoom in Project
Fig. 12.1 Provisional Design Principle Derived from Theoretical Review, Analysis and Comparative Study
Source: Author
VISION

The CBL canal as strategic corridor in which is used as carrying structure to promote synergism between urban activity, production and natural environment that at the end opens the opportunity to empower local inhabitants, provision of more choice and job opportunity and natural restoration.

DESIGN IDEA

Considering the concept of Two Networks and Urban Metabolism, the idea is to use CBL canal as a carrying structure of urban development. Therefore, the canal need to be transformed from backyard into front yard. This idea is supported by the proposed project in which CBL canal will be used as inland waterway. This inland waterway project can be seen as an opportunity to shape this area into livable area where nature, urban and production can be integrated instead of leading only industrial development along the river.

The first concept is using CBL Canal as a limit of urban expansion. In this case, several industries are authorized to develop along the canal in certain degree which is equipped by proper waste water treatment plant. On the other hand, new real estates are permitted to grow in the western side of CBL canal, integrated with social housing to decrease the social segregation. Together with the provision of multifunctional public space inside the complex, allowing more interaction between various actors. This multifunctional space can be also equipped by training center for craftsmanship to improve low labor skill or any other activity. Moreover, this multifunctional space can be place to provide permeable surface and green public space. In order to gain people’s interest in agricultural activity, some urban farming can be also accommodated in this multifunctional space. In addition, local waste collection and recycling center can be placed in several points inside this complex.

Regarding the water pollution issue, the solution proposed is to transform the abandoned green area in the industrial area into water purification park. This park will be facilitated with water purification plant connected to industrial disposal outlet. In addition, gardens will be added as a filter and store the storm water to prevent run off. Together with landscaping, this area has a potential to be used as public space with additional education facilities integrated to it.

In this design idea, CBL Canal itself will be positioned as carrying structure for new development. Connected with existing fragmented green corridor, it opens possibility to manage slow lane and fast lane between several activities. Some quiet zone facilitated with green public space and small water channel connected to small pond, or, trail with green corridor along agriculture site to provide a nice environment for pedestrian and cyclist. On the other hand, infrastructure with proper integrated public transport could be an alternative to manage fast lane.

The main concept which will be applied in the overall design is the concept of two networks and urban metabolism. The main concept that is applied in the overall design is the two networks which is using traffic and water network to manage the territory into 2 areas: quiet zone and busy zone.

To achieve this condition, three specific concepts are pointed out: the first is the artery, the second is the capillarity and third is green porous. In regional scale, the quiet zone and busy zone are separated by locating fast lane in the center of industrial activity while the outer skirt will be connected by slow network (public transportation, pedestrian and public space along water network). In the village scale, the two zones are created by locating the fast lane in the periphery of quiet zone, creating a quiet pocket linked to the canal. In the project scale, the quiet zone can be located next to the canal, in between the water network and the traffic.

The artery concept explains the management of transportation network in which the fast lane pulled inward and centralized in the industrial area, functioned as carrying structure for industrial development and residential development while the water front of CBL Canal can be connected with smaller water network and used as carrying structure for more public activity as well as room for nature.

In the quiet zone, which is along the canal, the concept of capillarity explains the ability of water structure to manage the water dynamic in this territory. Thus, several water pockets that link to the canal by additional ditches will be provided. As additional point, this water pocket provide potential for recreation and water cleaning facilities which the relate to the third concept.

The green porous concept is used to reinforce the existing green patches that are connected to the canal to enhance both the quality of space and productivity in this territory. This green porous is also important to activate the abandoned and unproductive land along the canal that at the end expected to trigger more public activity and increase social cohesion.

Together, these three concepts forming five types of landscapes regarding to the existing land use located along the canal. The five landscapes are wetland green, productive green, industrial green, urban-rural green and green belt.
THE ARTERY

The artery concept explains the management of transportation network in which the fast lane pulled inward and centralized in the industrial area, functioned as carrying structure for industrial development while the water front of CBL Canal can be connected with smaller water network and used as carrying structure for more public activity as well as room for nature.

THE CAPILLARITY

Flood-able area to manage water dynamic such as water run off and water level raise.

- water ditch
- water storage

THE GREEN POROUS

Diverse green pocket along the canal to enhance the productivity while providing room for public activity and biodiversity.

- green pocket
- green corridor

Fig. 12.2 Traffic Network
Source: Author

Fig. 12.3 Water and Green Network
Source: Author

Fig. 12.4 Five Landscapes
Source: Author
STRUCTURE PLAN

The concept explained above will then be translated into structure plan. The structure plan proposed will be breakdown into several steps with the consideration of time and stakeholders need to be involved in which step.

As a starting point, it is important to have in mind that every stakeholder must commit to cooperate with each other. Local authority with urban planner and designer, industry, real estate developer and local community need to be involved to have a common goal and acceptable decision.

In the first stage, the preparation of informality relocation and villagers affected by CBL project need to be accomplished. Infrastructure development with public transport in parallel with social housing development is necessary to accommodate this relocation. This integrated social housing together with public transportation aim to limit the informality growth and real estate development particularly in the eastern part of canal where today is still dominantly covered by agriculture land and Urban Kampong.

In the second stage, Industrial development will be allowed in the specific area. The selection of the area must follow several criteria: 1. Close to the proposed container terminal; 2. abandoned area or unproductive agriculture site. The type of industry will be focused on recycling industry concerning the high amount of waste produced and recycled in this territory. The industry will be directed in two scales. First is the neighborhood scale to promote recycling activity for direct reuse or low technology involved such as organic fertilizer, biogas, etc. Second, the regional scale industry to promote recovery of resources involved higher technology such as bio-plastic, electricity from biogas, etc. in the early stage of this phase, educating process is important for local inhabitants to gain the awareness of waste management as new economy.

In the third stage, the enhancement of agriculture and aquaculture activity through the concept of agroforestry, silvofishery, and wetland restoration can be conducted. This phase need a strong involvement of local community to guide local inhabitants during the process. This enhancement and nature restoration process will be followed by the establishment of green blue network creating a connected network both for leisure and ecological corridor (slow lane) as well as room for nature to prevent flooding and fresh water scarcity.

The restoration of natural environment might take longer time. During the process, the industries should be prepared to transform their industry totally into bio-based industry using the potential of biomass production through agroforestry and wetland restoration. At this moment, collaboration between farmer and industry can be established.

Lastly, the room in eastern part Bekasi District will be preserved for Urban Kampong development and through time, during the improvement of this territory, CBL Canal can be seen as carrying structure for different element and has potential to be accessed not only for industrial purpose but also water public transportation in the future.
POLICY/ACTION:

1. Industrial development will be focused on recycle industry, non recycling industry will be taxed higher compared to recycling industry.
2. “Waste for Food” program. Incentives will be given to recycling startup business.

POLICY/ACTION:

1. Land certification to secure land property
2. Tax reduction for productive land in order to decrease unproductive site

Provide training and workshop to local inhabitants and farmers regarding wetland restoration, sylvofishery, and agroforestry.
POLICY/ACTION:
1. tax incentive for shifting to bio-based industry

Fig. 12.8 Step 4
Source: Author

1. Densification and expansion of Urban Kampong

POLICY/ACTION:
1. promote activity to enhance urban kampong identity
2. support financial for local community to develop local research center for agriculture and aquaculture

Fig. 12.9 Step 5
Source: Author
Fig. 12.10 Timeline of Overall Design Proposal
Source: Author
STRATEGIC COMPONENT

Strategic components are tools to help the implementation of design intervention in zoom in scale. Related to overall design concept and principle, there are six strategic components proposed: waterside promenade, lateral link, green pocket and promenade, sponges, intersection and road upgrading/downgrading.

**Waterside promenade**

provides slow zone accessibility along water network while connecting important nodes

**Lateral Link**

connects important elements in the hinterland to activity along waterfront with slow mobility lane or water network

**Green pocket and promenade**

provides space for social interaction as well as production and biodiversity

**Sponges**

enhances porosity of space for dynamic interaction

**Intersection**

for public space and community services

**Upgrading and downgrading road**

Providing slow lane and fast lane to provide quiet zone for leisure activity and fast zone to provide production efficiency

Three strategic area are selected to show the projects in detail. Strategic area means area that has a potential in urban, production and nature which is also the three systems that aim to be investigated as an objective in this research. First location is located in the northern part which is constructed by urban kampong (urban), fish pond (production) and mangrove ecosystem (nature). Second location is located in the middle section which consist of Urban Kampong (urban), unproductive agriculture site (production), new proposed industry (production) and water network (nature). Third project is located in the southern part which is structured by urban kampong (urban) real estate (urban), agriculture site (production) and water network (nature)

Fig. 12.11 Detailed Project Location
Source: Author
MANGROVE AND WETLAND RESTORATION

In this location, the project proposed will be focused on the wetland and mangrove restoration while promoting aquaculture productivity (Silvofishery). The wetland restoration project will take place in the abandoned area which was formerly a wetland area located along the canal. This area will be transformed into wetland park to stimulate waterfront activity as well as waste water treatment (rain, grey and black water) to provide fresh water for aquaculture activity. In addition, the wetland vegetation has potential to be used as biomass that correlated with the strategy of bio-based industry. As a result, this new type of landscape provides a better working and productive landscape, green blue infrastructure, ecological landscape and community spaces which is suitable with the four points of ecosystem services: regulating water run-off, supporting resource cycle, provisioning of food and fresh water and culture enhancement by providing space for recreation, education and aesthetic. Overall, this project can enhance the identity of this village while maintaining the potential of the ecosystem.

1. Biogas Storage
2. School and sport field
3. Boat stop and public square
4. Biorecycling center and water storage
5. Wetland Park
6. Aquaculture
7. Fishing hut
8. Helophyte Pond
9. Mangrove/silvofishery

Fig. 12.12 Proposal of Mangrove and Wetland Restoration
Source: Author
1. sedimentation pond
2. primary treatment: horizontal flow system
3. tertiary treatment: vertical flow system
4. water purification: free water surface
5. water filtration
6. clean water storage

Common reed (Phragmites australis)
Water Hyacinth (Eichhornia crassipes)

BEFORE
separate fish pond and mangrove area
80% mangrove, 20% fish pond

AFTER
80% mangrove, 20% fish pond
Fig. 12.13 Implementation of Strategic Components
Source: Author

Fig. 12.14 Multifunctional Space: Nature, Production and Recreation
Source: Author

ECOSYSTEM SERVICES

<table>
<thead>
<tr>
<th>REGULATING</th>
<th>CULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Recreation</td>
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<tr>
<td>Climate</td>
<td>Aesthetic</td>
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<td>Water run-off</td>
<td>Education</td>
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<td></td>
<td>Identity</td>
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<tr>
<th>SUPPORTING</th>
<th>PROVISIONING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Cycle</td>
<td>Food Production</td>
</tr>
<tr>
<td>Soil Formation</td>
<td>Fresh Water</td>
</tr>
</tbody>
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Fig. 12.15 Visualization of Design Proposal
Source: Author
AGROFORESTRY

This project will be located in the middle section of CBL canal where massive unproductive agriculture land can be found. The area selected for this project is the burnt agriculture site or agriculture site that is not very productive. The agroforestry concept helps to make agriculture system more sustainable, improve soil and water quality while providing home for biodiversity (Retnowati, 2003). Related to bio-based industry, agroforestry has a strong potential to be used in the future as bio energy, providing opportunity for collaboration between farmers and industry.

The agroforestry system is divided into four big clusters. First, forest farming with its role as natural barrier between industry and agriculture while providing room for orchards, high value crops such as mushroom, medical crops, etc. Second, alley cropping in which agriculture crop is cultivated in the alleys between widely spaced rows of trees such as eucalyptus or other pulpwood. Third, the concept of silvopasture system which combines tree plantation, forage and livestock production. In the area which is lower and has potential to be flooded, new type of agriculture can be introduced. The concept is to provide adaptive plot where during wet season it can be used to cultivate rice paddy in combination with fish farming and during dry season it can be used to cultivate rice paddy in combination with vegetable.

As a result, this new landscape can promote a better ecological connection while improving the agriculture productivity. On the other hand, providing room for public interaction as well as education which is suitable with the four points of ecosystem services: regulating water run off, supporting resource cycle, provisioning of food and fresh water and culture enhancement by providing space for recreation, education and aesthetic.
Step 1: Farm-dyke construction

Step 2: rice on the elevated middle terrace and fish in the deeper periphery during high water level.

Step 3: Growing paddy in the periphery during low water level.

Adaptive Agriculture

BEFORE

AFTER

Informal education + small scale recycling and learning center

Collaborating: large scale and small scale industry

CBL Project
Partial Industrial Development
Bio-Based industry

waste recycling industry

Transition

Limited Productivity

Full Productivity

Planting establishment Growth Restoration of unproductive site

Site preparation
**ECOSYSTEM SERVICES**

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<thead>
<tr>
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*Fig. 12.18 Implementation of Strategic Components*
Source: Author

*Fig. 12.19 Multifunctional Space: Nature, Production and Recreation*
Source: Author

*Fig. 12.20 Visualization of Design Proposal*
Source: Author
INTEGRATED SOCIAL HOUSING

The location of this project will take place in the area which is nearby the industry, real estate, Urban Kampong and agriculture activity where a huge amount of construction site and underused site can be found. The aim of this project is to provide room for informality and immigrant from outside Bekasi District. This integrated social housing will be equipped with skill training center as well as recycling center to empower the local inhabitants. In addition, neighborhood park will be proposed to provide room for interaction between different society. Urban agriculture, room for commercial activity and helophyte filter can be installed to provide room for production, waste water treatment and promote local economy. In addition, the provision of integrated public transportation which is connected to Jakarta, Bekasi city center and new industrial area aims to provide easy access to job, education and health.

1. Social Housing
2. Helophyte Filter
3. Urban Agriculture
4. Room for commercial activity and public space
5. Public Transportation

Site for Integrated Social Housing: area in which industry, real estate, urban kampong and agriculture field are placed adjacent to each other
Neighborhood Helophyte Filter

**B E F O R E**
- Canal
- Paddy Field
- Orchard
- Real Estate
- Post-construction site
- Marsh
- Unproductive site
- Pond
- Stream
- Orchard
- Paddy Field
- Pond
- Irrigation System

**A F T E R**
- Canal
- Paddy Field
- Orchard
- Real Estate
- Neighborhood Training + Recycling Center
- Orchard
- Social Housing + Urban Agriculture
- Helophyte Filter
- Pond
- Orchard
- Paddy Field
- Wetland Treatment System

- Infrastructure + Public Transport Development
- Social Housing Development
- Provision of open areas for commercial activity
- Restoration of informality and villages
- Informal Education + Skill training Center
- Restoration agriculture field, Helophyte Filter and wetland treatment
- Implementation of urban agriculture and recycling activity in neighborhood scale
- Collaborating, household industry and larger industry
- CBL Project
- Partial Industrial Development (recycling)
- Expansion of Room for commercial activity along the road (to serve industrial worker)
- Transition
- Bio-based Industry Development
**ECOSYSTEM SERVICES**

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Fig. 12.22 Implementation of Strategic Components
Source: Author

Fig. 12.23 Integrated Social Housing
Source: Author

Fig. 12.24 Visualization of Design Proposal
Source: Author
REFLECTION

A deep insight is acquired through the project of urban landscape transformation along CBL by applying concept of two networks as well as urban metabolism as integrated ecological approach towards sustainable development. While understanding these selected method, a thought of potential innovation coming from joined fields for instance, ecology, morphology and biochemical field seems to cooperate their way towards the development of new methods in urbanism. However, when applying these two concepts, recognition of future challenges of such effective method particularly in a developing country such as Indonesia arose. The importance of accommodating those concepts and link it into reality in which much more complex considering local context (actors, place and culture) become another concern. Throughout this project research and design are elaborated together where theoretical framework shaped the context and vice versa where in certain degree, the ability to be adaptive to certain condition is essential.

Along the design process, it is realized that selected methods (two networks and urban metabolism) is perceived as promising tools which relevance with the case study and its problem but on the other hand has its own limitation. This limitation related to local culture where urban planning and design activity in Indonesia is far behind European countries such as Netherlands. Using western concept into project in eastern developing county might be uncommon and highly potential to be rejected. For example, the design goal using two networks and urban metabolism promote synergism thus requires strong commitment and participation from every stakeholders including local community which is rarely been done before in this country. Moreover, the strongly rooted culture of the people who perceive nature as non valuable elements is another challenges.

Despite the fact of the challenges that might limit this project, I see myself as both urban planner and designer who has to see this project as a moment to opens up provocations, debate, avoiding the fear of complexity and see this as an opportunity to contribute to the mental revolution of this country. Throughout the process, I learnt that reiteration and self training toward critical way of thinking and observing is strongly necessary and helps me personally to embrace the complexity of this project. At the end, I would like to see this thesis project as a complex narrative project in which deals with uncertain time limit and prospective while giving opportunity for me as designer to dive into this narrative, being utopian and experimental while at the same time the capacity to step back and being grounded.
Books and Journals


Websites


Maps
http://media-kitlv.nl/image/4cfcf13f1-36f8-cdc5-9a5d-1781b67c3f6
http://www.lib.utexas.edu/maps/ams/indonesia/index.html
http://www.bakosurtanal.go.id/
https://www.bappenas.go.id/id/

Other

180