# TRANSFORMATIVE RESILIENCE

A Study of Derivative Form of Resilience
in Informal Settlement
Study Case: Bukit Duri, Jakarta

**Ardian Wiratama**
Faculty of Architecture and Built Environment I Delft Institute of Technology

**TU**Delft
**BK**Bouwkunde

SPS

Complex
Cities

Ardian Wiratama

ardianwiratama@gmail.com

2018

# TRANSFORMATIVE RESILIENCE

*A Study of Derivative Form of Resilience
in Informal Settlement
Study Case: Bukit Duri, Jakarta*

**TU** Delft
**BK** Bouwkunde

SPS  Complex Cities

# transformative resilience

*Graduate Thesis Report:*

Student Name : Ardian Wiratama

Student Number : 4626133

Faculty of Architecture and the Built Environment

(Urbanism track)

Delft University of Technology

ardianwiratama@gmail.com

*Research Group:* Complex Cities

First Mentor : Arie Romein

Second Mentor : Roberto Rocco

cover image source:

*Contents*

*image source: KITLV*

### Ciliwung yang Manis
*Ciliwung mengalir*
*dan menyindir gedung-gedung kota Jakarta*
*[...]*
*Ciliwung bagai lidah terjulur*
*Ciliwung yang manis tunjukkan lenggoknya*
*[...]*
*Teman segala orang miskin*
*timbunan rindu yang terperam*
*[...]*
*Begitu kali bernyanyi meliuk-liuk*
*dan Jakarta disinggung dengan pantatnya*


### The Pretty Ciliwung
*Flowing in between, mocking up all those*
*buildings of Jakarta*
*[...]*
*Ciliwung, like an outstretched tongue*
*the pretty Ciliwung is showing her swing*
*[...]*
*Friend of the poor, a place of buried yearning*
*[...]*
*Once she sings wriggly,*
*then the Jakarta is alluded by her tail*


*\*A poetry by W.S. Rendra (a senior Indonesian poet)*
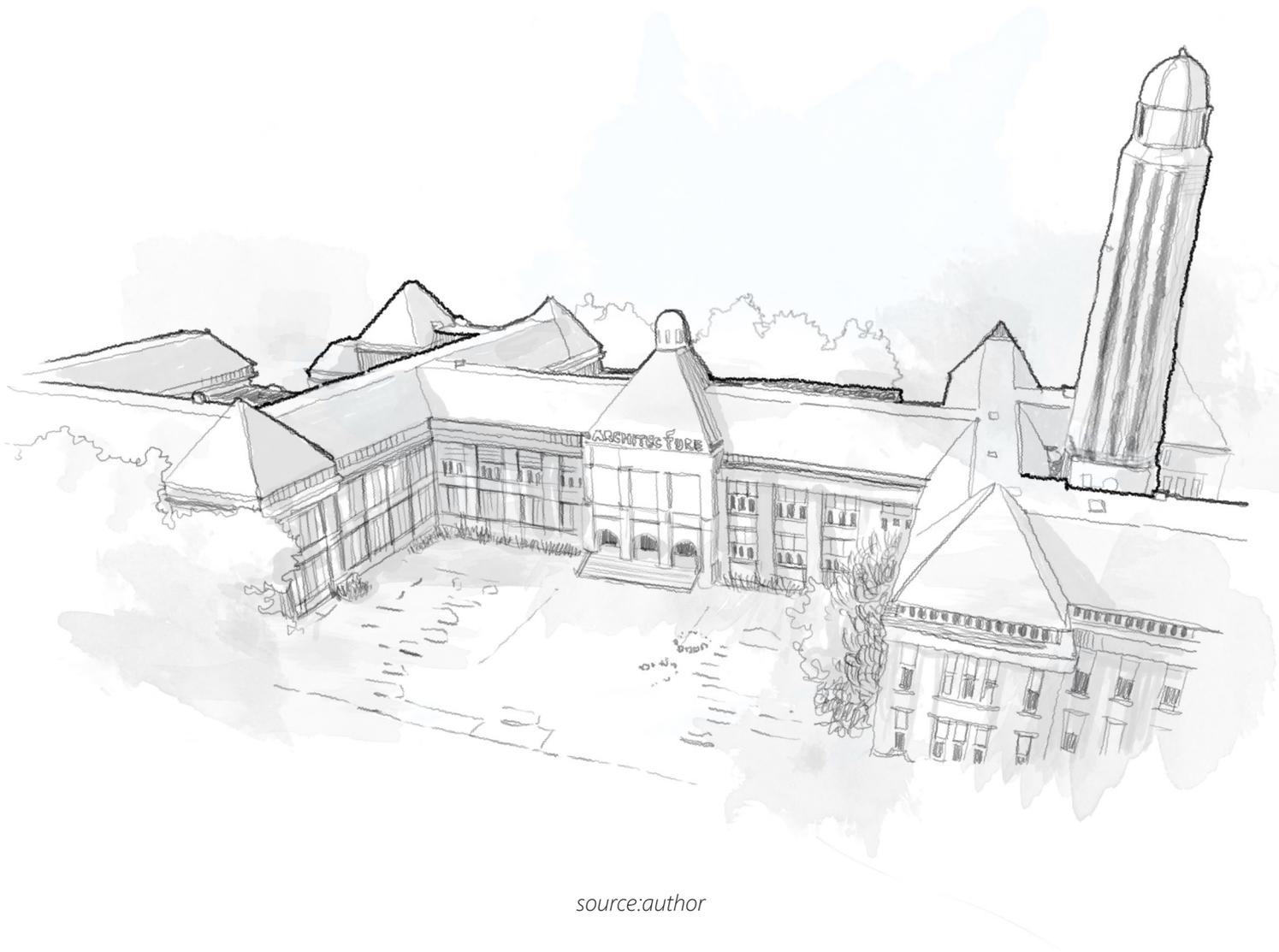
ARCHITECTURE

source:author

## ACKNOWLEDGEMENT

source:author

## SUMMARY

The exposure of flooding has been existed in several Global South countries, not particularly in Indonesia. The community which has been living in vulnerable location encounters the magnitude of flooding through times with a difficult and complicated situation to encounter the devastating impact of the disaster. Many policies and actions from the government have tried to solve the issues, yet the outcomes are still improperly touching the root of problems. Lack of dialogue between authority and inhabitants has resulted in a clash of rationalities which then destructs the process of policy implementation.

The primary objective of the research is to set various pattern of intervention which can be implemented in informal settlement as a part of constructing resilience and sustainable system in the neighborhood. Based on that objectives, several observations and analysis were made to identify the local properties that could contribute to the improvement of spatial, economic, and social quality. The flooding as the central issues in this project is also analyzed through layer mapping and analytical review, including identification of stakeholder and flood-risk governance that exist in the system. The framework of resilience which includes engineering resilience, ecological resilience and social resilience is being a reference to determine the value of existing properties which importantly contributed to the performance of resilience-sustainability system.

Zoned-defined intervention as the design hypothesis is proposed as the statement of solution which tries to manage diverse problems on the site. Due to the complexity and variety of the problems, categorization of problems is made to determine the most important properties in the neighborhood which still needs improvement.

The products of this research compile several layers of solution which includes policy recommendations, design framework, pattern of designs and test case (pilot project) intervention. The framework of flood-risk governance asses all the intervention and design proposal which then contributes to the improvement of resilience value.

In the end, this research will be an input for the local stakeholders, both the authority and grassroots actors, to develop the quality of livelihood in the context towards a more resilience and sustainable neighborhood. Considering the complexity of the subject, further research on multiple dimension is necessary before practically implementing the solution.

# Section 1

Introduction

Motivation

Context Introduction

*Jakarta, as one of the biggest city in Southeast Asia, shows tremendous development in the last decade*
*source: www.100resilientcities.org*

## INTRODUCTION

Our nature as human beings to roam space is one of the substances of existence, which is also related to our relationship to the environment. Nature provides almost everything for the people but also needs a very sensitive understanding of the people in the way the environment is exploited. A city as a trace of civilization compiles large anthropogenic properties which belong to its inhabitants. As the city develops, the system is getting more complicated and the human-nature network has been transformed into a more complex relation.

Not only in the environmental dimension, but a progressive advancement of the city also consequences a massive change in social structure. Uneven development in the city is creating an enormous gap concerning accessibility to capital resulting high-class community on one side and poor-low-class community on the other side. This situation is sometimes a result of institutional policy made by the government which, in the beginning, was trying to deal with the challenge. Moreover, uneven human capital also leads to the situation, where there are a winner and a loser, which the last one is restricted to certain access.

Accommodating our need to develop the city while also dealing with the uncertain-fluctuating challenge of the future requires a better understanding of the dynamic of the system. The properties of the challenge exist in many aspects and also ongoing in multiscalar dimension. A single problem that is happening in the urban area is most likely not only affiliated to the micro level environment but also in more broader level in which regional approach would take place. Without neglecting the local context, one needs to walk between the scale and not to narrow the awareness.

A city of Jakarta, Indonesia has been chosen as the context of this project considering its problematic situation in the built environment. Alike many big cities in the world, Jakarta is also facing the challenge of climate change and environmental hazard while at the same time dealing with massive development of the city which is sometimes immaturely planned. As the population grows at a tremendous rate, the lack of regulation from the government has caused informal occupation of some spaces within the city by certain communities. In the end, these particular communities have to live with the most dangerous risk of disaster, such as flooding.

This project is focusing on the elaboration of two main issues, which are disaster (flooding) and informal settlement, to propose intervention and solution. Both of these issues are influencing each other introducing a complex system in the built environment. During the research process, observation, and mapping had been made to acknowledge ideas of the context which are then suggested to be the inputs for strategy and design framework. The outcomes of this project will include policy recommendation, design framework, stakeholder map, design pathways and design pattern.

*Flooding has become recurrent issue in Jakarta.*
*source: universe.byu.edu*

## *Motivation*

Jakarta, the capital of Jakarta, has crossed my life pathways at certain times introducing various perspective that the city has. Having experienced to see different dimension of city's issues, I decided to elaborate my experience and knowledge to research specific subject in Jakarta. This research has a personal objective in which understanding the city and practicing knowledge are the main motives among many.

Working in marginalized community has been my interest and passion since I was in my bachelor years in Bandung, Indonesia. Although my experience of working in Jakarta is still limited, my interest has been accommodated by several voluntary and informal participation in community assistance in Bandung. By knowing and directly seeing the context of specific community, I had experienced the way the communities see the city and vice versa. It encouraged me to work and do something to identify where in the system those different level can meet in certain points.

Personally, I consider that this step I have taken is the only beginning of my future career, allowing me to know better my country and specifically the city of Jakarta. One thing in certain is in the next coming years and decades, I will develop my skill on working with people and elaborating practical approach in the city environment.

*Research Studio*

Considering the broad issues and subject of the research, I found that Complex Cities research group is the most suitable group in which multi-scale approach will be elaborated more. The subject of informal settlement in combination with disaster risk suggests various dimension of built environment to understand the roots of the problem. Moreover, this research group introduces not only spatial approach to propose solution but also the other aspects, such as governance system, stakeholder involvement, policy production, etc.

Moreover, Complex Cities research group has specific focus group, Inclusive Cities, in which I found a great reference and input for my project. Issues and approaches that are introduced in this focus group has given a wider perspective to work on the project. By several sharing session and workshop, the construction of the research was properly supported.
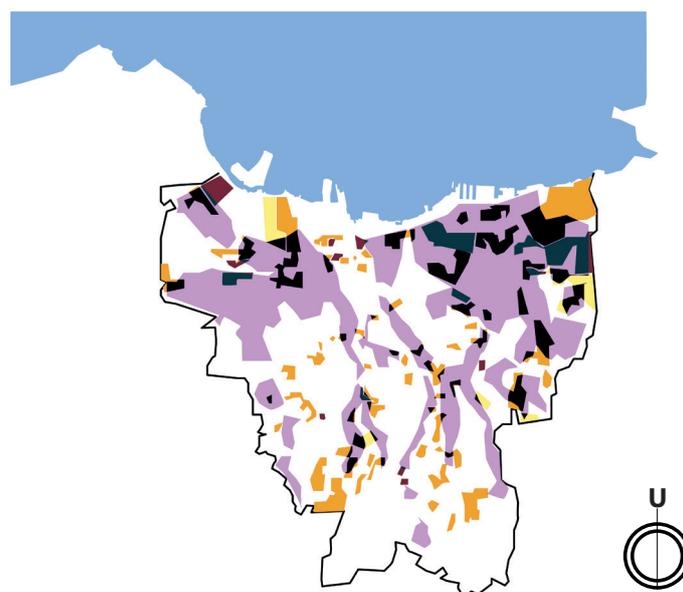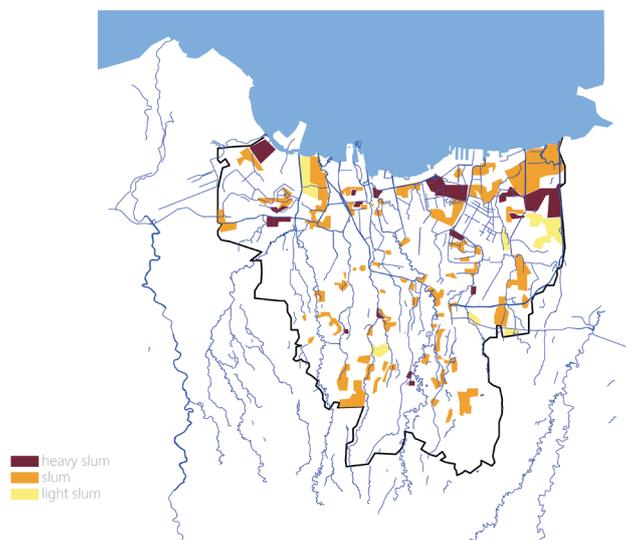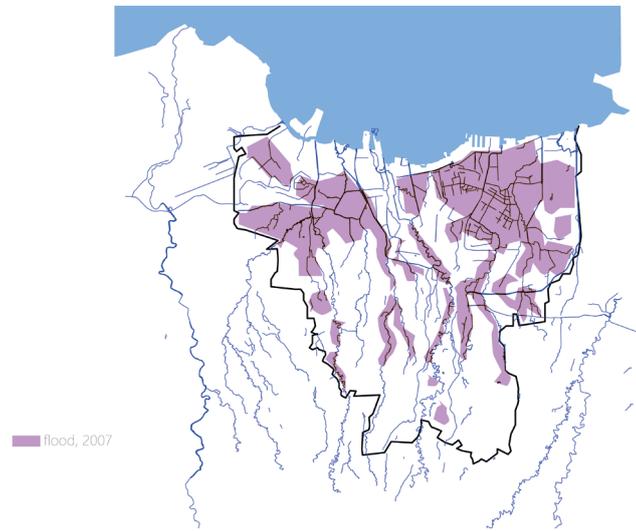
*Overlayed map of flood-prone area and the location of slums (3rd map).
Most of the slums are located in vulnerable area in which the magnitude
of disaster is exacerbated by the poor living condition.
Source: Jakarta Urban Challenges in a Changing Climate Change, 2010)*
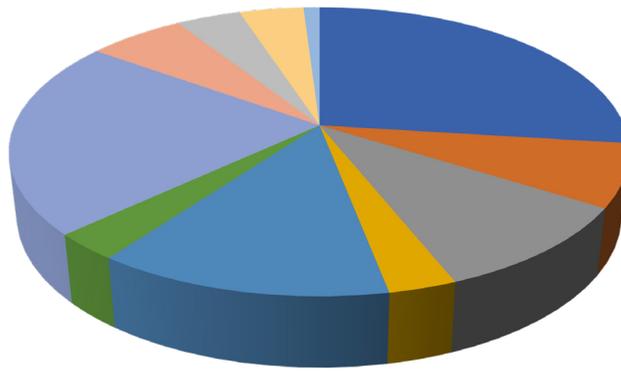
*Land use distribution in Jakarta, the three largest segments are:*
*slum area (27%), residential area (22%), and Transportation facility (13%)*
*source: (Schellekens, 2015)*

## Context Introduction

### Jakarta: City of Flooding

Flooding has been remarked as one of the urgent issues in Jakarta. The magnitude of the flooding is devastating almost the entire area of the city, with no exception, the informal settlement located on the river embankment. Frequently happened at least once a year, flooding is still a significant threat for the people living in the vulnerable area. Due to the limited space for living, some communities have to occupy 'idle' land with lack of basic infrastructure to survive their living. This 'idle' land can be found in many locations, such as river embankment, space next to railway track or even the space under the overpass.

The magnitude of the flooding is varied on the existing condition of the area. However, due to the lack of access to capital and basic infrastructure, the impact of flooding always brings the inhabitants to crucial damage.

### Options of Living Informally

Elaborating discussion of informal settlement cannot exclude a discourse of capital production within the context. The distribution of capital in informal settlement profoundly determine the capacity of individual or household to perform any type of adaptation and transformation. Opportunity to grow and develop for the individuals in informal settlement is often determined by their bond to social linkage and network of neighborhood. As (Dahrendorf, 1979) introduced the theory of *Life Chances*, the capacity of individuals is close in meaning to their life chances, which are *'... simply opportunities in the sense of alternatives to choose from. The more of these alternatives a person has ..., the greater are his possibilities and thus his life chances, (which) are a function of two elements, options and ligatures'* (Dahrendorf, 1979). In a brief conclusion, ligatures could define the meaning and reasoning behind person's action whereas options emphasize the objective and horizon of action.

Java Sea

Jakarta Province

Municipality of Depok

Ciliwung River

Municipality of Bogor
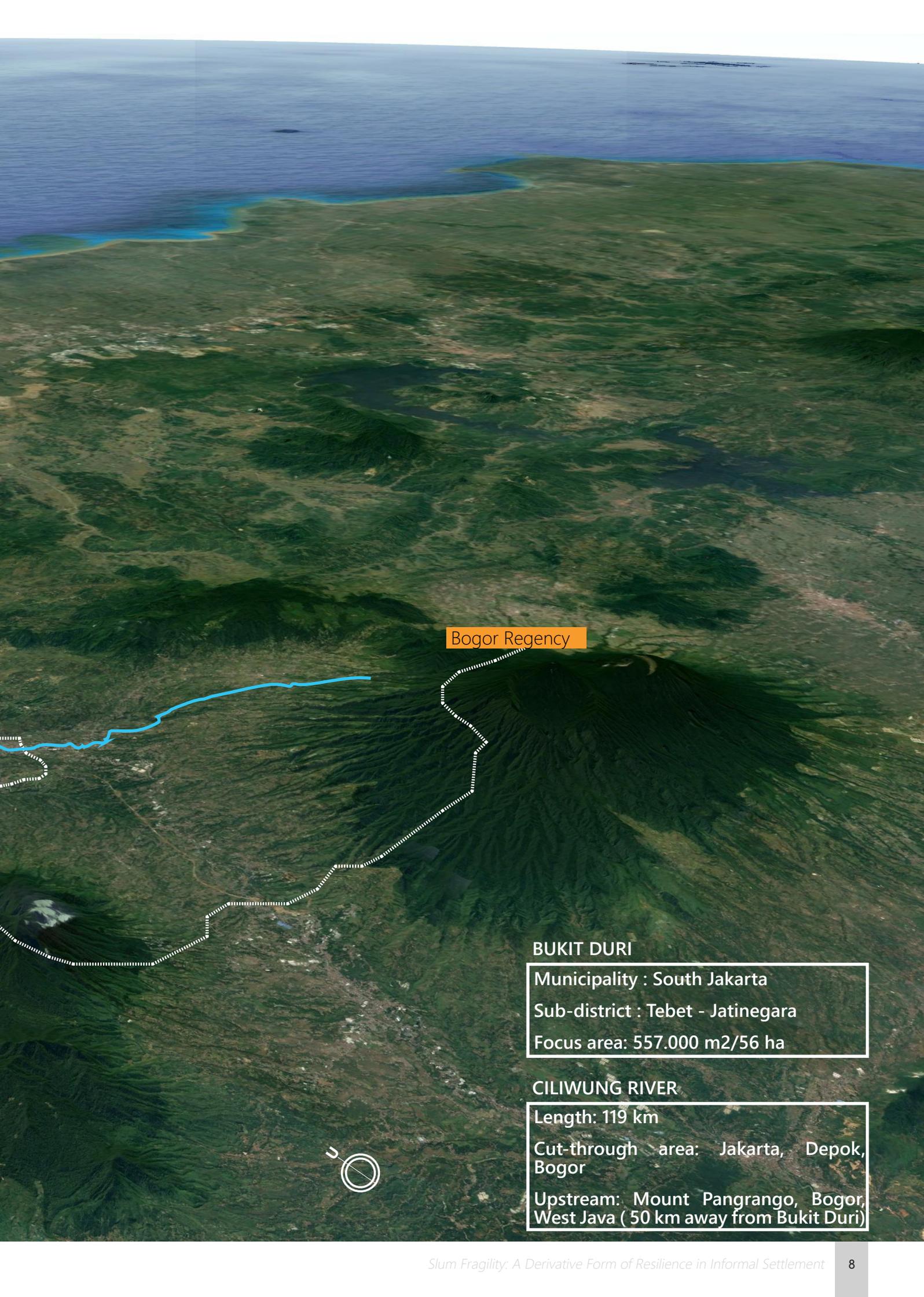
Bogor Regency

**BUKIT DURI**

Municipality : South Jakarta

Sub-district : Tebet - Jatinegara

Focus area: 557.000 m2/56 ha

**CILIWUNG RIVER**

Length: 119 km

Cut-through area: Jakarta, Depok, Bogor

Upstream: Mount Pangrango, Bogor, West Java ( 50 km away from Bukit Duri)
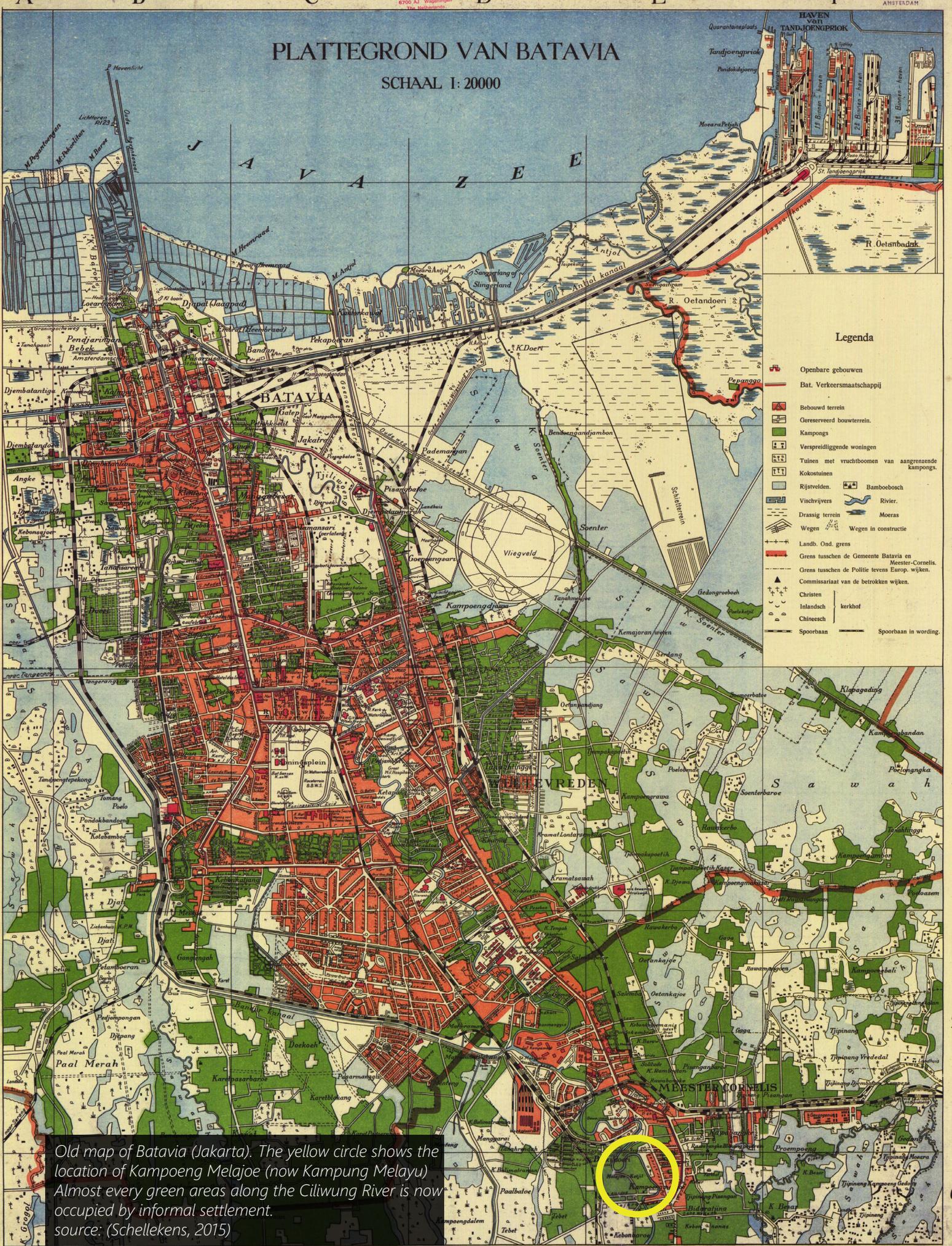
Old map of Batavia (Jakarta). The yellow circle shows the location of Kampoeng Melajoe (now Kampung Melayu) Almost every green areas along the Ciliwung River is now occupied by informal settlement.
source: (Schellekens, 2015)

Inhabitant of informal settlement has limited access to certain capital, yet there are also opportunities for them to create alternatives to sustain their life. Those alternatives cooperate with the informal environment in which diversity of options characterizes the system

*Informal Settlement as a Context: Bukit Duri, Jakarta*

Throughout the time, slum settlement has been resulted by unplanned urban development creating 'idle' space to be occupied by people who cannot afford to get a formal house. The increasing number of urbanization could not be balanced by the provision of housing and the supporting infrastructure. In many Global South countries, this issue is still showing its growing trend due to uneven development in the country. Especially in Indonesia, the high-increasing urbanization growth has shown remarkable number within the last decade (Jegho, 2016).

In Indonesia, the existence of informal settlement has been found in many big cities, or megacities, such as Jakarta, Bandung, Semarang, etc. Compare to the other Global South cities, Jakarta has been remarked as one of the densest city (Davis, 2006). The result of uneven access to capital is forcing the people to move from the surrounding region to the inner-city which may fulfill their need to get prosperity. Especially in Jakarta, its role as the capital city is still attractive enough to invite people to come. However, the existence of slum settlement has been a part of the city and cannot be neglected after all.

Based on its density, location, and access to employment, Bukit Duri can be defined as inner-city kampong which is used to be or even still a melting-pot for the newcomer from all around the country. Predominantly occupied by Betawi community (indigenous community in Batavia, now Jakarta) in the colonial era, Bukit Duri has now composed of a diverse community, such as Chinese, Javanese, Sundanese, Malay, Padang, etc. Mixed-acculturated socio structure significantly formed the spatial production within the neighborhood in which there is a lot of public space, such as alleys, terraces and yards that accommodates rural-living lifestyle.

The existence of Bukit Duri cannot be separated from the surrounding economic activities that have been established since the colonial era. Manggarai Railway Station, one of the biggest railway station in Jakarta, has been existed as an important terminal for commuter-line passenger from the regions since it was first used in 1918. Consist of 10 (ten) functional tracks, 7 (seven) of them are connecting Jakarta to the other cities, such as Bogor, Depok, Jakarta Kota, Jatinegara, and Bekasi. Its crucial role for mobility has also created more opportunity for the emergence formal-informal commercial activities, such as hotel, restaurant, stores and street vendors. This high-demand of economic function has not been properly accommodated by the local regulation which then resulting spatial and mobility problem, for example, deteriorated pedestrian path, and traffic congestion.

However, regarding the living quality, Bukit Duri neighborhood has not been supported by the proper basic infrastructure, especially for water and waste. The complex land ownership situation has made the border between formal and informal land is biased. Even though they have been living for more than 50 years in the current location, it is a fact that they are still secluded from the major system. Currently, some households are only supported by limited public infrastructure and the rest inhabitants can only use self-made facilities, such as public bathroom, wells, and septic tanks for their daily life.

Meanwhile, in terms of disaster, those particular community has found themselves even more vulnerable to natural hazard, since, based on the geographical condition, the space they live is fragile and highly exposed to flooding. Moreover, the dense-crowded neighborhood structure also makes the inhabitants hardly mitigate themselves in a disastrous event. Moreover, they are not only fragmented spatially but also segregated socially.
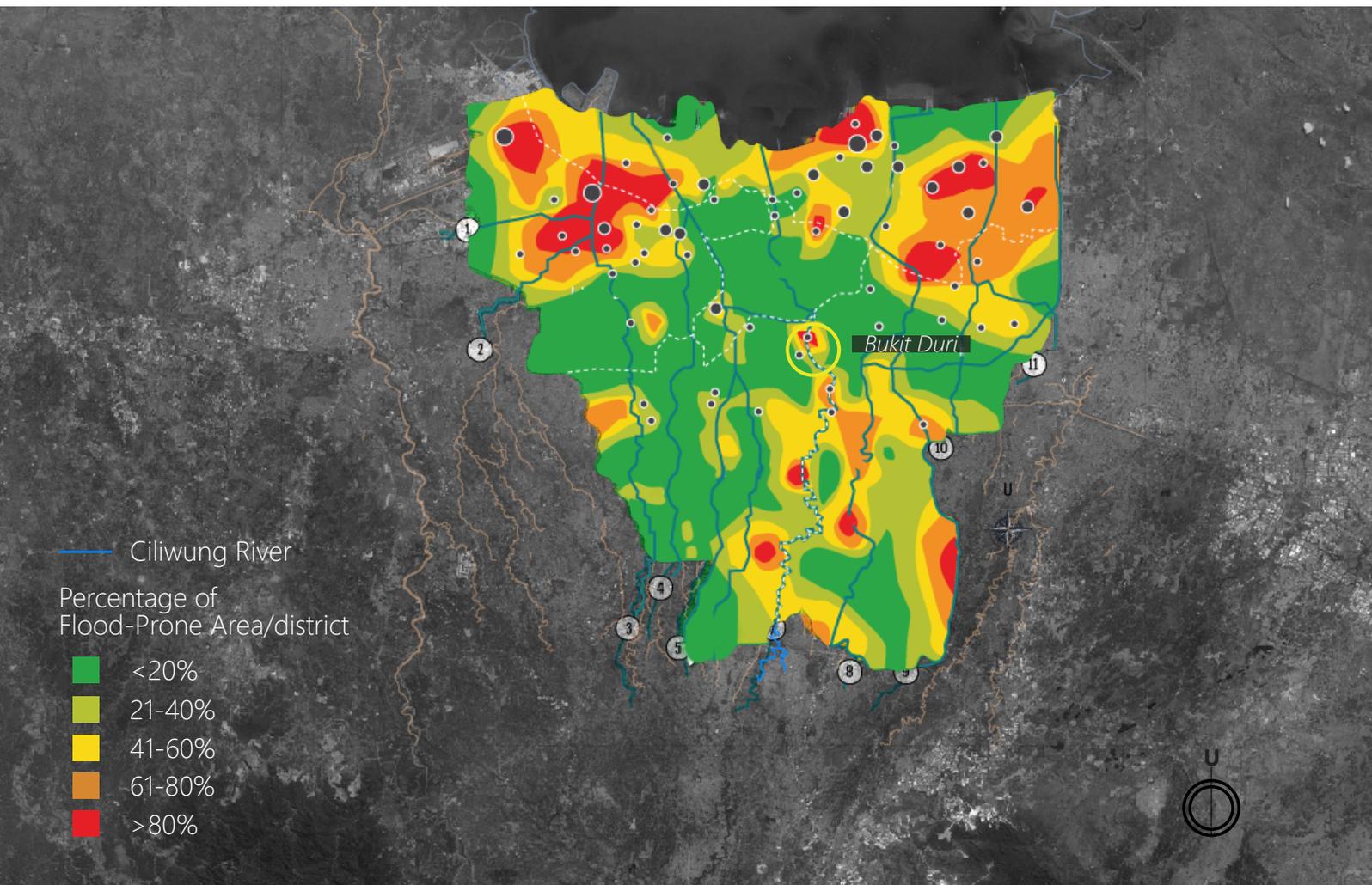
*Several location along Ciliwung River are spotted as vulnerable place to flooding
source: Litbang Kompas, infographic by Anggara Kusumaatmaja*

Legend:

—— Ciliwung River

Percentage of
Flood-Prone Area/district

- <20%
- 21-40%
- 41-60%
- 61-80%
- >80%

Bukit Duri

*Poor living environment has brought the inhabitants of Bukit Duri more vulnerable to any natural hazards. Lack of infrastructure support secludes them from the major system.*
*source: jakartaglobe.id; kumparan.com*

Living right alongside Ciliwung River, Bukit Duri neighborhood has experienced a high magnitude of flooding as an accumulation of poor waste and water management from the upstream to the downstream. The upstream of Ciliwung River is in Cisarua, Bogor, at least 50 km away from Bukit Duri, which prominently known as recreational destination for people in the region. Tons of rubbish can be produced only within two days in the weekend which mostly been thrown into to the river. During the wet season, Bukit Duri can be flooded once in every month.

Furthermore, most of the inhabitant of Bukit Duri is relying their life in the informal sector. This high dependency in the informal sector has made them vulnerable to poverty since the access to capital is lacking. On the other hand, the existence of informal sector on this location has been seen as an important endorsement of the other commercial activity surrounding the neighborhood. For instance, dozens

of street vendors are providing options for the office worker to get low-cheap meals.

Many interventions have been proposed as slum-upgrading program, yet it sometimes only be a top-down approach which lacks the community participation. Moreover, slum upgrading has been translated as infrastructure upgrading which only contributes to physical dimension and insignificantly improves the social and economic condition.

# Section 2

**Problem Fields**

Problem Analysis
Positioning
Problem Statement
Goals
Research-Subresearch Question
Relevance
Aim of the Research
Methodology
Tools
Theoretical Framework

*A disintegration of new infrastructure and existing infrastructure*
*source: RadarOnline.id*

## PROBLEM ANALYSIS

In the future of the complex world, there is an ongoing discourse on defining resilience as one of the promising propaganda in the way it deals with uncertainty and adaptability. This appealing term has been spread throughout the world as enticing propaganda in many city-developments. Yet, it is sometimes difficult to define resilience as practical term into the actions. Due to its broad interpretation of resilience, it is rarely easy to derive appropriate action in such a context. In many cases, there are some critics of this agenda that suggests ineffectiveness of the actions which only make a slight impact on the built environment.

Commonly, resilience has been known as the capability or capacity to return to the previous condition from any hardship. In general, it requires a reference state to determine its directions and objectives.

However, the way resilience involves in human-natural interaction is still biased. Mostly, resilience program only considers single-state equilibrium as the only goal for such a problem. This state briefly defined by (Holling, 1996) as '...*the capacity of a system to revert to previous equilibrium post-disturbance*'. In many cases, it is strongly related to engineer-based approach in which we can find in the form of command and control management, such as flood control infrastructure. The depiction of single-state equilibrium can be represented in a concept of a single basin of attraction which draws the ball of the state to the bottom. The singular direction to the bottom restricts possibility to have another scenario of equilibrium.

Meanwhile, living in this dynamic-uncertain environment, one needs to consider multi-state equilibrium as the direction toward resilience. Conceptually, the multi-state equilibrium suggests more than one basin of attraction which provides more opportunity to move into another scenario of equilibrium. For instance, natural disaster as a peculiar case in the built environment, which the magnitude fluctuates, needs to be examined by different scenario and not only focused on a single-state direction.

## River normalization best way to mitigate floods: Ahok

**Agnes Anya**
The Jakarta Post

Jakarta | Fri, February 17, 2017 | 06:34 pm

👍 Like

## Jakarta aims to become resilient city

**Corry Elyda**
The Jakarta Post

Jakarta | Fri, November 18 2016 | 08:45 am

👍

**PREMIUM**

**BOOKMARK THIS PAGE**

🔖

**1**

**SHARE**

f 🐦 g+

in 💬 ✉

**FOLLOW US**

f 🐦 g+

After being selected as one of the members of the Rockefeller Foundation's Resilient Cities program in May, Jakarta is working to live up to the program goals, an official said.

"We hope all stakeholders, including communities, academicians and the government, can work together to realize the concept," Jakarta's assistant the governor for spatial planning and environment ...

vimeo Business
**Collaborate and share securely**

**Guardian Jakarta live**

## $40bn to save Jakarta: the story of the Great Garuda

Forget Venice. The fastest-sinking city is the Indonesian capital, parts of which are dropping at 25cm a year. Can an outlandish plan for a giant seawall and luxury waterworld city in the shape of a mythical bird save Jakarta from drowning?

**by Philip Sherwell**

With her hand stretched upward, the elderly storekeeper in batik dress and white headscarf indicates the height of the waters that poured into her home in Jakarta's great flood of 2007. Sukaesih is a diminutive figure, but she points to a ridge on the doorframe about two metres above the threshold.

The 60-year-old grandmother, who like many Indonesians goes by only one name, lives in the down-at-heel waterfront neighbourhood of Muara Baru. Her front room-turned-store, where she sells soft drinks and the clove *kretek* cigarettes beloved of locals, looks unassuming, but is at ground zero for the city's battle for survival.

Just across the alleyway is the stone seawall that was reinforced and heightened after 2007, but is already cracking, buckling and leaking. The fortification is all

*Several resilient action and practice in Jakarta are working on different focus and approaches*
*source: (Jakartaa Post, the Guardians)*

SOCIAL (PEOPLE)



ENVIRONMENT
(PLANET)

ECONOMY
(PROSPERITY)
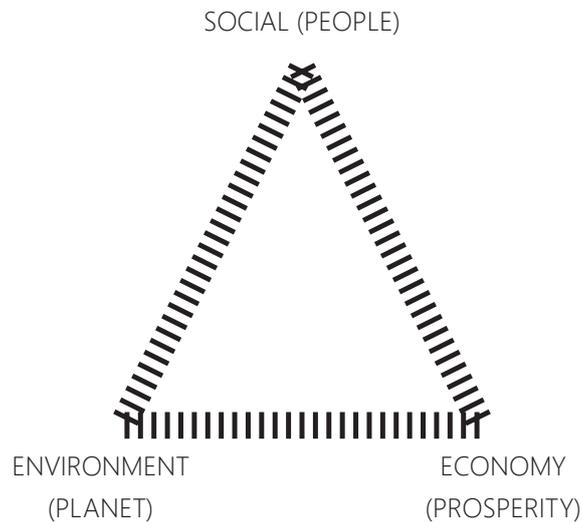
*Sustainable triangle and its three pillars. Both sustainability
and resilience engage multi-scalar dimension that
elaborating two of them is necessary, rather than focusing
only in one subject.*
*source: author*

## Context-Based Problem

*Resilience and Its Practicality*

A critical remark on understanding resilience is the way
it is defined as operational tools. As (Klein, Nicholls, &
Thomalla, 2003) described, '*The problem with resilience
is the multitude of different definitions and turning any of
them into operational tools'*. Some experts from different
background have stated the different definition which
then leads to complicated understanding of how to
apply this term into the practice. Moreover, the broad-
general definition makes it even hard to be applied in
the local context, where sometimes the community is
vulnerable in the first place. There is always missing
line between the decision maker and the actor who will
apply the system.

Furthermore, the relationship between resilience and
sustainability is sometimes unclear. In many cases, those
two terms are working as two-separated dichotomy
which at the end reducing the value of the process.
However, the embedded concept of sustainability
which engages three theoretical dimensions; social,
environmental, and economic, is closely related to the
way resilience is defined as a process. Both resilience and
sustainability are working on the dynamic environment
in which various factors necessarily influence states of
equilibrium or the stability of the system

*Identified Clash of Rationalities*

In general, a clash or conflict of rationalities has been
defined in several works of literature as the interaction
between technocratic and marketized system of
governance and informal dimension of marginal
community (Vanessa, 2009). Different nature of those
dimensions often creates complex dialogue between
the actor that resulted in unproductive solution to the
problems.

In recent situation, flooding as one of the most
problematic issues in Jakarta has been acknowledged
with different understanding by the stakeholders in
the city. Government as the actor of policy-making has
exercised its rationalities in terms of mitigating flooding.
These rationalities are characterized by a regular-formal
presentation of the system in the built environment
suggesting a high performance of engineering-technical
infrastructure network. The more efficient the system,
the more it is considered workable. Consequently, it
sometimes fails to accommodate dynamic nature of the
environment which can be found in socio-economic
dimension.

On the other hand, another actor in this environment which is the inhabitant also performs their rationalities in facing the disaster, especially flooding. Living in vulnerable place, they try to adapt to flooding while at the same time run their social network and economic business in the neighborhood. The aspect of socio-economic has been the most important property for the inhabitants of the kampung, with no exception is Bukit Duri. The rationalities of keeping socio-economic structure have influenced the way the inhabitants adapt to flooding. For instance, as a valuable property for their business, some of the inhabitant of Bukit Duri has put their production space on the second level.

A clash of rationalities has often made a complex dialogue between the government, as the top-level actor and the inhabitant, as the bottom-grassrootss actor. In Bukit Duri, this clash has happened several times, evidenced by massive turmoil at the time of eviction of some households. The eviction itself is a part of the program of river Ciliwung normalization, initiated by the provincial government which explicitly running as a top-down approach with a lack of participation from the inhabitants.

## POSITIONING

*Existing top-down intervention*

In general, different actions to deal with flooding in Jakarta has been made by the government, not only in small context but also in broader scale. In the last ten years, a mega project called National Capital Integrated Coastal Development (NCICD) has come as one of the main action to deal with the environmental issues in Jakarta, including a proposal to build Giant Sea Wall in north Jakarta coastline (Jarvie, Sutarto, & Asmara, 2013). This project mainly focuses on remediating the polluted coastline and building protection from the sea which is used to reduce flood prone within the city. Despite huge investment in this project, there is only a few (if any) intervention made on the micro level. The area in which vulnerable to disaster, such as slum settlements are still undercounted.

Not only in the environmental dimension, this project also accommodates the need for the city to develop and gain economic capital. However, its sensitive background of the project is still arising controversy in society. The basic reason for the project is still debatable whether it is necessary for the better environment or only for accommodating private interest (Sherwell, 2016). Moreover, the unclear feasibility study has been seen as a disreputable mark for the project.

There are also other implementations of the top-down environmental program as it has been listed below:

| POLICY | ACTIONS | RESPONSIBLE |
|---|---|---|
| Jakarta Urgent Flood Mitigation Project | Dredging & rehabilitation of selected key floodwas, canals and retention basins<br>Technical assitance for project management, engineering design reviews, contructor supervision, engineers for dredging & rehabilitation works & tech. assitance for implementation; resettlement policy framework, resettlement plan, grievance redress system | Ministry of Finance |
| Masterplan for Comprehensive River Water Management Plan in Jabodetabek | (technical cooperation project)<br>Promoting the capacity building of organizations related to flood control project<br>Institutional capabilities for flood mitigation in JABODETABEK | Ministry of Publik Work; Ministry of Water and Irrigation; Ciliwung Cisadane River Basin Develpment Project |
| JABODETABEK Metropolitan Priority Area Strategic Plan | Target Indicator: mass transport, road networks, ports, airports, urban development, industrial areas, water supply, sewage system, waste management system, flood management system, electrical power institute<br>Future concept and vision of MPA<br>Concrete Image and infrastructure development plan of the MPA<br>Framework for private sector participation | Ministry of Economic Affairs |
| DKI Jakarta Spatial Plan 2030 | (PROVINCIAL LEVEL)<br>Identify Strategic Area of Env. Intervention : Ciliwung River and its Alongside<br>Rearrangement of canal and river corridor, including the land acquisition;<br>River normalization: provide inspection road, building reorientation towards the river;<br>Waste disposal control into the river;<br>Redevelopment of river and canal embankment fir green areas & flood buffer;<br>Improvement of space utilization control along the canal and river through law enforcement<br>Incrareasing community participation in corridor management of canal and river through economic empowerment, provision of infrastructure & facilities | Development Planning Agency |
| Medium-Term Regional Development Plan DKI Jakarta | **Public Works Affairs:** Doing Land acquisition and preparation of LARAP to support setup the capacity of Ciliwung River;<br>Carrying out water diversion path along the river ciliwung up west / east canal;<br>**Ministry of Public Housing**: rearrangement of the village along the Ciliwung river | Development Planning Agency; Ministry of Public Work |
| Ciliwung River Normalization | **Provincial Government of DKI Jakarta**: land acquisition;<br>flood water diversion path;<br>provding water pump and public bathroom;<br>restore the river width to 35-50 meters | Ministry of Publik Work; Miistry of Public Housing; Provincial Government of DKI Jakarta; Ciliwung Cisadane River Basin Develpment Project |

*Several actions has been made to manage flooding*
*source: (Jakarta Spatial Plan 2030, JUFMD document)*

The critique towards those programs is mostly focusing on the interconnection of each program to another. Despite the enormity of the investment for each program, the significance of the program is still questionable. Every program is going partial and the impact is fragmented.

| POLICY | TIMEFRAME | BUDGET | STATUS |
|---|---|---|---|
| Jakarta Urgent Flood Mitigation Project | 17 January 2012-28 Februari 2019 | WORLD BANK | Active (latest: dredging West Flood canal and upper Sunter Areas |
| Masterplan for Comprehensive River Water Management Plan in Jabodetabek | February 2007-March 2010 | JICA ( Japan International Cooperation Agency) | the study: Urgent Study of Flood Damage in jabodetabek was established in 2002; JICA dispatched a study team from Sep 11-Oct 25, 2005; Preliminary Study: Feb 2006 Implementation: March 2006 Evaluation: Sep 27-Oct 10, 2009 |
| JABODETABEK Metropolitan Priority Area Strategic Plan | June 2011-June 2012 | JICA ( Japan International Cooperation Agency) | in relation with Ciliwung; it has been mentioned in the aspect of water supply; 50% of the people in DKI are being served water by PDAM (state-owned drinking water company); the people not served by PDAM rely on unsafe water source: shallow well and stream (river) |
| DKI Jakarta Spatial Plan 2030 | 2012-2030 | DKI Jakarta Regional Revenue and Expenditure Budget | Generic legal document |
| Medium-Term Regional Development Plan DKI Jakarta | 2013-2017 | DKI Jakarta Regional Revenue and Expenditure Budget | Derived document from DKI Jakarta Spatial Plan 2030 and Long-term Regional Development Plan DKI Jakarta |
| Ciliwung River Normalization | 2012-2015 | DKI Jakarta Regional Revenue and Expenditure Budget | Derived document from DKI Jakarta Spatial Plan 2030 location: T.B SImatupang Bridge-Manggarai floodgate |

*Citizens demonstrate rejection to recent eviction which has been done as part of river normalization*
*source: www.republika.co.id*

In terms of informal settlement, there was also government project which tried to control and manage the issue through Kampung Improvement Program (KIP) which first started in 1969 (Juliman, 2006). In a collaboration with World Bank, this program was considered an alternative to upgrading the settlement. Focusing on the basic services, such as road, water, drainage, and health and education facilities, this program has been seen as promising action and found its popularity in the 1970s. However, it remains struggling to be settled on the detail since there was very little support in the smallest unit which is the household. Very few interventions are shown inside the house and it left the inhabitants to live in poor condition, without proper ventilation and lighting.

Even though it had a good record as innovate program, KIP could not sustain the scheme and eventually stopped in the 2000s. The inherit program has been proposed at a provincial level under the name of Sub-District Society Empowering Program (PPMK) yet it still cannot solve the problem (Juliman, 2006).

As a conclusion, a lot of actions has existed to improve the quality of life in Jakarta, not only in terms of the environmental aspect and infrastructure upgrading but also capital empowerment. However, most of the action has been made with a lack of participation of the local inhabitant, which sometimes causes misunderstandings and miscoordinations during the process. The top-down approach made by authority is sometimes formed as one-way approach and it suggests more authoritarian nature of governance.

*Moving from the bottom*

Recently, the informal settlement in Jakarta, especially Bukit Duri has been backed sporadically by local initiatives, such as Ciliwung Merdeka (Free Ciliwung), a self-help neighborhood forum which is voluntarily supported by activist, researcher, architect, and planner. This forum mainly aims to assist the inhabitants which are living along Ciliwung River to get their rights as well as empowering them to live more sustainable and independent. By organizing local event and courses, Ciliwung Merdeka is trying to engage the inhabitants in upgrading the livelihood especially by increasing human capital and social capital.

*In a more local context, there has been a proposal to create more livable environment initated by Ciliwung Merdeka by introducing 'kampung susun' (elevated kampong)*
*source: ciliwungmerdeka.org*

One remarkable action from Ciliwung Merdeka is the proposal of Kampung Susun Manusiawi Bukit Duri (Bukit Duri Elevated Kampong) which is a form of participative action to build more proper living environment while also trying to deal with flooding issue (Suryani, 2016). Assisted by architect and planner, the inhabitants of Bukit Duri are invited to propose a design based on their need and knowledge of their neighborhood. This participatory scheme has been appreciated by the inhabitants and furthermore has been proposed to the government. However, this program has failed to get support from the government and still yet to be realized.

To summarize, the actions made by local initiatives, especially Ciliwung Merdeka, has suggested more participative approach to engage the local inhabitants, yet there is still a lot of work to do to involve in the broader level of bureaucracy to get more attention from the government.

*Positioning: bridging the top level, and bottom level*

Both top-down and bottom-up approach is considerably essential to tackle the problems that are happening in Jakarta and specifically in the kampung, Bukit Duri. The existing issue of the application of those approaches is a disconnection between top level and bottom level which then makes a gap in the process. Therefore, a translation tool is needed to derive the generic objectives from the top while also to provide context-based framework for the local scale (bottom level) intervention.

In conclusion, there is still an ongoing issue about informal settlement, especially Bukit Duri and its vulnerability to flooding. By considering the challenge of climate change and natural hazards, the improvement of the neighborhood needs to be addressed systematically to build resilience and sustainability. This project is trying to propose not only the physical intervention but also improvement of social capital, economic capital and human capital by using both top-down and bottom-up approach.

source: m.viva.co.id

SOCIO-ECONOMIC

- Low state of capital
- High Vulnerability to Poverty
- Slow recovery against disaster

SPATIAL

- Lack of basic infrastructure
- High exposure to disaster
- Minimum support of flood infrastructure
- Minimum legal enforcement of the property

INSTITUTIONAL

- Lack of translation tool
- Non-transparant planning process
- Pragmatic problem-solving approach
- Lack of participatory approach

*The problems field are divided into 3 (three) main aspects:*
*socio-economic, spatial and institutional.*
*source: author*

## PROBLEM STATEMENT

Bukit Duri as one of the informal settlement in Jakarta has been exposed by flooding almost every year. The vulnerable and fragile living condition is composed by socio-spatial problem which then leads to high magnitude of disaster impact to the neighborhood. Its limited access to economic capital also brings the inhabitants close to poverty once they are exposed to flooding. Yet, very few approaches have been introduced by the government to address resilience and sustainability within the informal settlement, especially in Bukit Duri. The pragmatic and technical solution often used as the only option which tends to neglect the existing socio-economic dimension within the community. The poor operational approach is considered a huge deficiency in many resilience programs which leads to the unsustainable process. Furthermore, top-down planning approach usually performs as a generic action in slum upgrading which is difficult to be executed at the micro level.

## GOALS

Based on the problem, there are several goals which are highlighted in this project:

- Inclusive planning system of resilience-to-flooding: inclusiveness of the system suggests more engagement between decision maker and local actor which then effectively intensify the process and action in such a context. This also implies more distribution of knowledge into different level which can be a platform for further development in the future.

- Improvement of infrastructure performance within the neighborhood: the provision of infrastructure defines the quality of the livelihood while also protect the inhabitants from destructive magnitude of flooding (disaster).

- Improvement of spatial quality of the neighborhood: the spatial aspect of livelihood suggests a better quality of life which can establish more sense of belonging to space. Space, in this case, is considered important to support more resilient and sustainable community.

## RESEARCH QUESTION

*tools*                    *method*

How can **inclusive planning strategy** *promote* **multi-state resilience-to-flooding** *to create* more **livable and sustainable thriving community** *in the* **informal settlement**?

Case: Bukit Duri, Jakarta            *goals*                    *context*

## SUB-RESEARCH QUESTION

What is the basic properties of informal settlement of Bukit Duri which define livelihood of the neighborhood?

What is the livability and sustainability properties of Bukit Duri which can generate resilience to flooding?

What is the existing fabric and infrastructure feature in Bukit Duri which can be a platform to create resilience of the neighborhood?

What is the proposition of informal settlement of Bukit Duri in the formal system in terms of generating inclusiveness of the planning process?

## RELEVANCE

*Societal:*

Urban growth in Jakarta is still showing an increasing trend. Meanwhile, the exposure of climate change which highly affects the built environment is also considered as the main threat to the city. Land subsidence, increasing flood-prone area, lack of groundwater and the other environmental problem has forced the government to take a more strategic planning approach to prevent a disastrous event.

The government's proposal to manage the issue has often been resisted by the citizen which are questioning the sustainability of the proposal. In the case of informal settlement, many proposals have been seen as a sensitive action which sometimes is related to eviction and displacement. The unsuccessful result of the several prior actions has been considered as discouraging mark for the similar proposal. In terms of the process,

the decided proposal is not fully supported by the inhabitants since it is not engaging and they do not feel participated in the process. The implementation of the action is often only one-way delivery which then very difficult to find its feasible result.

To initiate more improvement in multi-layer aspect, there should be a collaborative and participative process in operating the program which needs huge attention from the government, private sector and the inhabitants by all means.

one small step for
a better future

*Scientific:*

The discourse of informal settlement in Global South especially in Indonesia has been ongoing for decades. However, concerning its relation with external force, such as climate change, and disaster risk, the evidence shows only measly outcome. Furthermore, application of the knowledge barely exists in many projects. Different political perspective from the actors often influences the process of adopting resilience, and sustainability in their projects.

This project is focusing on the void where there is the disconnection between the decision maker and the actor who will implement the program. From the institutional perspective, there is a huge importance on how to use scientific research in the way of proposing regulation. Therefore, collaborative process between research, regulation, and project action need to be enhanced since the very beginning phase until the end. Since it deals with the complex environment, a phase of reassessment and evaluation is also important in which it needs more supportive assistance from every stakeholder.

A generic definition of resilience and sustainability need to be tested on the micro level to lift the value of locality and territoriality in a specific context of the informal settlement. Bukit Duri as the proposed case could be a pilot project and by all means, it can be adopted in many similar contexts in Jakarta or in other Global South cities which are experiencing comparable issues. A contribution to the discourse will not only in a frame of theory but also as a practice.

## AIM OF THE RESEARCH

Aiming the critical complexity of resilience in the informal settlement, this project is proposing a strategic framework which could be used to define goals and objectives for further actions. This strategic framework is composed of the strategy and vision of spatial and infrastructure quality in Bukit Duri. Further development of the strategy and vision will also include a recommendation for policy and regulation making. The main objectives of defining multi-state resilience and sustainability will be translated into multi-layer superimpose and scenario development. Moreover, a time-basis plan will also be proposed to determine the action and its following evaluation and reassessment. All those outcomes will contribute to the state of resilience Bukit Duri neighborhood which also unfolds inclusiveness and sustainability of its inhabitants.

To proceed with the objectives, there are some attributes which need to be addressed for each sub-research question:

Identification of informal character and properties in Bukit Duri to define the livelihood quality of the inhabitant.

Diagnosis of built environment in the relation to living condition and the relationship of the people to the water (Ciliwung River). This is also highly correlated to the first objectives which analyze the production of space and its relation to the activity of inhabitants.

Identification of the morphology and structure of the neighborhood which supports the livelihood in daily basis as well as supporting the system of mitigation and recovery. It includes the quality and provision of basic infrastructure and moreover the flood-infrastructure.

Identification of proposition of governance model and stakeholder collaboration model within the frame of the resilience-to-flooding system. This also includes the scheme of land tenure, land ownership, and business model for the improvement of the neighborhood towards more sustainable and resilient community. In addition, there is also an identification of existing resilience program and the post-disastrous program made by the government and also initiatives taken by local actors, such as NGO and the inhabitants itself.

## METHODOLOGY

Methods that are used in the project are structured within the methodology and classified in two different frameworks, theoretical framework and spatial framework. During the working process, those two frameworks are interrelated and used in reciprocal relation.

## THEORETICAL FRAMEWORK

This framework consists of different basis theory which is the theory of:

- Flood-risk governance

- Resilience system

- Spatial production in Kampung (informal settlement)

All those theories are used as a platform to shape the direction of the project and also to determine and assess the factual condition in Bukit Duri in more scientific way.

In more specific, the theoretical framework is also constructed in the specific case of Bukit Duri and its related case study. The framework includes not only theory but also a practice which can be learned from the similar context in Indonesia, or in Global South countries in general.

*Analytical Framework*

The analytical layer which are used on this research basically developed from the need of answering the sub-research question while also combining the findings from theoretical study. The layers are:

- History layer: this layer mainly focuses on the time-based development of Bukit Duri from its early emergence until recent situation. The development of Bukit Duri will be later explained from various aspect: spatial, economic, and environmental. Moreover, this layer also explains the remark of flooding disaster time by time which shows vulnerability of some areas within the neighborhood.

- Governance system layer: this layer is focusing on the production of policy and its implementation throughout multiple scale, from regional to local scale. In regards of this, the nature of policy production in different territory will be taken into consideration in the way it influences the localized application and implementation.

- Landform and Infrastructure layer: this layer is elaborated by studying formation of informal settlement in Jakarta, especially the settlements occupying land along Ciliwung River. Moreover, specific categorization of informal settlement will be introduced on this layer by adapting the explanation of Ford's kampung typology (Ford, 1993). The infrastructure quality will be also explained in relation to historical and governance layer.

**P1**

Personal Motivation

Problem Statement

Current Issue Scientific Relevance

Problem Analysis

- Inadequate Socio-spatial Quality
- Inappropriate Derivate Form of Resilience in Local Scale
- Spatial Vulnerability
- Frequent Flood (natural disaster)
- Infrastructure Lacking

Problem Statement

Research Question

Sub-Research Question
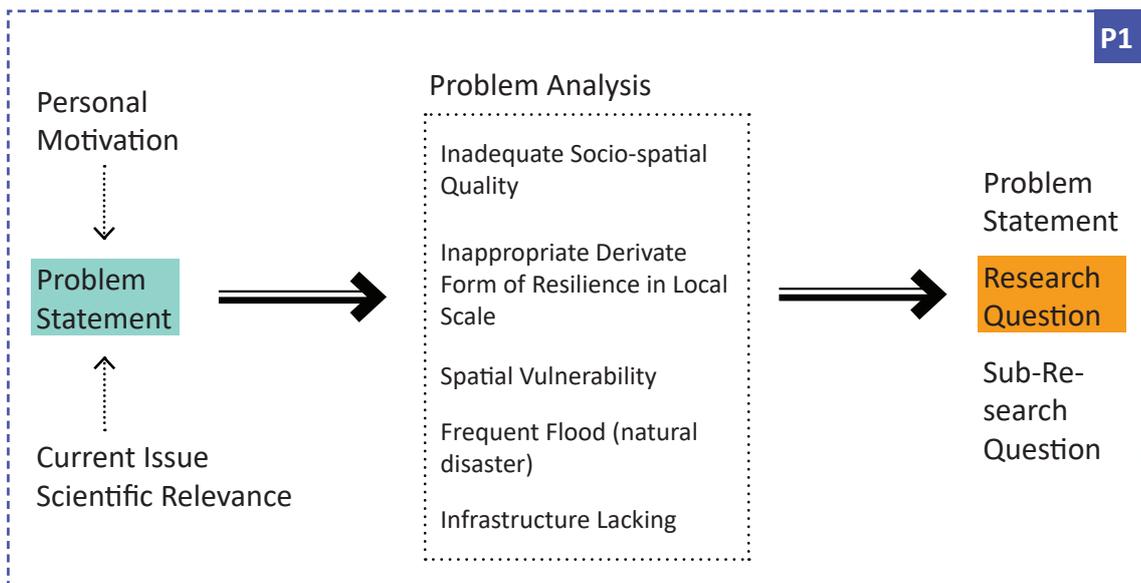
**SRQ1** *Which is the basic properties of informal settlement of Bukit Duri which define livelihood of the neighborhood?*

**SRQ2** *What is the livability and sustainability properties of Bukit Duri which can generate resilience to flooding?*

**SRQ3** *What is the existing urban fabric and infrastructure feature in Bukit Duri which can be a platform to create resilient community?*

**SRQ4** *What is the proposition of informal settlement in the formal system in terms of generating inclusiveness of the planning process?*

*Diagramatic scheme of methods and outputs in the relation to problem fields, research question and objectives*
*source: author*

**P2**

**SRQ1**

**Theoretical Framework**

- Resilience System
- Flood-Risk Governance
- Kampung: Informal Settle-ment

*additional layer*

**Analytical Framework**

- Historical layer: general history + flooding history
- Governance System
- Landform + Infrastruc-ture
- Land tenure system
- Socio-economic structure

**SRQ2**

**SRQ3**

**P3**

**Spatial Framework**

*Dupuy Network City Model:*
- Infrastructure network
- Production-Consumption
- Household network

*additional layer (flood-related layer):*
- Governance system
- Geographic Layer

**P4**

**Planning Strategy**

*product*

POLICY RECOMMENDATION

VISION+STRATEGY

**SRQ4**

**P5**

**Design Framework**

*product*

DESIGN PATTERN
*general intervention*

SITE-SPECIFIC INTERVENTION
*design experiment*

**REFLECTION**

additional layer in the Kampung based on (Tunas, 2008)

Land tenure

socio-economic structure

Landform + infrastructure layer

Policy+governance layer

History Layer (general+floding history)
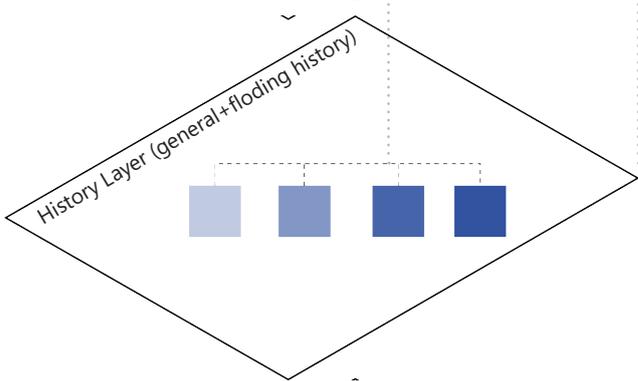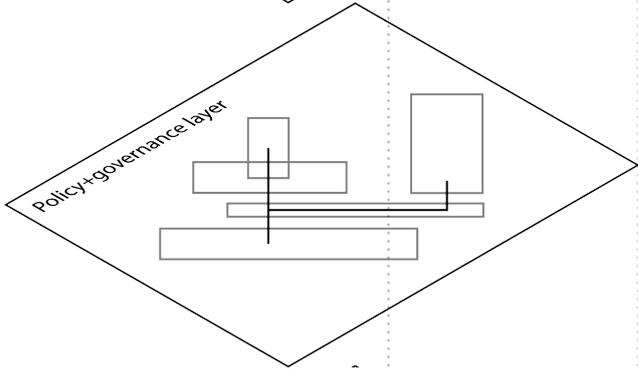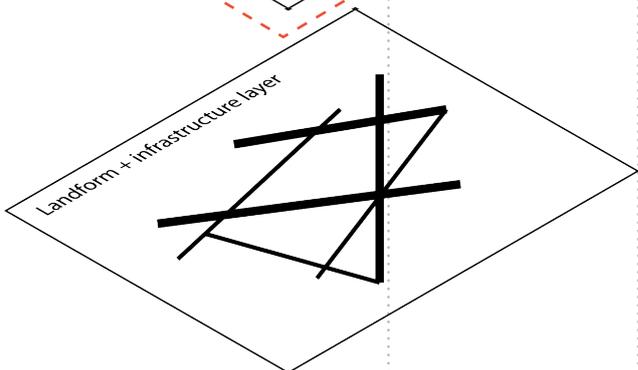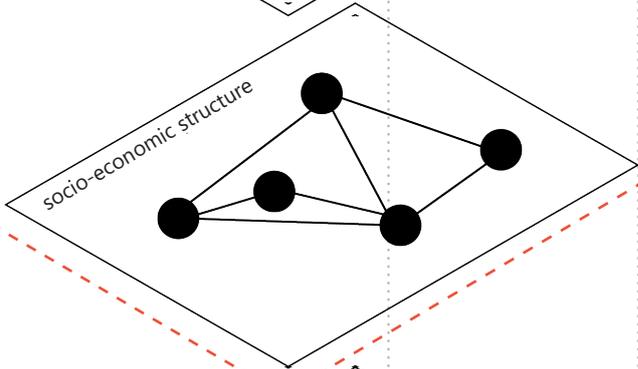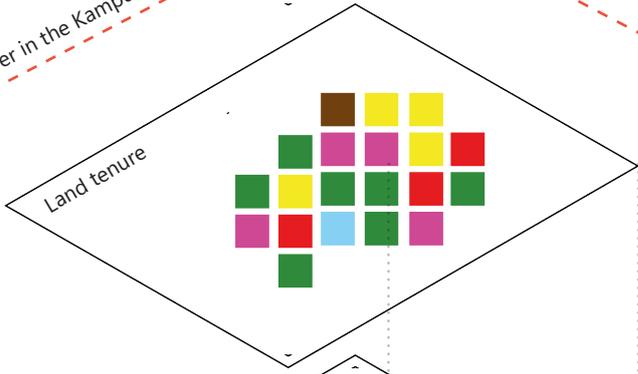
*The multiple layer of analytic framework of the project*
*source: author*

In addition to above mentioned layer, there are two other layers which mainly focusing on particular issues in informal settlement, specifically in the kampung. These two layers are derived from the research of Devisari Tunas, *The Spatial Economy in the Urban Informal Settlement* (D. Tunas, 2008):

- Land Tenure layer: this layer tries to define the complexity and peculiarity of tenure system in the neighborhood which influences the production of space and the degree of vulnerability to disaster.

- Socio-economic structure: this layer specifically identifies local system of social network and flow of information which also influences initiation of particular formal-informal local business enterprises.

All those layers above are mainly explained on specific analytical chapter which then produce summarized input for the design.

*Spatial Framework*

On this framework, the spatial framework is also used to describe the spatial analysis and its properties. Basically, the layer of the spatial framework are adapted from the layer of Dupuy Network City Model (Gariépy, 2009) which are:

- Level-one operator: Infrastructure network

- Level-two operator: Production-consumption

- Level-three operator: Household network

In addition, two other layers are also introduced to relate closely the issue of flooding. Those layers are:

- Governance system

- Geographic layer

All those layers are coherently used to assess the resilience and sustainability level of the fabric and more particularly the community of Bukit Duri.
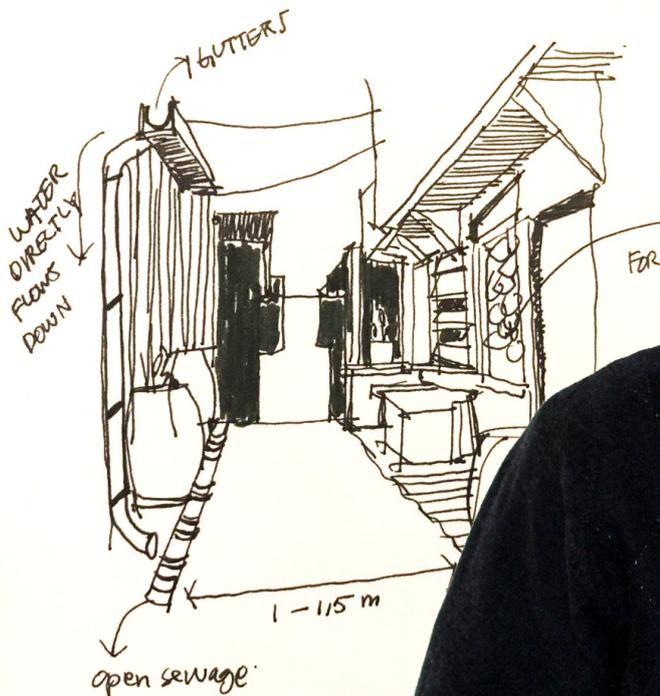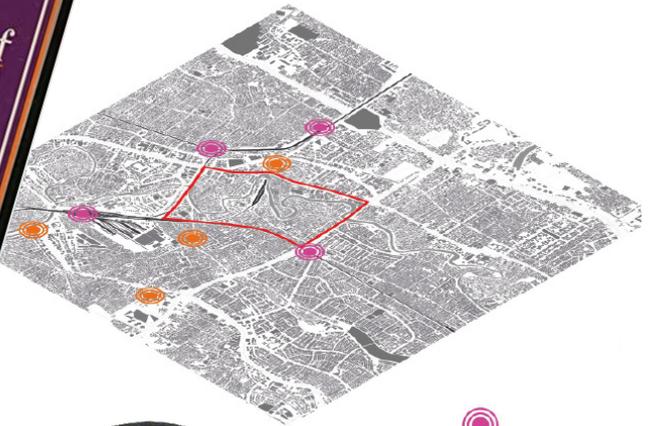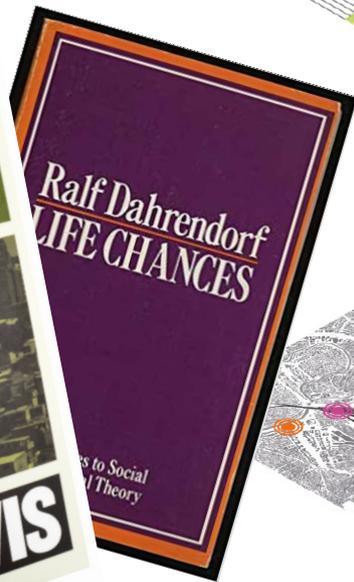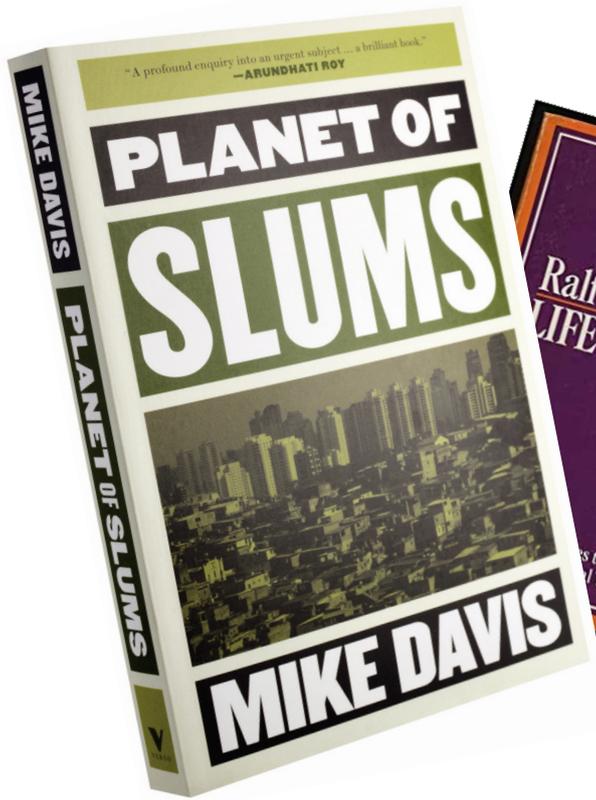
*Tools*

To address the research, tools for the project are determined as it has been listed below:

- Layer mapping analysis: this tool mainly aims to identify various analytical and spatial layer to define specific issues or problems.

- Interview: to capture the ideas and issues, the interview is focusing on the local actor which are the leader of sub-district, leader of neighborhood as well as the local entrepreneur. Moreover, interview is also made with the government institutions which have responsibility to particular program related to flooding and informal settlement.

- Literature Research: this tool provides background argument and direction of specific subject and intervention, for instance kampung improvement, flood governance, and resilience system. Moreover, this tool helps to reflect the research and design proposal into the ongoing discourse and practice.

- Spatial abstraction: sketches and portraits of the site are made to illustrate the existing remarks of the neighborhood but also to find the pattern of the livelihood, especially during field observation. This aims to recognize the basic properties that exist while also laying out the feature for further intervention.

- Spatial Analysis: in particular, spatial analysis aims to recognize the pattern and connection between the structure in the neighborhood. Space Syntax analysis will be used as a starting point to locate the area, not only in the small scale but also in broader scale.

- Policy matrix: the relation of the policy is mapped on a diagram of strength and attractiveness. The aims of the matrix are to recognize the dependency or interdependency of the action while also acknowledge the nature of the system.

- Scenario Development: the possible scenario of development is elaborated into the time-frame. The development of the scenario aims to recognize the alternative of state which is not only limited to singular direction but also multiple possibilities.

- Actor Analysis: the analysis of actor or stakeholder determines the direction of development; therefore, this tool is enhanced to identify the existing involvement of the stakeholder while also proposing more collaborative scheme.
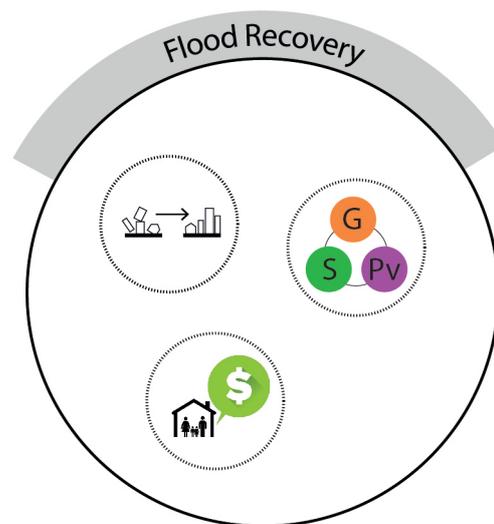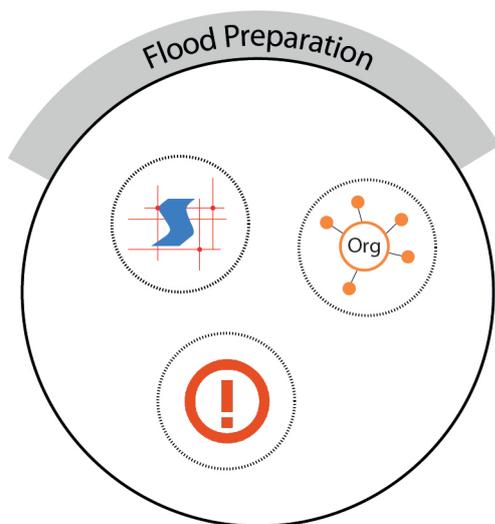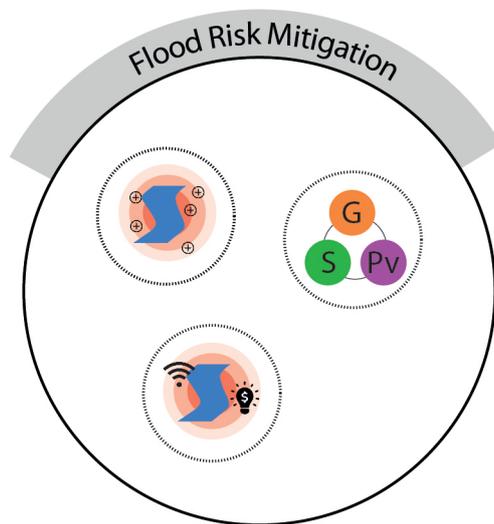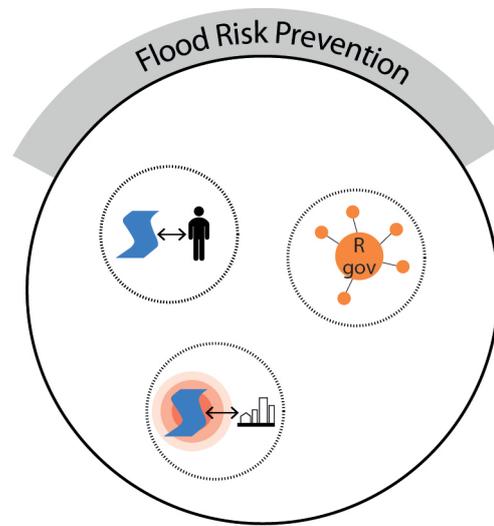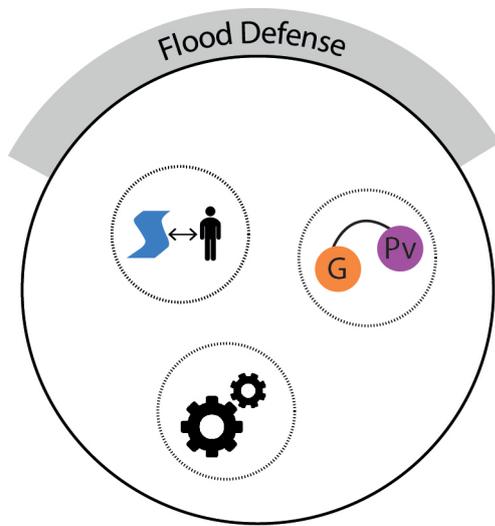
*Flood risk governance approach in different typical character*
*(source:author)*

## Theoretical framework

*Various Character of Flood-risk Governance*

To distinguish the character of flooding governance, there are several properties that need to be considered as assessment criteria. The context of this project highly related to bigger frame of flooding governance not only in Jakarta Provincial area but also the regional governance. Therefore, identification of the nature of each territorial governance will influence adaptation of policy. Flood-risk governance is introduced on this project to construct the whole story of design thinking.

The subject of flood governance has been adopted in many research and project throughout the world. The most common explanation of identifying typology of flood governance can be found on Flood Risk Management Strategies (Hegger et al., 2014) as it is listed below:

In the way to adopting those different characters there should be first an identification of existing properties of the context while also addressed requirement for future development. In many cases, few examples are that are indicating implementation of all those strategies in a single context. There is usually one specific character emerges in the implementation of flood-risk strategy. However, this project is trying to identify the context by using the frame of above-mentioned flood-risk governance strategy while at the same time is trying to propose adaptation in local context.

| Strategy | Actor | Measures | Range of Work | Character |
|----------|-------|----------|---------------|-----------|
| Flood risk prevention | Regional government | Discourage development in flood-prone | Building outside the flood-prone; limiting exposure to people/property | Keeping away people from water |
| Flood defense | Government, private parties | Structural measures | Infrastructure work; increasing capacity | Keeping away people from water |
| Flood risk mitigation | Citizens, developers, public-private | Smart design in flood-prone area | Building support inside vulnerable area; | Retain/store the water inside flood-prone area |
| Flood preparation | Governmental organization | Preparing flood event | flood warning system; disaster management; evacuation plan | Managing flood occurrence |
| Flood recovery | Government, citizen, companies | Fast recovery | Reconstruction plan; compensation/insurance | Managing after-disaster event |
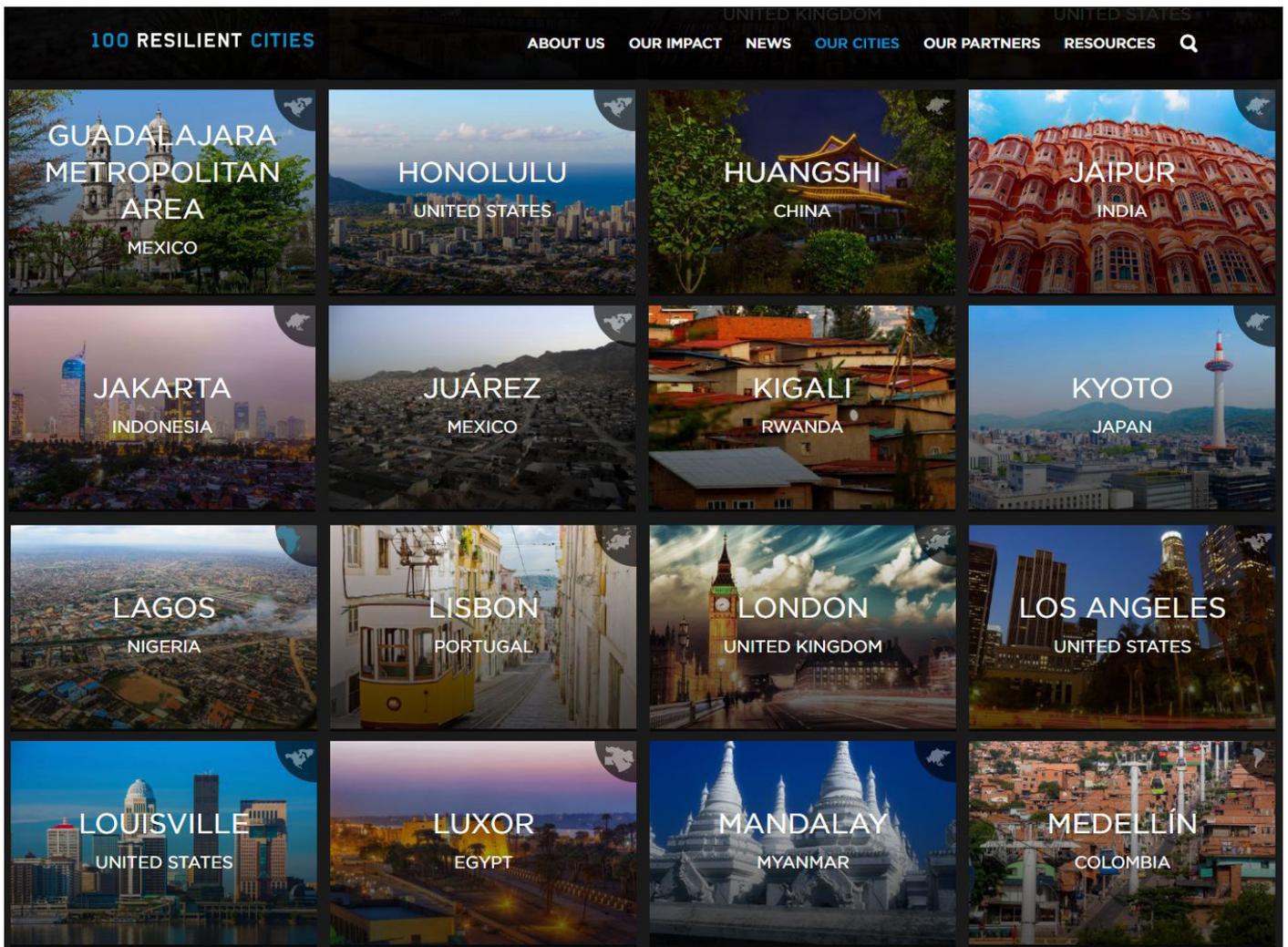
*Jakarta is one among 100 cities that adopt the resilience approach in city development*
*(source: 100resilientcities.org)*

*An Intricate Notion of Resilience*

Widely spread as a common term, resilience has been found as difficult operative approach in the way it is adopted in built environment. In certain ways, the generic meaning of resilience does not have a concrete form which then needs a derivative understanding. To apply in specific project, one needs to make working definition to see detailed properties in environment. However, its flexible definition also provides opportunity to the user to apply in contextual way. (Brand & Jax, 2007) in (Meerow, Newell, & Stults, 2015) described, 'the meaning of resilience is malleable, allowing stakeholders to come together around a common terminology without requiring them to necessarily agree on an exact definition'. This can be promising, yet, without any limitation, it also leads to opportunistic way of thinking.

Generally, the properties of resilience can be stated in a form of persistence, transition, and transformation. Those three pillars of resilience can be described as a process, rather than an output. Thus, defining resilience is always about dealing with dynamic and forceful environment. Its dynamic character of resilience needs to be assessed in multi-scalar layer and in multiple times. In terms of assessment, the reference state need to be described at the first time as a remark for the outcome. This reference state is highly related to the way resilience describe a desirable state in the future.

Practically, the notion of desirable state is also arguable, allowing different definition to be involved. Its working definition is highly exposed to the interest of the user or the stakeholder which then leads to complicated validation of the system. The desirable state closely defined as a common norm which the society will widely accept. Therefore, its practical dimension is becoming even more difficult. (Liao, 2012) described the critical understanding of desirable state as, '*Because the boundary of desirable regime is socially constructed, expanding it involves redefining the norm—society needs to accept necessary changes in the form and intensity of socioeconomic activities ... *'. Since it covers multiple layers of the environment, understanding resilience is also about defining sustainability, which the three pillars: social (people), environment (planet), and economy (prosperity) are embedded.
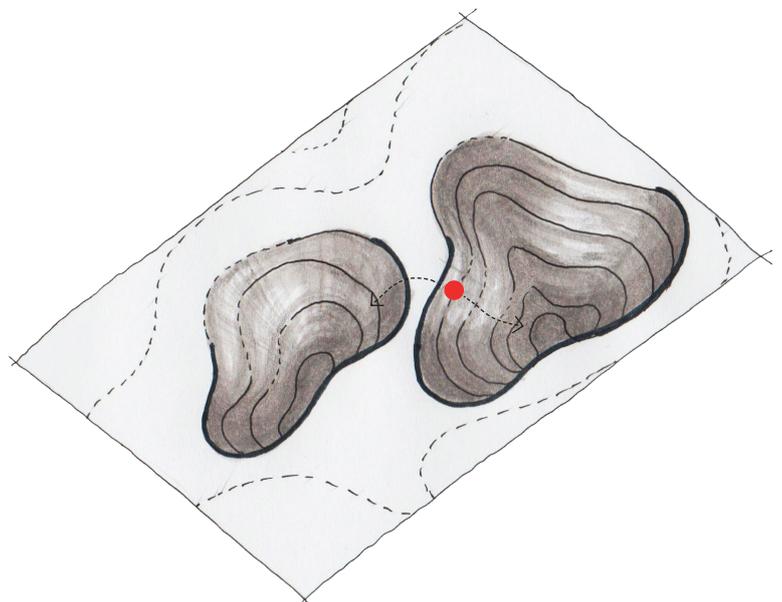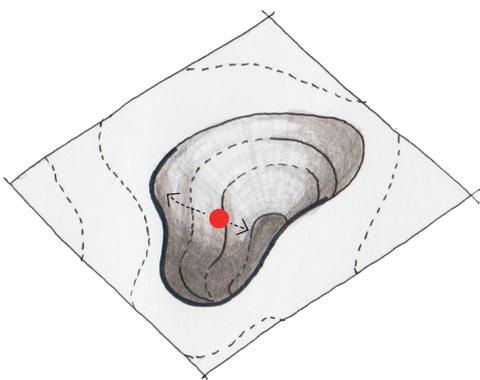
*Single-state and multi-state equilibrium can be illustrated as two different cluster of basin. The red-dot represent the state in which it can move within the basin until it is settled on the bottom (equilibrium). In multi-state equilibrium, there are more than one basin of atttraction, which the dot (state) can move around those basins and not bounded in only basin of attraction.*
*source: author*

## Dichotomy of Resilience

In general, there are two approaches to define resilience, engineering resilience and ecological resilience. Those two terms widely used to determine the form of resilience system in many programs. The first approach encompasses recovery and restoration as the key driver, as it was stated by (Wang & Blackmore, 2009) in (Liao, 2012) as, '… *concerned with disturbances that threaten the functional stability of engineering systems, which are often linked with low probabilities of failures or, in the case of failure, quick recovery to normal levels of functionality*'. Its measurement of engineering resilience is mostly referred to resistance to the disaster and recovery from disaster. The state of engineering resilience generally described as a desirable single-state which refers to the previous stability.

Meanwhile, the ecological resilience provides more encouraging description of the desirable state. This state of resilience covers a wider direction on defining the desirable state. (Liao, 2012) explained the remark, '…*any fluctuation within the regime is normal because systems are inherently dynamic.*' Its capability to accommodate dynamic system is more applicable in such a complex environment, such as slum settlement. Moreover, compared to engineering resilience, the ecological resilience provides access to enhance the relation between people and the environment. (Berkes, 2007) in (Liao, 2012) explained, '*Recovery is often interpreted as returning to pre-disaster condition, implicitly assuming an optimal reference state, which nevertheless does not exist in coupled human-nature*'.

In the end, both engineering resilience and ecological resilience approaches can be adapted in every context depends on the need and requirement. In fact, the possibility of combining those two approaches is also possible in certain extent. Considering the existing condition and future necessity of the context (site), this project is trying to see the possibility of the combination of engineering resilience and ecological resilience approaches.

## The Role of Social Resilience

Identification of social structure in several cases has been an essential part of the research process. The performance of resilience highly relies on the way the inhabitants of the community perceive the system as a part of their life. Therefore, social resilience as one of the sub-subject of resilience framework is related to the local social network and culture which shares authentic local knowledge of the community.

(Adger, 2000) in (keck & Sakdapolrak, 2013) determined social resilience as the capability of inhabitants of community to respond to any external disturbance which affects their local social infrastructure. As it cooperates specifically with specific-localized properties of the network, basic understanding of the system is necessary before furthermore making any interventions. Initial research, for instance, social mapping, will more likely grasp the knowledge that the community has shared through time which determines their way of thinking of the new ideas and solution.

However, considering its complex understanding of social dimension, there is still a few examples of adaptation of social resilience in practice. The agenda of resilience which is predominantly proposed by government is still slightly elaborating on the subject of social resilience. Therefore, in many cases, additional infrastructure and intervention from the government are sometimes neglected by the inhabitants (user) as it did not necessarily accommodate their actual need.

*Typical situation of kampung (informal settlement) in Bukit Duri*
*(source: medium.com)*

*Informal Settlement and its Vulnerability*

As a result of planning system, an informal settlement has been widely accepted as an embedded part of the city. Especially in post-colonial city, the existence of informal settlement cannot be separated from the socio-cultural and economic change in the different period. (Tunas, 2009) described, *'socio-spatial fragmentation as result of the major economic transformation'*.

The secluded system of informal settlement has been considered as a peculiar case, which sometimes leads to a regularization of the system, in the case of informal settlement, it is mostly about eviction and displacement. Rather than providing solution, the approach is often damaging the existing socio-economic structure.

Furthermore, its peculiar character of informal settlement also influences the complexity of formalizing the system. The regular character of the formal system hardly accommodates the dynamic and complex environment of informal settlement. As (Roy, 2005) stated, '*If informality is a differentiated structure, then formalization can trigger inequality even deeper.*'

Therefore, approaching informal settlement needs a comprehensive understanding of the localities and context feature. Without knowing the local context, any actions will barely touch the root of the problem.

*Urban Kampung, a Local Manifest*

The term kampung (urban kampung) is derived from the term '*kampong*' (kampung) in Malay or Indonesian Bahasa which means traditional villages. The main reason of adoption of this term in urban settlement in Indonesia is because several settlements indicate presence of rural (village) lifestyle within the neighborhood. Considering the diverse demographic entity of the settlement, as a result of massive urbanization, the development of urban kampung is highly recognized for its multicultural assimilation and social negotiation among inhabitants. In the end, this coincidental encounter is resulting a mixed-diverse community in the neighborhood. In fact, some examples even show a strong social and economic structure as it is determined by the common fate and same problems the inhabitants have.

Another significant issue about kampung (informal settlement) is the tenure security which highly influences almost every aspect of livelihood, especially social and economic structure among inhabitants. Borrowing the term of life-chances theory (Dahrendorf, 1979), security of tenure can represent the 'options' that determine further reasoning of action-taking. There is a significant difference between the land-owner which has strong tenure security to the one which cannot represent any legal document of their land. For instance, the inhabitant with stronger security of tenure tends to build more permanent housing structure with proper infrastructure connection which suggests more resilient situation to disaster. On the other hand, more vulnerable living situation has been experienced by the inhabitant with less secured tenure security since they tend to build semi-permanent housing without proper infrastructure connection.

*A defined working framework of this project based on the conclusion of theoretical analysis (source: author)*

Flood Risk Prevention

Flood Preparation

Flood Defense

Flood Risk Mitigation

Engineering Resilience

Ecological Resilience

Social Resilience

Flood Recovery

low degree

high degree

Moreover, security of tenure also influences the process of getting resident attributes which then determines the opportunity to get proper job or business enterprises. This particular subject is considered important to develop further empowerment framework of the kampung. (Devisari Tunas & Peresthu, 2010) also suggest three main aspects of informal settlement empowerment, which are tenure security, informal economies, and social capital. Those three aspects are interlinked and having correlation each other.

*Interrelation between Theoretical Subject*

This project has been developed by framing and linking all those subject of flood-risk governance, resilience system and Kampung (informal settlement). The first subject of flood-risk governance is mainly focusing on the provision of design criteria and intervention. This subject is highly related to the second subject, resilience system, which plays a role as a background approach to this project. Social resilience has been the foremost important part of the framework as it determines the direction and performance of the program and design intervention.

Further development of design assessment is using the argument provided by this subject to value the capacity of resilience of the neighborhood. Moreover, the subject of Kampung (informal settlement) is used to provide a distinctive-contextual layer of neighborhood which support the analytical and spatial framework.
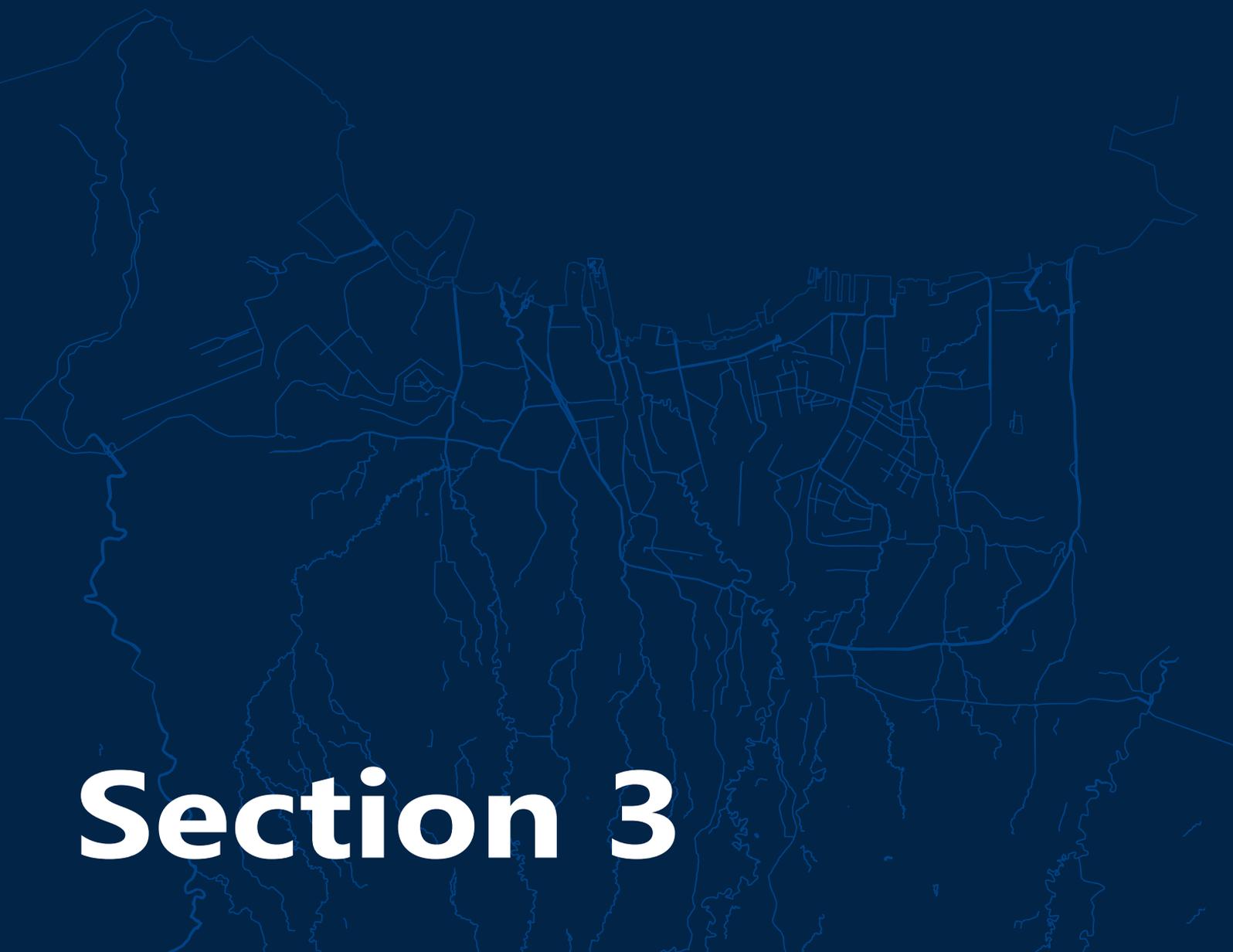
# Section 3

# Analysis

History of Bukit Duri
Governance System
Landform and Infrastructure
Socio-Economic Structure
Land tenure system
Policy Review

Jatinegara (Meester Cornelis) was growing

Jatinegara (Meester Cornelis) trailway was built and operationalized

Batavia city expansion

| 1700s | 1887 | 1894 | 1905 | 1910s | 1970s |

first trace of development in Bukit Duri and Jatinegara

Jatinegara was growing enormously; train station and regional market played important role as development embrio

Bukit Duri was strategically located in a meeting point, where the regional commuter line and regional-local markets come across

Jakarta Spatial Plan 2030
Implementation of strategic areas
2014

Milestone - check point
2018

2017
New government regime
*Evaluation of bottom-up action: Elevated Kampung*
*Evaluation of Normalization Program*

Strategic areas for environment: Ciliwung River
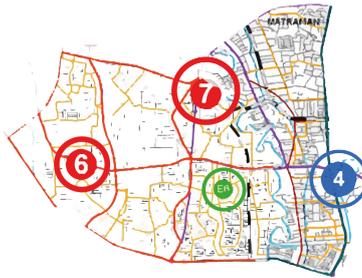
Strategic areas for Economy:
Jatinegara and Manggarai

## History of Bukit Duri

*General History*

Along with extending development of the city of Jakarta, the first existence of Bukit Duri had been first remarked in early 19s century. Recognized as a part of Jatinegara district, this neighborhood had benefitted from surrounding vibrant economic activities, such as Jatinegara market which supports not only local trading but also city-scale and even regional trade activities. As the city of Jakarta developed to the south, Jatinegara district played an important role as connecting zone between old district and the new-extended development.

In the 19s century, this area was known as 'Meester' district after the owner of most of the land, Cornelis Senen, a preach from Banda Island. He also owned most of the area of what it is now identified as Kampung Pulo and Bukit Duri neighborhood. Due to some reasons, this neighborhood was later divided into some ownership structure belonged to the local landlord. Informal land-transfer transaction influenced the current-existing complex situation of ownership in the neighborhood at that time.

*Socio-economic Existence*

Jatinegara has been growing more rapidly since the 1930s along with the development of Jatinegara Market (Meester market), this district has transformed as melting pot for immigrant from the region who sought for opportunities to settle in the capital city of Jakarta. Therefore, in the first existence, several informal neighborhoods within the district had very diverse demographic entity compiled by many ethnics and cultural backgrounds. The immense flow of immigration had given mutual interrelation to the existing economic activities in which the newcomer tended to join the market. However, the diversity of socio-cultural network had slowly disappeared as the inhabitants had adapted to the urban lifestyle. There are only a few (if any) traces of rural lifestyle which still exists on the neighborhoods.

*Old picture of Jatinegara market shows the virbrancy of the disctrict
(source: errycloeksono.wordpress.com*

*Flooding History*

Bukit Duri neighborhood is known as one of the most threatened neighborhoods in terms of flooding disaster. Coming almost every year, flooding had inundated the large area of the neighborhood, leaving major destruction for the inhabitants. The magnitude of flooding varied time by time, yet it is identified in utmost magnitude every 5 (five) year. The last high-magnitude flooding in 2007 was remarked as the most destructive disaster in Bukit Duri and Jakarta, causing 80 deaths in total (Tempo.co, 2015).

The magnitude and damage of flooding also vary within the neighborhood, depends highly on the geographical location and access to infrastructure. In several locations which are located in low-plain area the magnitude of flooding is more significant than the other locations since it is directly impacted by early-coming flooding. It is even exacerbated by lack of infrastructure connection which complicates the mitigation of flooding.

Experiencing flooding for decades, the inhabitants of Bukit Duri has already realized the risk and danger of this disaster. They have adopted common understanding on how to locally mitigate and evacuate their properties when the flooding is coming. It is also shown on the way the inhabitants spatially transform their properties, such as house and warehouse, to be more tolerated to flooding. In some cases, the houses have been built in two or more stories in which the users can store the properties in higher level.

The experience of flooding also influences the social network among inhabitants which adapts to flooding mitigation. In flooding occurrence, the mitigation is usually performed communally by the inhabitants by helping their closest neighbors for flood warning or evacuation. Living closely as neighbors, this situation has been supported by their local trust and empathy. However, due to a lacking extended knowledge to flooding, their action is mostly based on the intuition and performed individually based on their capacity.

most vulnerable area

Inundation Level:

> 150 cm

71-150 cm

10-70 cm
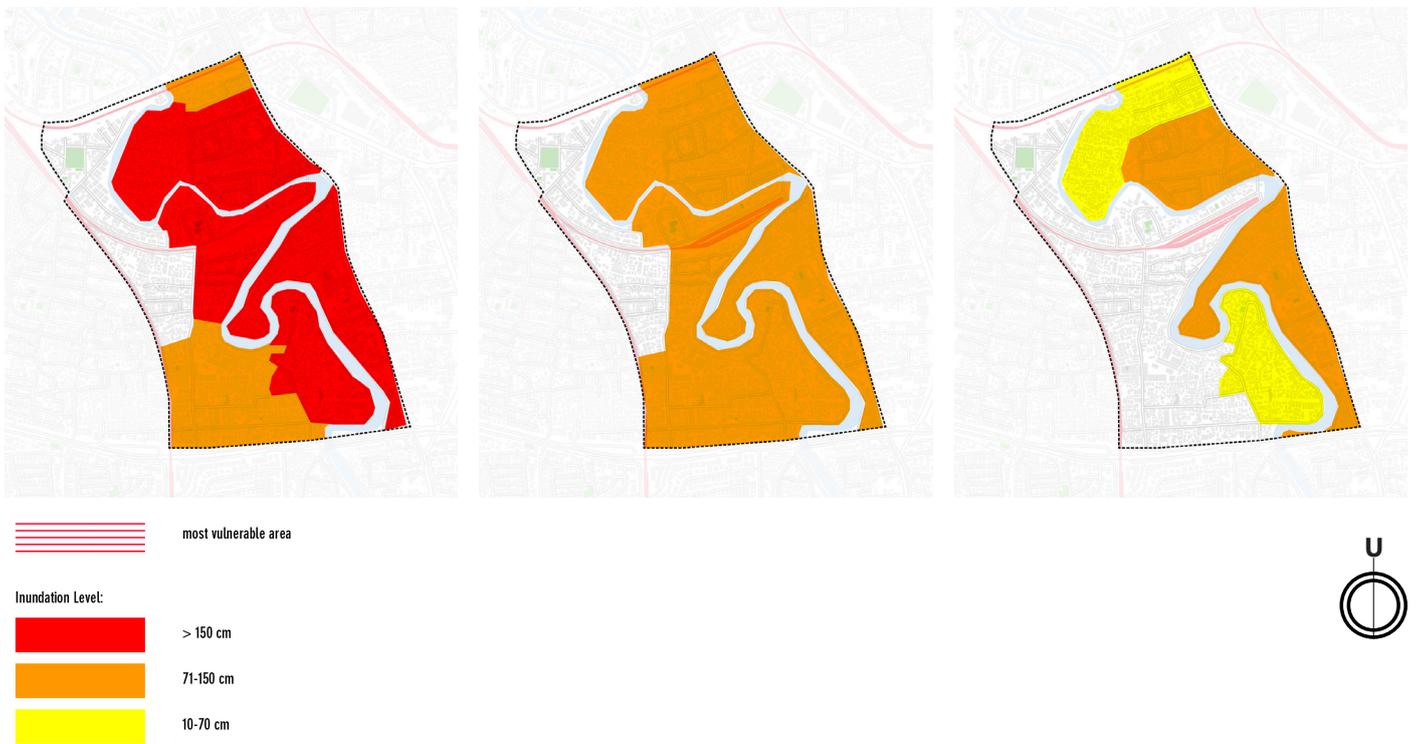
*Map of flooding from time to time (2015-2016)*
*(source: author)*
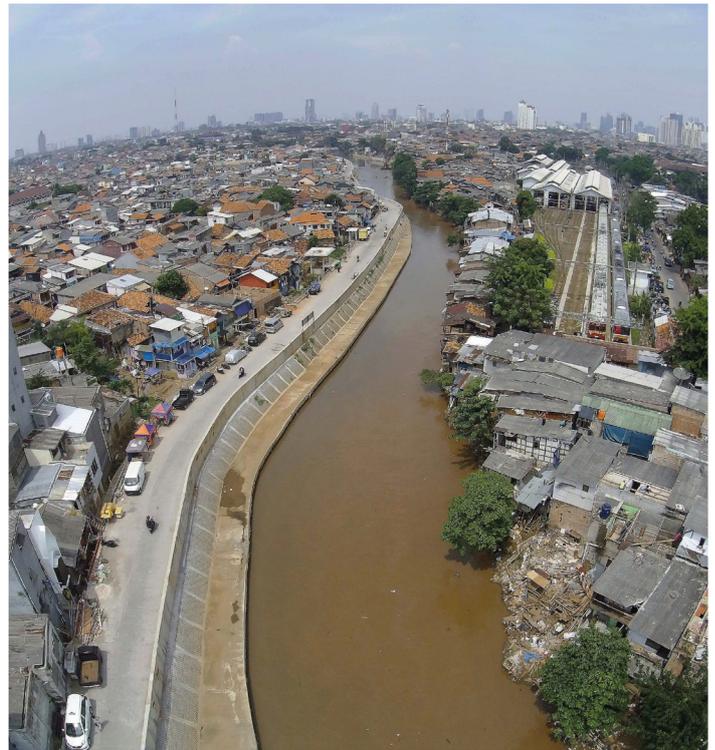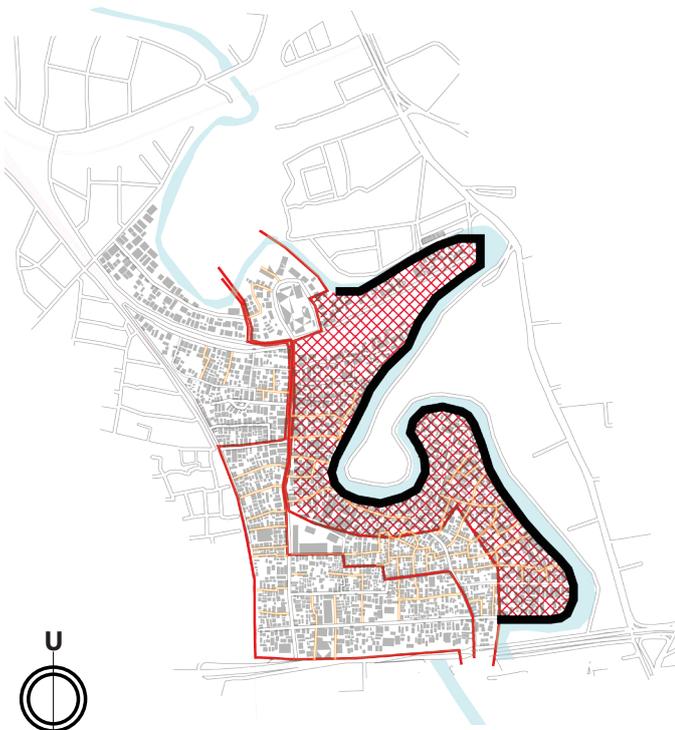
*Infrastructure border the interaction between the neigborhood and the river (water)*
*(source: author; http://denahrumah3kamar.download)*

Jakarta Province   Municipality of Depok   Municipality of Bogor   Bogor Regency

South Jakarta territory
East Jakarta territory

*Territorial Water Management*

connector channel

P pump location

0   500   1000m
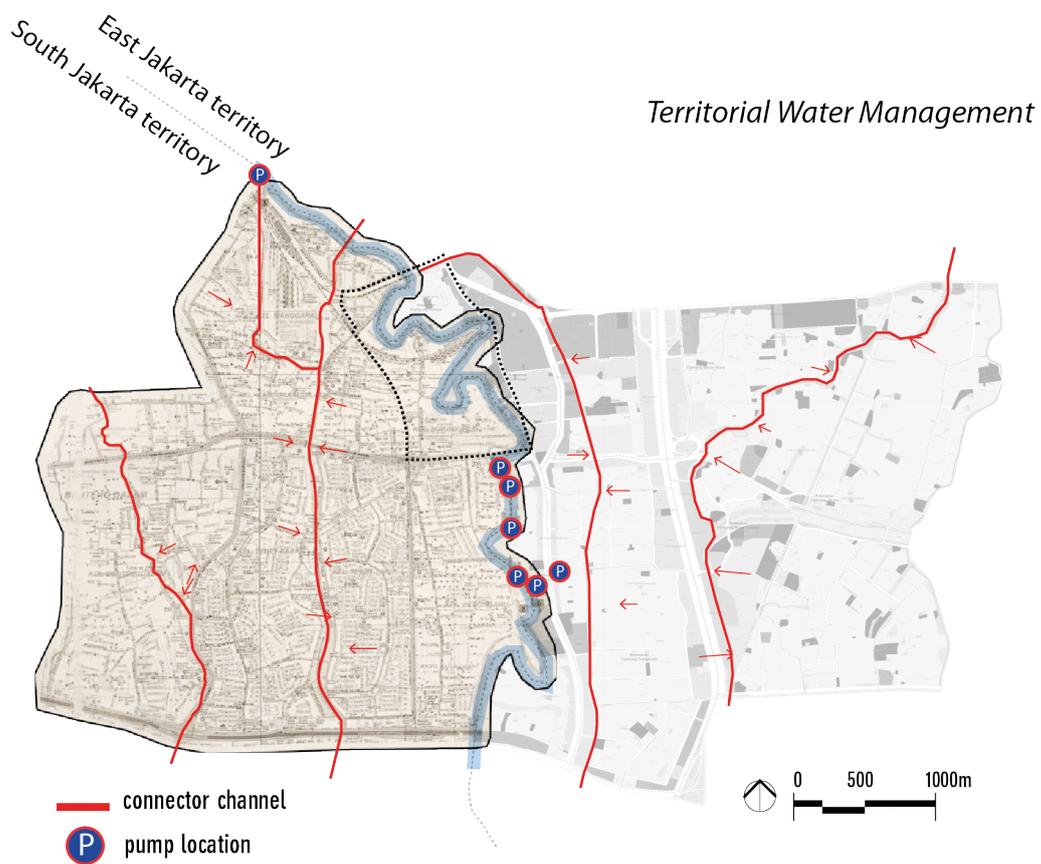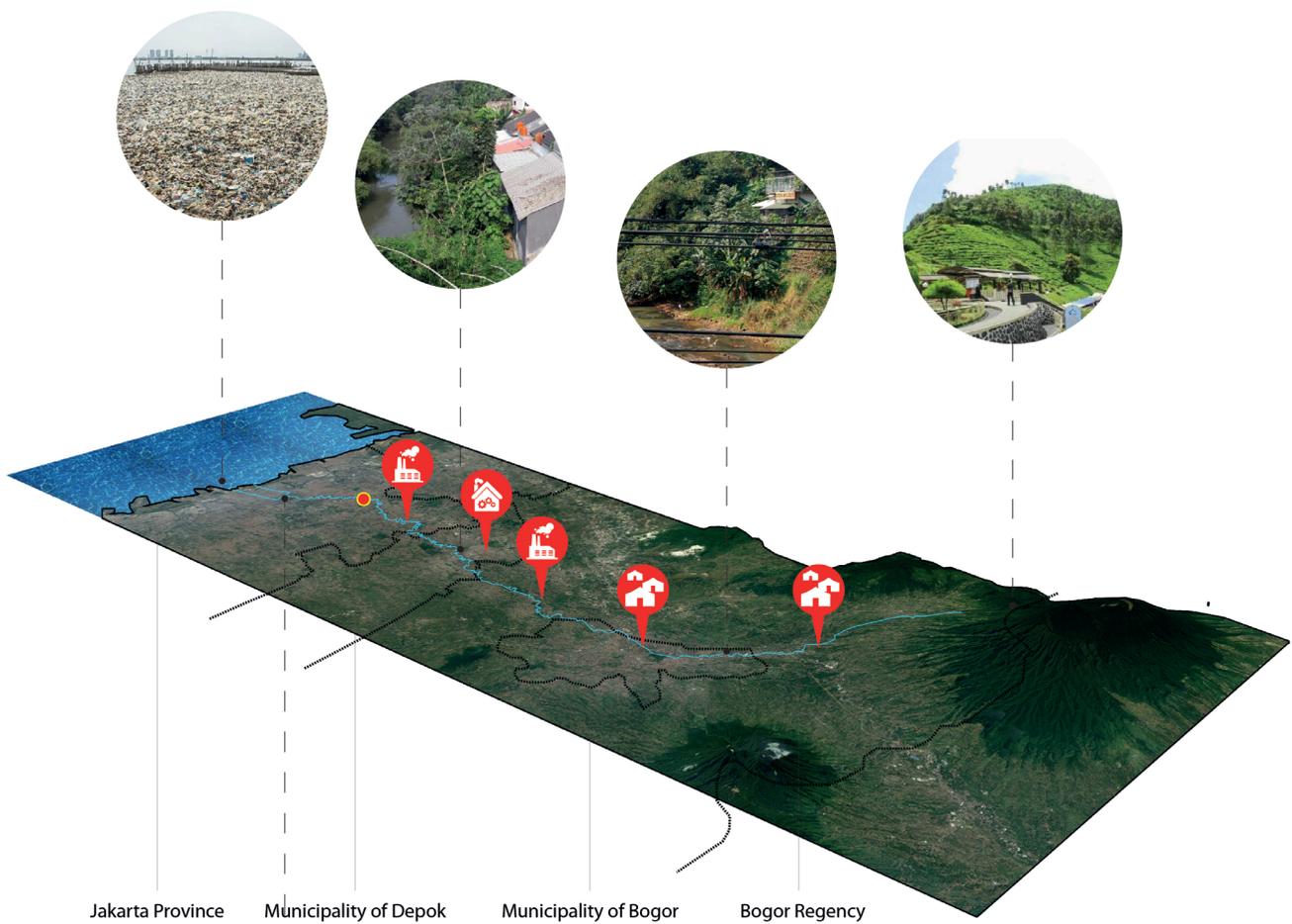
*Top picture: each territorial government has been dealing with different problematic issues*
*Below: Location of Bukit Duri in the border of two municipalities*
*(source: author)*

## Governance system

### Regional Flood-management Issues

The production of flood-related policy in Jakarta province has been predominantly influenced by dynamic environmental issues that are happening in regional scale. Ciliwung River which is flowing from the upstream area, Bogor Regency, to the coast of Jakarta, has passed through several different territories, which are: Bogor Regency, Municipality of Bogor, Municipality of Depok, and Jakarta Province. The complex interaction between territorial stakeholder leads to inefficient policy implementation which furthermore delimits the performance of the actions. Moreover, different environmental challenge that each of territory is facing has made the flood-management system fragmented. However, an intention to coordinate all the territorial government has been made by the introduction of Ciliwung Cisadane River Basin coordination body (BBWSCC) which has the main objective of managing water resources in Ciliwung-Cisadane River for enhancing sustainability and people's welfare (Cisadane, 2018). Yet, there are still several issues emerge regarding implementation of actions from regional institution to the local context suggesting a fragmentation of governance. In the most occurrence, BBWSCC as the coordinator does not receive proper data and information from the local level which can determine the direction of policy implementation.

### Bukit Duri, in between two municipalities

In a territorial frame, Bukit Duri has located within Municipality of South Jakarta and more specifically in Tebet district. The river of Ciliwung as the east-side border of the neighborhood is also being the territorial border between this municipality with the Municipality of East Jakarta. Therefore, concerning infrastructure support and connection, those two municipalities play important role in providing the links. However, there are some limitations which suggest imperfect performance of coordination between municipalities.

Fragmentation of policy-production between two municipalities is influenced by different priorities taken by the municipal governments to manage their territories. Moreover, as it happens in almost governance system in Indonesia, the production of policy has been constrained by a single-year budget allocation which fails to prospect medium-term and long-term policy implementation. Therefore, it is common to find that each different government regime has managed the issue with different approach.

GOVERNMENT

(P)-(M)

Regulation to flooding

Policy implementation

C+R

during and post-occurrence of flooding support

Flood Infrastructure

BBWSCC

PRIVATE

CSR

*has not been really exist*

**?**

LOCAL ORGANIZATION

SETTLEMENT

**?**

*has not been performing well*

NEIGHBORHOOD

*hit-or-miss action*

One-way system

RT-RW (local neighborhood association)

Koperasi (local self-help economic cooperation)

local economy

C+R  *Central + Regional*

P  *Provincial*

M  *Municipal*

*Existing interaction of stakeholders*
*(source: author)*

## Landform and Infrastructure

### Existing Stakeholder Relation

*Sprawled Kampung*

Based on several observations of policy implementation, the stakeholders that are involved in the projects predominantly act as the government sub-ordinate agency which is limited in terms of its budget. Working in an only one-year allowance budget, some government agencies cannot perform a sustain action to solve the problems. While at the same time, there is still a few examples of the involvement of private parties in the project suggesting an imbalance structure of collaboration.

Moreover, lack of involvement of private sector has delimited the range and scope of the project which is not only restricted by the budget but also lack the introduction of new technology and innovation. The grassroots stakeholders, such as local organization, inhabitants, and the local leaders (chief of RT/RW), were not properly involved in the implementation of policy from the government. Recently, the grassroots stakeholder has been considered as the passive receiver rather than an active actor in the planning process.

The existence of kampung (informal settlement) in Jakarta has been a considerable issue for decades pulling attention from the authority to take over the problems. Not only for the native citizen of Jakarta, the kampungs is also occupied by the newcomer immigrants which some of them illegally moved to the city. Due to the increasing land value in almost the entire area of the city, the middle and low economic citizen tend to occupy the 'idle' land around the city, for instance, the land adjacent to the river. The marginalized living space has been the only option for them to live in the city close to their job opportunities.

The density of the kampungs in Jakarta is typically high, as a result of inability of government to provide formal living space for the newcomer. The government has found difficulties in mapping and collecting the exact population in the kampungs since most of the inhabitants do not have proper legal identities. This lack of control from the government has led to sporadic and organic growth of the kampungs in the city. Furthermore, the informal properties of the kampungs also create more marginalized situation for the inhabitants since it delimits penetration of infrastructure connection.
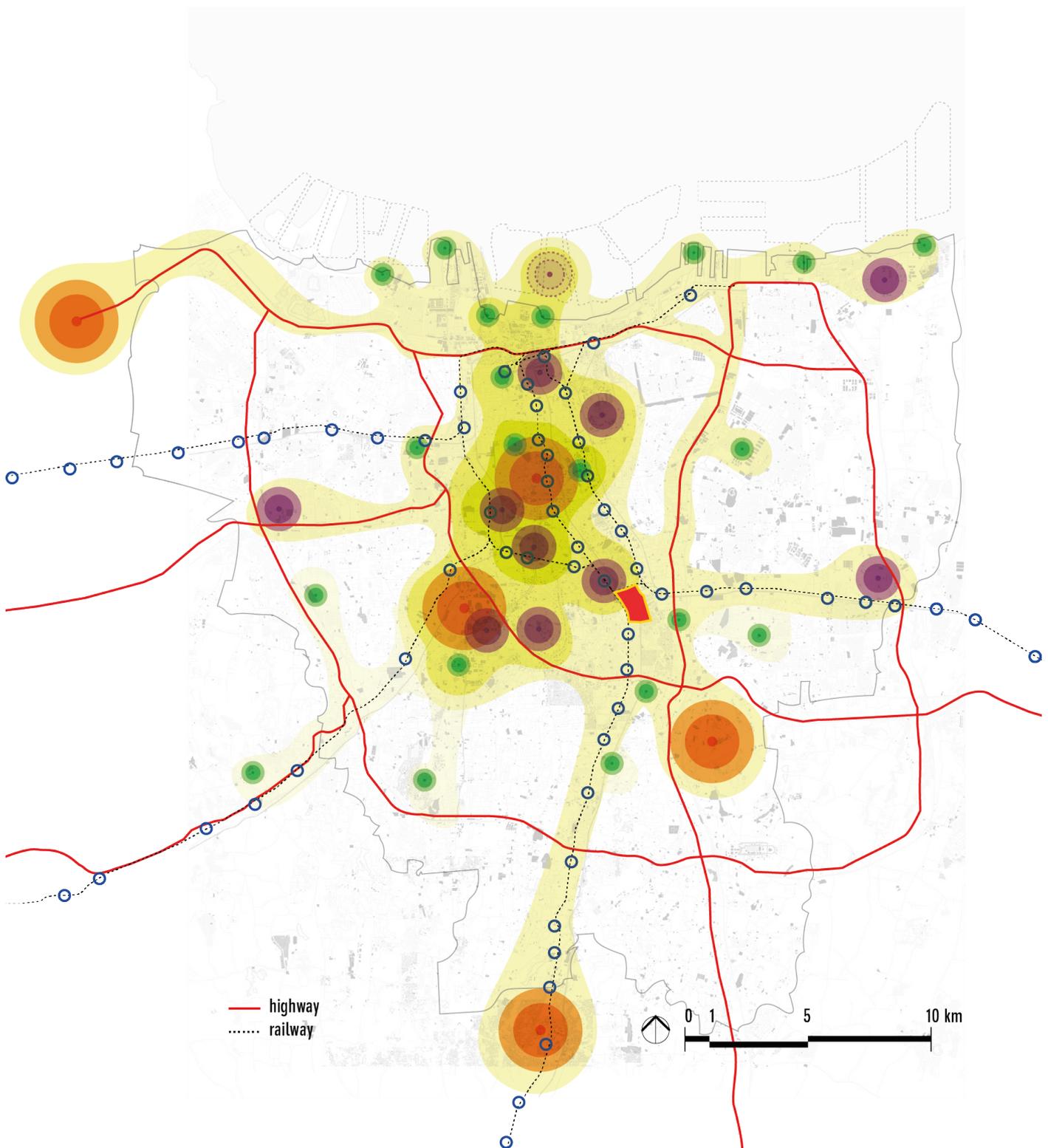
**centralities-subcentralities**
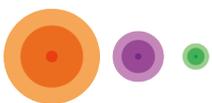
----- railway

—— highway

*Map of centralities and infrastructure network in Jakarta.
Bukit Duri is located in the area with a high concentration of
centralities which suggest masive development pressure
(source: author)*

In-map legend:

—— highway
----- railway
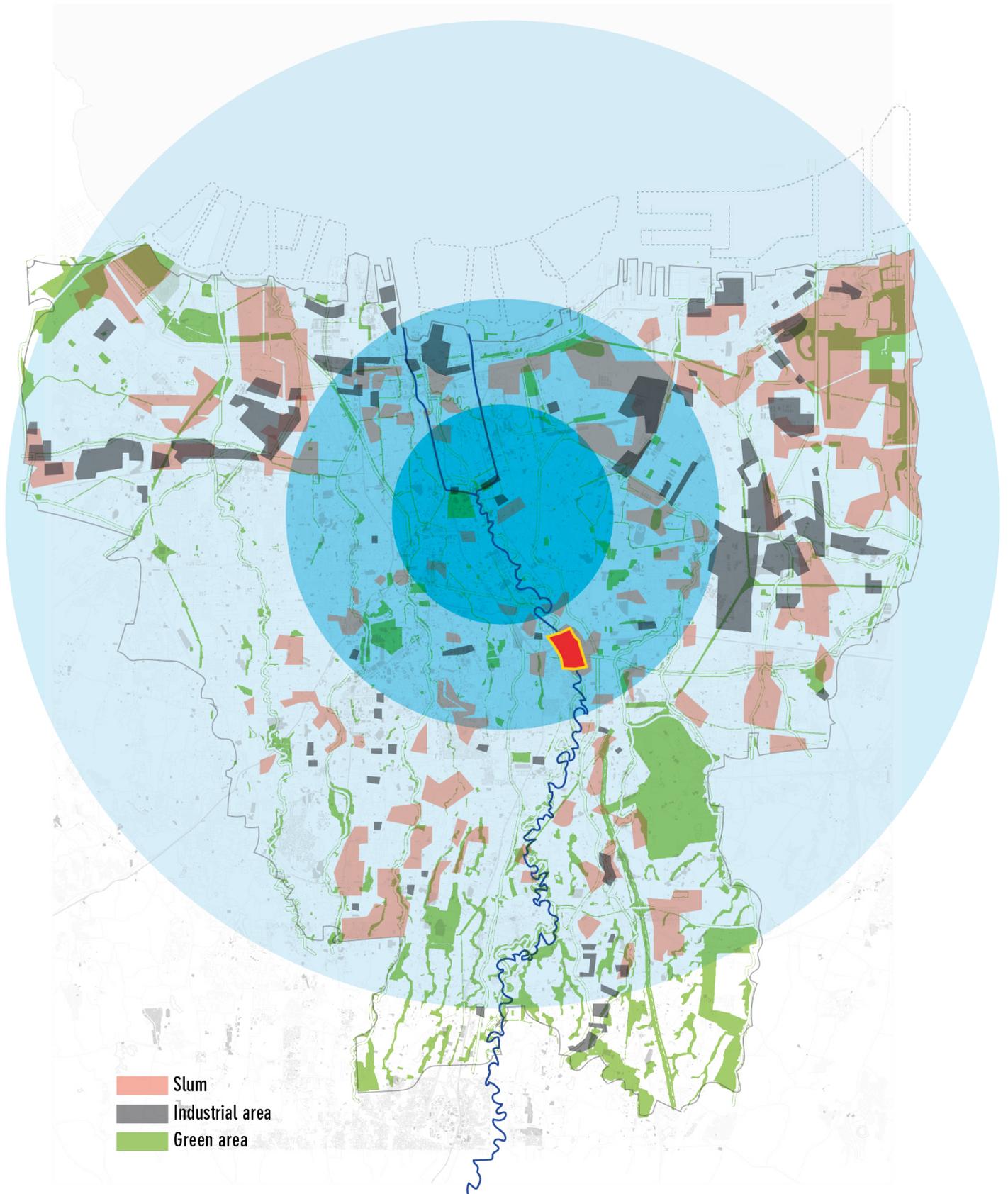
*Proportion of green space in the inner ring of the city is considerably limited. Bukit Duri is located in second ring where several slum settlement emerged (source: author)*

**Legend:**
- Slum
- Industrial area
- Green area
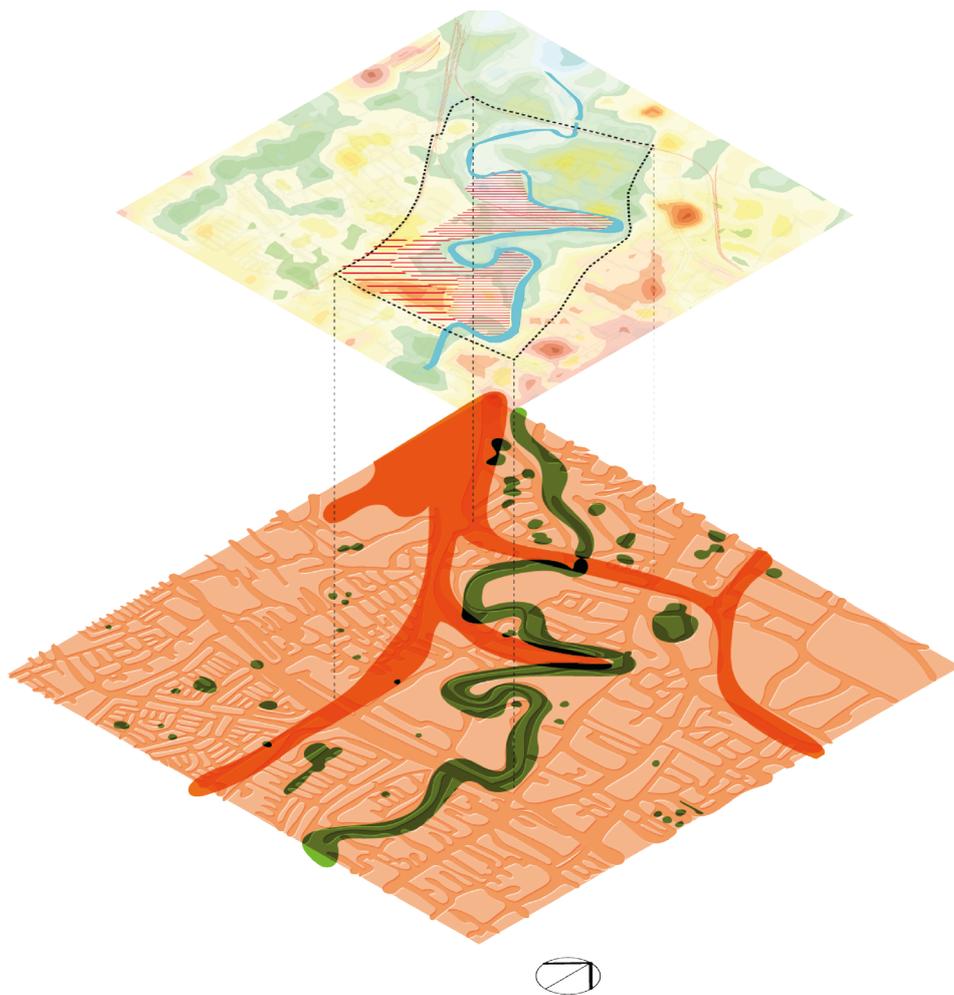
*Surrounding area of Bukit Duri is dominated by hard landscape*
*(source: author)*

*Categorized Kampung*

Its development can identify the growth of the kampungs through the time. Adopting the classification of Ford's kampung typology (Ford, 1993), the kampungs in Jakarta can be classified into several typologies:

*Table 1  (Ford, 1993) in (Tunas, 2008)*

| Types | Location | Characters |
|---|---|---|
| Inner-city kampung | In between colonial structures and new centers | - High density 100 thousand per square km<br><br>- Severe environmental problems<br><br>- Main attraction: access to employment |
| Mid-city kampung | Close to fashionable residential districts and the commercial spines | - Density 20-40 thousand per square km<br><br>- Better environmental conditions<br><br>- Benefit from urban services provision<br><br>- Good employment opportunities |
| Rural kampung | Rural area but slowly engulfed by the city | - Essentially agricultural<br><br>- Lower density<br><br>- Almost no infrastructure and service provision<br><br>- Less transient population |
| Temporary Squatter kampung | - Scattered throughout the metropolitan area<br><br>- Sites without amenities<br><br>- Transition areas | - No legal tenure<br><br>- Severe environmental and hygienic condition |

Based on those categories, Bukit Duri has been identified as one of the high-density inner-city kampung experiencing the character that has been mentioned.

*Lack of infrastructure connection in the neighborhood has resulted to problematic mitigaion of flooding
(source: author)*

*Infrastructure Support*

In terms of the support of infrastructure, Bukit Duri has experienced a big lack of connection to the major system, especially on the deepest part of the neighborhood. Due to the complex issue of legality, most of the households in the neighborhood cannot afford to get connection to the formal system of infrastructure. Some household even does not afford to have proper basic infrastructures, such as bathroom, drinking water system, and waste disposal system. This situation has made some of the inhabitants living in a very low quality of life as they are experiencing slums and diseases.

The provision of infrastructure legally needs a formal application from the inhabitants by providing their valid and legitimate citizenship document and the legal document of their land. However, in many cases, it does not work appropriately as it is supposed to be. The inhabitants which informally live in informal house/land sometimes do not have the legal status of the land. It forces those inhabitants to take an illegal action of getting infrastructure connection by hijacking the system. For instance, a single-user electrical installation from one house can be connected to more than one informal houses with a system of shared-paid bill.

Furthermore, there is still a few pieces of evidence of flooding infrastructure exist in the neighborhood. The government is still highly focusing on the major infrastructure system, such as dikes, retaining wall, and flooding canals which are not really connected to the neighborhood system of infrastructure. Therefore, this kind of disconnection is still not performing proper mitigation at the local level. Moreover, the provision of evacuation of infrastructure is still inadequate within the neighborhood, considering the magnitude and destruction which come very high any time.

In the neighborhood of Bukit Duri, there are still a few facilities that are allocated to be an evacuation zone. These evacuation zones are usually located at the neighborhood headquarter with an insufficient space to evacuate large numbers of people. Moreover, the basic infrastructure support, such as life vest, evacuation boat, and emergency lighting, are still limited which then forces the inhabitants to provide individually their tools and equipment.

*Communal activities oftenly perfomed by inhabitants as the manifestation of social network*
*(source:medium.com)*
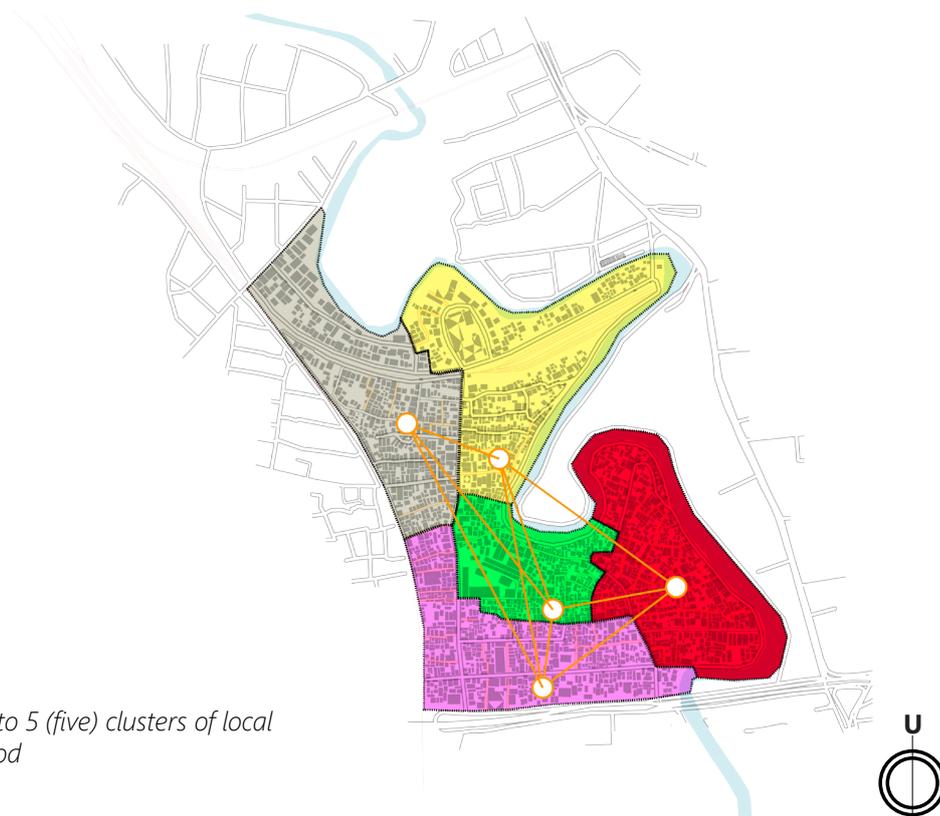
*Bukit Duri is divided into 5 (five) clusters of local network of neighborhood*
*(source: author)*

## Socio-economic Structure.

*Local Neighborhood Network*

Alike other neighborhood systems in Jakarta or even in Indonesia, Bukit Duri has performed a local social network which suggests a self-organized scheme. This local social network is divided into two level, which are:

- Rukun Warga (RW) which organizes in neighborhood level, compiling around 3-10 sub-neighborhoods.

- Rukun Tetangga (RT) is working in sub-neighborhood level, compiling around 10-50 households.

In total, Bukit Duri has 12 RWs and 151 RTs in which 4 RWs has been identified as the most threatened area to flooding.

A distinct character of this local system is the way the system working closely with collaborative support from the inhabitants. For instance, the head of neighborhood is usually elected based on the trust that the inhabitant give to any respected person. The event of election is also held together with the local celebration, which is often called *syukuran*. Therefore, this intimate system of neighborhood has suggested more close relation between inhabitants and their own local leaders. In terms of flooding evacuation, there were some examples that the inhabitants tend to follow and rely on the instruction from local leader rather than the one from municipal or provincial government.

Furthermore, the local social network also influences the performance of local economic business within the neighborhood. Some examples of local business, such as kiosks, taverns, and stores are relying their operation on the connection to some local prominent persons in terms of provision of funding, materials and more importantly the business space. The more the person engaged in the local network, the easier he/she will get opportunity in business.

*Some examples of existing local business in the neighborhood which uses private and public space.*
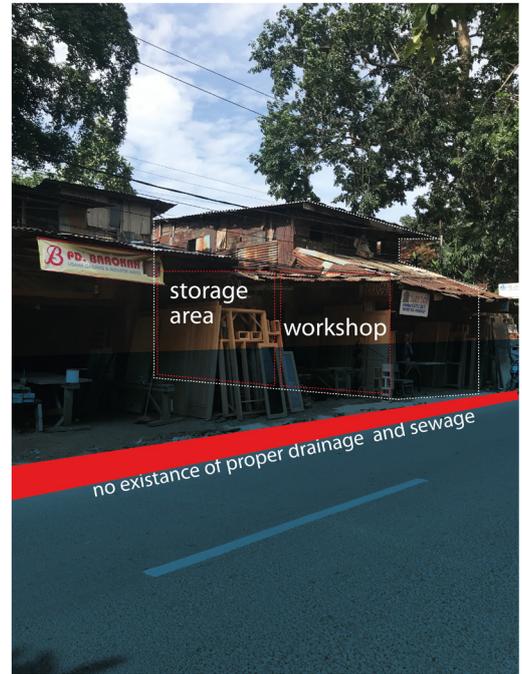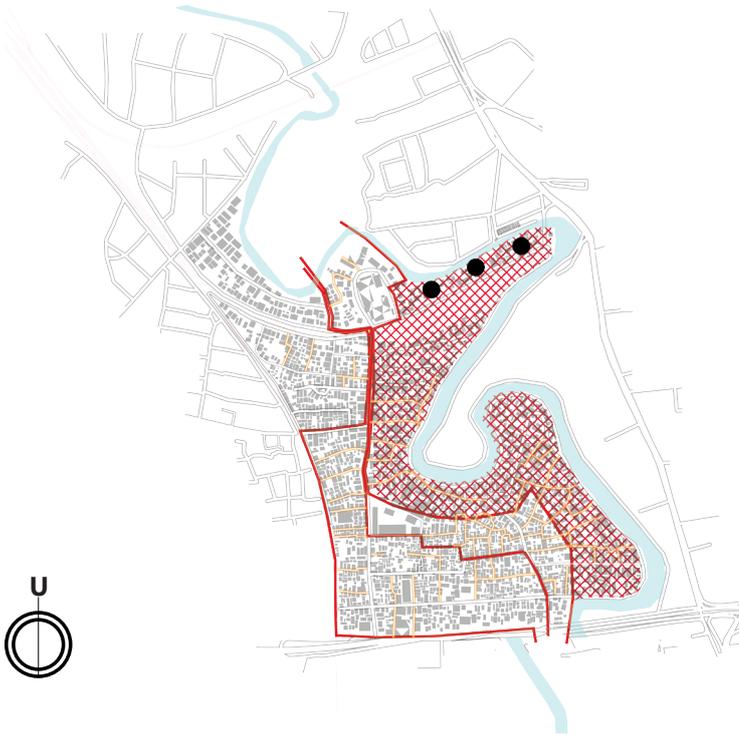
local economy threatened by flooding

*Local Economic Business*

Predominantly, the inhabitants of Bukit Duri are working in informal sector ranging from small-scale business to mid-high business. Gaining benefit from their strategic location to the surrounding economic activities, the inhabitants have opportunity to work in various economic sectors. However, in terms of its vulnerability to flooding, most of the local businesses are not supported by proper infrastructure which can protect them.

*Existing Local Cooperation*

In terms of its production support, most local businesses are getting benefit from the existence of local cooperation which is called Koperasi, such as Koperasi Pawang. The aims of this cooperation are giving easy access to saving, loan, and supply of raw material for the local business that is eventually building a more self-dependent system. In terms of its support to disaster recovery, this cooperation usually provides short-term aid for the inhabitants to re-activate their businesses. However, the existence of this local cooperation has not been included on the bigger scheme of flooding (disaster) mitigation from the government.

**Land Tenure System**

*Land-ownership Category*

The land ownership category in Bukit Duri can be classified into 4 (four) main level:

- Freehold ownership (*Sertifikat Hak Milik*)

- Rights to Build ownership (*Sertifikat Hak Guna Bangunan*)

- Rights to Use (*Sertifikat Hak Pakai*)

- Other registered rights

However, complex system of land ownership does exist in the neighborhood evidenced by almost 50% of the household which do not have legal documentation to prove their legality. Various problems caused this situation, yet there is one particular issue which predominantly happened. In most non-legal household, the ownership certificates were supported by old-obsolete documents which current Agrarian Law does not authorize most of them.

living area

no existance of proper
drainage and sewage
storage area

housing building which are threatened by
frequent flooding

U
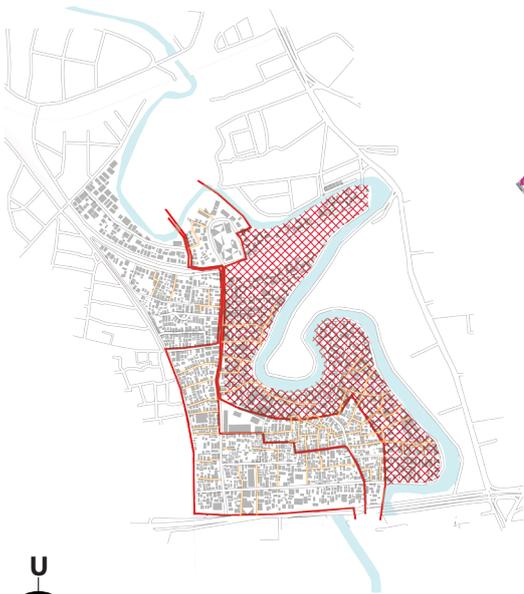
🟧 Freehold (Sertifikat Hak Milik)

🟦 Rights to Build (Sertifikat Hak Guna Bangunan)

🟩 Rights to Use (Sertifikat Hak Pakai)

⬜ Registered Rights
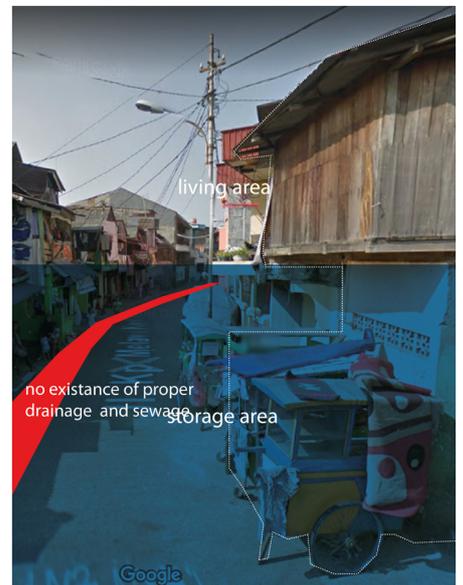
Based on the interview and research, there are some other types of ownership document which exists in the neighborhood:

- Land grant certificate

- Inherited letter of ownership

- Deed of land sale and purchase

- Purchase receipt

Most of the ownership documents that are mentioned above were obtained from the old system in the colonial era. There was a period of transition of the system to switch the document to the newest version yet most of the inhabitants have not done the procedure for many reasons. Even worse, some documents were also obtained from informal procedure provided by third party back then. In this case, those particular documents were identified very weakly in terms of its legal force.

## Policy Review

Over decades, the regional, provincial, and municipal government has tried to address the problem of flooding by producing many policies and actions. Based on its nature of governance level, the policies were implemented in different style and approach.

The most recent policy is river normalization which is still ongoing currently. The main objective of this policy is reconfiguration of river Cilwung and its in order to get the water flow with minimum obstacles appropriately. As the consequences, there were some informal buildings on the embankment which were removed. This also implies a disconnection of existing socio-spatial structure in which the inhabitants are benefitted from.

However, there are still many issues which are still yet to be solved by the government. In some cases, there are several identified dis-integration between the new-built infrastructure and the existing infrastructure on the local scale. Especially in Bukit Duri, the existing neighborhood is considered fragmented to the major network of infrastructure which still leads to the vulnerability to flooding.

Moreover, for some reasons the government also faces difficulty to install an integration of the infrastructure network in the neighborhood considering the legal status of some households. Without any legitimate status of the land, some households do not have access to the infrastructure. Therefore, there is still a complex interplay between infrastructure provision and ownership status in the neighborhood.

*Former governor of Jakarta on his visit during flooding occurence in one of the kampungs (informal settlement) (source: geotimes.co.id)*

## Conclusion

Bukit Duri has been one of the most-dense neighborhood which benefits from its strategic location in a vibrant-prominent economic district of Jatinegara. The unplanned growth and development of this neighborhood have suggested a disintegration of this neighborhood from the wider system of infrastructure. The impact of flooding (disaster) has been not only destructing the spatial and physical properties but also economic activities. The informal aspect of the neighborhood has presented the difficulty of infrastructure intervention.

Alike other communities in Jakarta or even in Indonesia, Bukit Duri has a mature social structure which is performed by the existence of local social network led by the local actors. The existence of this local network provides chance to a more communal collaboration of mitigating flooding (disaster). Moreover, local businesses in Bukit Duri are also predominantly supported by the local cooperation or '*Koperasi*' which give certain assistance to sustain the business.

However, in terms of the flood-governance in the broader scheme, there is still an indication of fragmented system which delimits the performance of intervention to mitigate flooding. The lack of involvement of private stakeholders and the society has also suggested inefficient transfer of knowledge and actions.
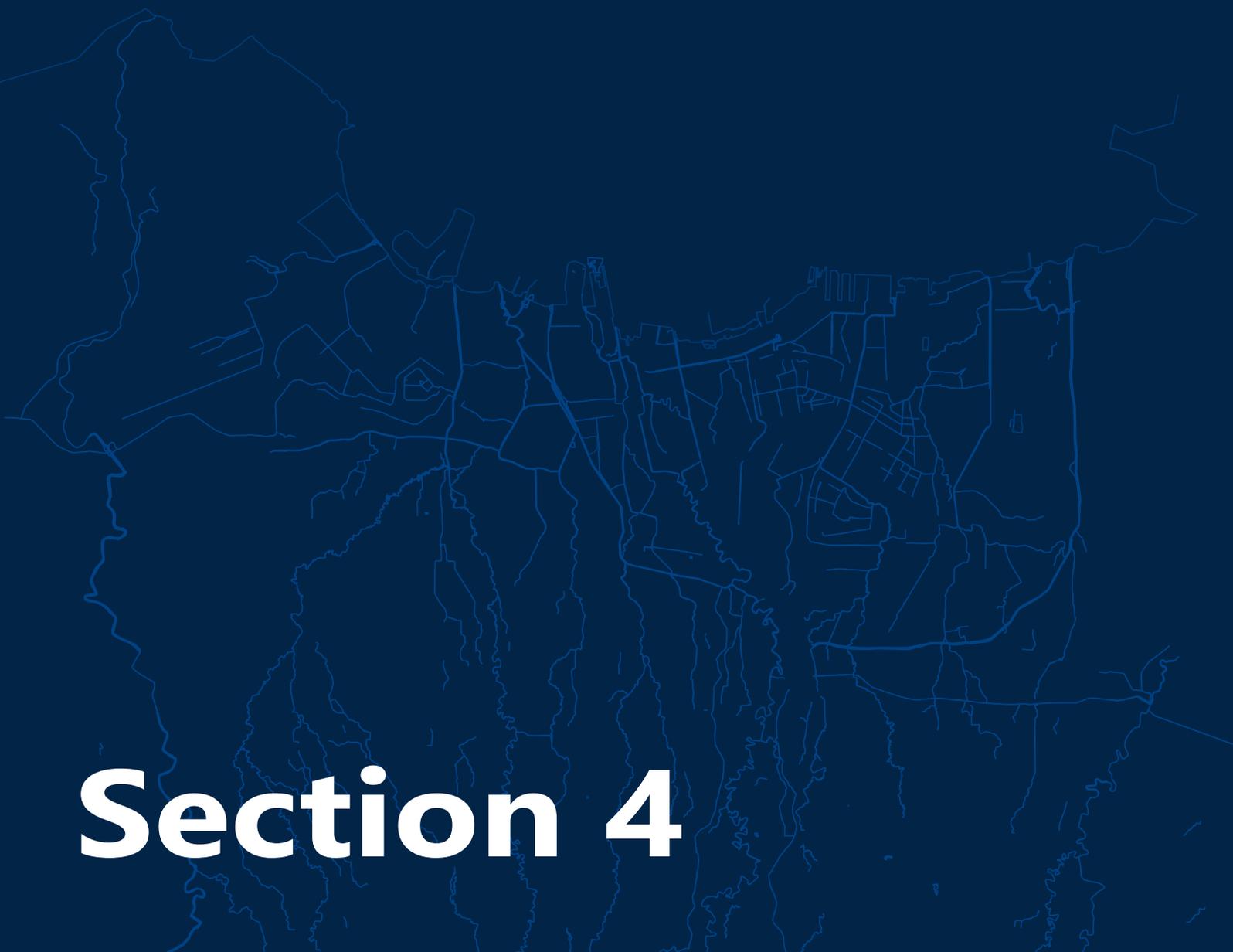
# Section 4

# Hypothesis

## Synthesis

A network of infrastructure in the neighborhood is disintegrated from the broader system of city-infrastructure. The most vulnerable area within the neighborhood is still lacking any connection to the network leading to difficult mitigation to the flooding. Moreover, this disintegrated area is also imposing problems of land legality more than other areas.

The neighborhood of Bukit Duri densely structured by human-made fabrics allowing only slight space for the natural landscape to thrive. This limited encounter to nature has led to a low degree of human-nature interaction in the neighborhood. Moreover, the small proportion of green-natural space consequences limited space for water absorption in which it is crucial to mitigate flooding.

Spatial adaptation to flooding has been performed individually by the inhabitants based on their capacity and experience. The inhabitants in the most vulnerable area, especially in the lowest plain, has transformed their houses and properties in various ways to minimize damage caused by flooding. Yet, this self-individual adaptation has not been integrated to the broader system of mitigation suggesting a more sporadic character of actions.

## Identified Vulnerable Area to Flooding

By superimposing the geographical layer, infrastructure layer and land tenure layer, there is a division of areas in the neighborhood concerning its vulnerability to flooding. The layer of geography provides information about altitude of the plains in which values to determine the level of water in flooding occurrence. The layer of infrastructure provides information about the existing provision and connection of infrastructure network in the whole neighborhood. While the land tenure layer determines the capacity of the household to perform adaptation to flooding based on their legal properties.

low <span>▮▮▮▮▮▮</span> high

infrastructure lines
(sewage and water system)

▮▮▮ land ownership status
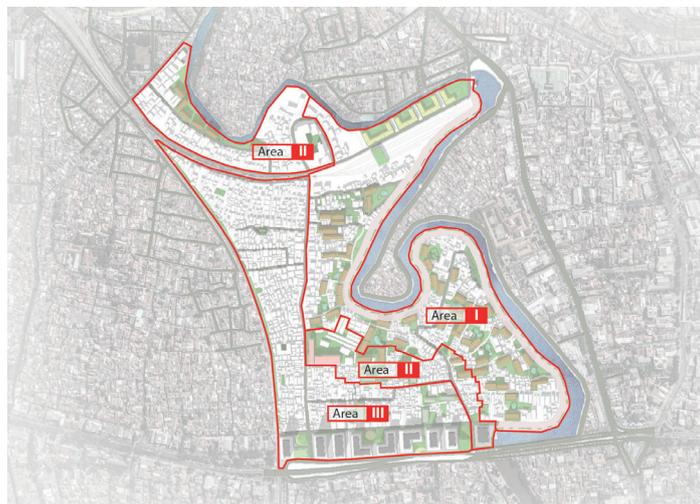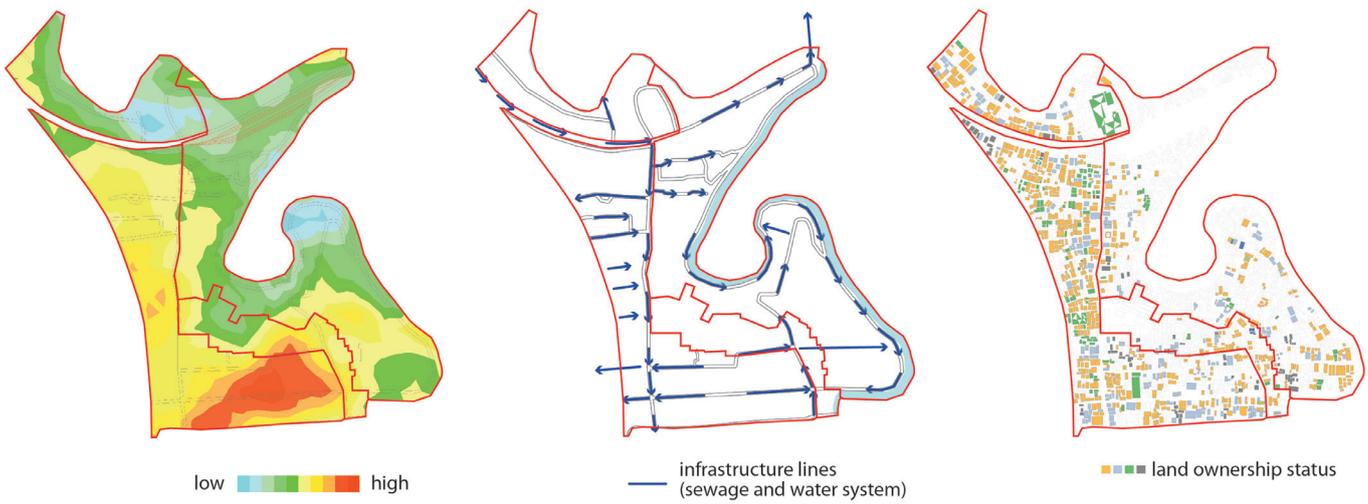


*Vulnerability-based areas are defined based on the layerof geography, infrastructure network and land ownership
(source: author)*

Based on the observation of those layers, these 3 (three) areas are identified:

- Area I: this area has been identified as the most vulnerable area among all considering its location in close proximity to the river. In flooding occurrence, this area is most likely the first area encounters the water. Moreover, this area is mostly laying in the lowest plain suggesting high inundation level of water. This area also predominantly occupies by informal households thus a lack of infrastructure support is also occurring.

- Area II: this area is considered the less vulnerable area than area I, yet it is still threatened by water, especially in a high magnitude of flooding. However, the support of infrastructure already exists at certain extent allowing opportunity to connect to the broader network. Moreover, the status of some of the households is identified legal and authorized.

- Area III: different from the other areas, this area has high connectivity to broader infrastructure. Moreover, this area is also the least vulnerable area to the water since it lays in the most relatively highest altitude and it is already supported by proper channel to mitigate water. Most of the households in this area are clarified by legal-authorized ownership suggesting more formal structure than other areas within the neighborhood.

Those 3 (three) areas are compiling different problems which need to be addressed by different approaches. The strategy for each area will be explained later in the design chapter.

History Layer (general+floding history)

• dense fabric - limited green spaces
• limited space for mitigating water

• economic acticvity exposed to flooding
• individual exposed to flooding

Policy+governance layer

• limited collaboration between government, private sector and society on providing and managing infrastructure

Landform + infrastructure layer

• disconnecton between local infrastructure and broader network

• casual action to flooding in local system - pragmatic adaptation to flooding

Social Structure layer

• capacity of adaptation depends highly on provision of infrastructure and properties of each household

Land tenure

*Existing interaction between analytical layer*
*(source: author)*

## Interlink between analytical layer

The relation of all the analytical layer was observed by superimposing each element on those layers. Furthermore, the interlink between the layers was drawn out by considering its influence on the spatial adaptation to flooding.

- By examining the neighborhood of Bukit Duri through the time, there is a remarkable influence of historical layer to socio-economic and spatial development. The vital role of Jatinegara district has attracted people to come and settle, especially in Bukit Duri leading to a dense-crowded neighborhood. On the other hand, this pressure of development has caused a decreasing proportion of green space. In terms of flooding, the experience of the inhabitants on the way to adapt to disaster has been developed through time. Local flooding mitigation has been performed by the inhabitants started from their own individual household to a more neighborhood scale system.

- The production of infrastructure policy highly relies on the nature of governance on each territory, suggesting a complex process of implementation. Therefore, the layer of governance is taking a considerable impact on the way landform and infrastructure layers were shaped. Moreover, the old-fashioned approach of policy production has been considered neglecting the human-nature dimension suggesting more technical and engineered resilience to flooding. By far, there are still a few intentions to establish or initiate more green space in vulnerable-to-flooding area, especially in Bukit Duri.

- Along with the complexity of governance system and policy production, the improvement of infrastructure network is still stagnant. The recent infrastructure support has not been connected to the local system of infrastructure. On this case, the neighborhood of Bukit Duri is still fragmented from the broader system of infrastructure, especially flooding infrastructure.

- As it has been mentioned earlier, the adaptation to flooding has been performed in more individual way by the inhabitants, especially some of them who has specific business properties. For example, some of the inhabitants who work as street vendors put their carts or wagons on the ground level of their houses. While at the same time, they move their living area and production area on the second level. Yet, this adaptation is still vulnerable to flooding in certain extent. In terms of flooding mitigation, the existence of local social networks, such as RT (*rukun tetangga*) and RW (*rukun warga*) has helped the inhabitants to get reliable information of disaster and moreover, it has efficiently provided a platform for delivering flooding infrastructure support in the neighborhood. Moreover, the trust-based system of social network provides opportunity to use this system in a more advanced way,

- Layer of land-tenure has significantly influenced other layers since it determines capacity of each household to adapt to flooding. The different approach of adaptation has been shown in different areas in the neighborhood based on their level of vulnerability to flooding. The most vulnerable area with minimum support of infrastructure of flooding was identified in the lowest-laying area in which legal ownership status does not support most of the households. The provision of infrastructure also depends on the legality that the households have.

## Conclusion of Bukit Duri

Considering all the layers that have been observed, several conclusions can be made, to propose design intervention. The conclusion of Bukit Duri will be the inputs for the next chapter of structuring strategic frameworks,

- The performance of infrastructure highly not only depends on the governance approach but also context-based layer of land tenure which defines legality of the households. Recently, these two dimensions have been ongoing in separated framework with a limited interlink.

- Limited support of infrastructure from the top level has forced the grassroots actor, especially the inhabitants, to perform a more individual-local adaptation to flooding. The adaptation has occurred in various way depends on the capacity that every inhabitant and household have. Moreover, a framework of development in the neighborhood is still not intentionally focusing on the mitigation to flooding yet it is contrarily accommodating haphazard development which is environmentally irresponsible.

- Relation between human and nature in the neighborhood is still lacking that is indicated by low proportion of green space and/or natural space within neighborhood. In terms of flooding, the insufficient amount of green spaces reduces the capacity to mitigate the water.

# Section 5

# Strategic Framework

Vision
Strategy Element
Policy Recommendation
Conclusions

## Design Hypothesis

Considering the complexity and variety of the observed problem, this project tries to develop more custom-made and problem-based intervention to the flooding, while also improving spatial quality and infrastructure performance. The intervention has been allocated into 3 (three) different areas referring to the vulnerable areas that have been mentioned before. In a brief statement, the design hypothesis of this project is:

***Zone-defined intervention suggest more tailor-made and specified treatment/solution to mitigate the flooding***

Furthermore, the design hypothesis is translated into the output of strategic framework and design pattern which observe typical problems within the areas.

## Project Approach

To answer the design hypothesis, there are several project approaches which are introduced on this project. The approaches are:

- *Infrastructure **Performance**: this approach is focusing on the improvement of infrastructure network in the neighborhood which takes

*Going towards a more resilient, sustainable and livable Bukit Duri*
*(source: http://membacaruang.com with few adaptation made by author)*

consideration of the broader system of infrastructure on the city scale.

- *Spatial **Transformation***: this approach is focusing on the spatial adaptation in the neighborhood in respect to the flooding while also try to solve the spatial-related problems, such as: land tenure, housing provision and productive space enforcement.

- *Human-nature **Engagement***: this approach is mainly focusing on the production of natural space within the neighborhood by providing allocated green space which improves capability to mitigate flooding while also building more integrative relation between the inhabitants and the environment.

All those project approaches are accommodated in the framework of the design which then derived into the several design patterns. Based on the approaches, primary layers of the framework are infrastructure layer, open space, and spatial development.

Vision Image



*Vision drawing of Bukit Duri neighborhood*
*(source: author)*

## Vision

To address existing problems while also provide a platform for future development, there are several manifestations of the design which are compiled in the vision of the neighborhood. The main issue of flooding is intervened by allocating connection of infrastructure while also providing a more permeable and adaptive land cover to mitigate the water naturally. Moreover, the challenge of population growth is addressed in the vision by preserving areas for a more mixed-used development in the less vulnerable location.

The vision is composed in a long-term projection which considers 40-year timeline. This figure has been chosen considering several phases during the timeline which any actions and change could take place, for instance, Municipal Spatial Plan renewal, Regional Development agenda, etc.

## Strategy Element

The manifestation of the vision will be enhanced further by dividing the implementation based on the inter-related layers. Every different layer is referring to the design approaches, which are *performance*, *engagement*, and *transformation*.

- Performance: the layer that is used to translate this approach is layer of infrastructure, including the network of basic infrastructure, such as toilet, bathroom, sewage system, water facility and waste facility. Moreover, in terms of mitigating the flooding, this approach also generates initiation of flood infrastructure system in the neighborhood which is connected to the bigger system. The introduction of flood infrastructure will include physical infrastructure (such as evacuation zone, communal warehouse, storage, detention pond, and pump facility) and non-physical infrastructures (such as flood warning system, communal data storage, and coordination map)

- Engagement: the layer that is used in this approach is layer of open space which defines proportion of green-natural space within the neighborhood to provide more nature-based mitigation to flooding. In combination with the other approaches, the proposed and existing open space will be introduced as multi-use space which not only helps to reduce flooding risk but also provides communal space for the inhabitants in the daily basis. For instance, the infrastructure of detention pond can be used as playground for the inhabitants to perform any casual activities, such as local market, workshop, gathering, etc.

## Policy Recommendation

- Transformation: to perform transformative approach, the layer of development plan will be introduced by defining the intervention based on specific areas (zone). These areas are derived from superimposed layer of geography, land tenure, and infrastructure which suggest degree of vulnerability to flooding. This approach defines the character of development of the areas within the neighborhood, which accommodates the need of flooding mitigation while also future development demand. Specific areas within the neighborhood are defined as permeable area with a low proportion of building footprint which contributes to a multiplication of water absorption. Moreover, certain areas are also allocated for a more dense-compact development to accommodate population growth and land use function. Built upon that purposes, the transformation approach introduces several typologies of building and open space which are referred to its particularity.

- Infrastructure: Integration of infrastructure between city-scale network and local network will be the main objectives of this project. The infrastructure provision is mainly divided into two categories, basic infrastructure and flooding infrastructure. The installation of infrastructure in the neighborhood is highly related to legal dimension of the households, hence there is a necessity to transform and reconfigure the system of the land tenure. A smart-design technology will introduce flooding infrastructure as the most important addition to the neighborhood. A new regulation from the government is needed to guide the utilization, maintenance, and provision of any facilities and appliances. Moreover, the involvement of the inhabitants for installing and utilizing the system will be highlighted to create a sense of belonging of the inhabitants to the facilities.

- Open-space: Proportion of green spaces in and around the neighborhood will be defined based on the different vulnerable areas. Aiming to distribute capacity of flooding mitigation, each vulnerable area has a different proportion of green space which can be translated into permeable pavement, parks, cluster of vegetations and detention ponds.

  The framework of open space also contains several programs for each typology of open space, to create a more specific exercise of the space. Yet, an adaptive approach of constructing the space is also enhanced considering the diversity of the activities in the neighborhood which could be accommodated in the public space.

- Development plan: Each different vulnerable

area has been defined based on its development characters. The most vulnerable area (area I) is highly transformed into a more permeable area by reducing the building footprint. To, reduce the footprints and configure the density there is a new typology of housing building introduced in this area. Combined with the new system of land tenure, community land trust system (CLT), the typology of co-housing will be adopted to create more proper living condition for the inhabitants which is integrated to the infrastructure network. Moreover, this new typology of housing will suggest a more formal system of land tenure while at the same time creating a more communal belonging of the properties.

The second vulnerable area which is safer than area I will be allocated more for a more middle-rise housing typology which is still allowing green-natural space to absorb water. Moreover, there will be some selected locations for evacuation zones and shelters as the assembly points of flooding (disaster) mitigation.

The area III which is considered the safest zone from flooding will be allocated for a more mixed-use development, such as commercial functions, office, and housing. Moreover, this area will be prepared for the future need of population growth and expansion.

- Stakeholder collaboration: the collaboration among stakeholders is enhanced by the introduction of new-proposed interlink between

government, private parties, and grassroots stakeholder. To propose a more balance involvement of the stakeholders, there are some new lines interact one stakeholder to the others. The role and action of stakeholder are divided into three different categories based on its sector:

1. Government stakeholder:

   The stakeholders from this sector are defined into 3 (three) roles, central-regional government, provincial government, and municipal government. The central-regional government is responsible for the performance of regional flooding management which enhances the existence of BBWSCC (Ciliwung Cisadane River Basin coordination body) by initiating online platform to accommodate two-directional contribution from top level to local level and vice versa. The main objective of this online platform is providing an actual and up-to-date data collection by inviting local stakeholder, such as inhabitants, to produce real-time flooding mapping. Furthermore, the existence of online platform also creates easy accessibility to certain data and information about flooding (disaster) to support any observation, research, and assessment. Another responsibility of regional government is managing contribution from the region in a form of funding, resources, and logistics to support the system of flooding mitigation.

Provincial government has the responsibility to provide a more integrated infrastructure network in a city-scale and local-scale by producing specific regulation and smart system of infrastructure. The implementation of infrastructure provision is enhanced in combination with the municipal government as the action-taker. Moreover, the role of provincial government is more importantly significant in terms of providing guidelines of land tenure in the city. The introduction of a new system of land tenure has to be supported by law enforcement which is working in a large-scale while also considers the context of locality. The system of land tenure, such as community-land trust, will provide a more legitimate system for the neighborhood to develop their local network of households.

Furthermore, the municipal government, which is the sub-ordination of the provincial government, is responsible for translating the development plan by defining a new plan of land use to manage several new interventions, such as green spaces, commercial function, and housings. Moreover, the municipal government can directly enhance the role of local economic cooperation such as '*Koperasi*' and local social network (RT-RW) to perform a more self-help system in the neighborhood.

2. Private parties

The invitation of private stakeholders is strengthened by allowing a Corporate Social Responsibility (CSR) to support any infrastructure provision in the neighborhood, for instance by installing a new kind of technology: water pump, rainwater treatment system, and public furniture. This kind of contribution is aiming for the introduction and presentation of a more smart-advanced intervention while at the same time giving chances for the private stakeholders to enlarge their markets.

The contribution of private stakeholder also exists by enhancing the current regulation of development right transfer (TDR) from the government which has the objectives of transporting development benefit to the under-developed area within the city. This approach has been utilized recently by the government, for instance by obliging companies to build infrastructure or public building before developing their facilities. In relation to Bukit Duri, the scheme of development right transfer (TDR) can support the initiation of green space and public facilities, such as evacuation building, by financing its construction.

The private sector could also contribute to the regional scale by the initiation of Environmental Impact Contribution from the companies which are located close to the river or getting benefit from the river or nature. This contribution can be proposed as a trans-boundary scheme which is not limited to the territorial border. Yet, this scheme will contribute to the whole system of regional flooding management which determines the actions based on priority and necessity. As an illustration, several companies in the downstream which are located close to the Ciliwung river can make a contribution to flooding mitigation action in the upstream, such as reforestation, dikes construction, reservoir, etc.

GOVERNMENT

C+R

P

M   M

Regulation to flooding

Policy implementation

PRIVATE

CSR

Development Right Transfer

Environmental Impact contribution

*tenure security*

land tenure system

Basic infrastructure + drainage & sewage

*advance technology (ex. rainwater harvesting, water treatment, waste treatment)*

*land use transformation*

*economy security*

Koperasi (local self-help economic cooperation)

COMMUNITY LAND TRUST

M

*infrastructure connection*

HOUSEHOLD

LOCAL ORGANIZATION

*social mapping*

*skill improvement*

*public furniture support*

*new economic venue*

New typology of Public Space + Coworking space+Evacuation zone

*local coordination (pre-, during, post occurrence of flooding)*

*funding support*

*data collection*

BBWSCC

online platform

*early warning real-time mapping*

RT-RW (local neighborhood association)

Regional contribution

*Payment Environmental Services (imbal jasa lingkungan) (Upstream ⇌ Downstream)*

C+R   *Central + Regional*

P   *Provincial*

M   *Municipal*

*Proposed interaction between stakeholders (source: author)*

## Conclusion

The neighborhood of Bukit Duri has several typical and specific problems in terms of flooding (disaster). The interventions that are proposed in the neighborhood are defined based on its particular character of the problems while also considering the degree of vulnerability to flooding. Moreover, modification of space to accommodate future needs is also taken into consideration by locating the development on the specified areas.

Each of the interventions is mainly referred to the project approaches, which are infrastructure performance, human-nature engagement, and development (spatial) transformation. The approaches that are used on this project also have key-distinct layers in which the implementation of the design will take place. Moreover, the interventions are also sheltered by the foundation of new-proposed policy as an addition to the existing system of governance.

Furthermore, the stakeholders who are responsible for taking the actions are addressed in the scheme of collaboration which allows interaction between multi-level actors. By introducing a new interaction among stakeholders, there is a possibility to adopt a more innovative and relevant intervention in the neighborhood.
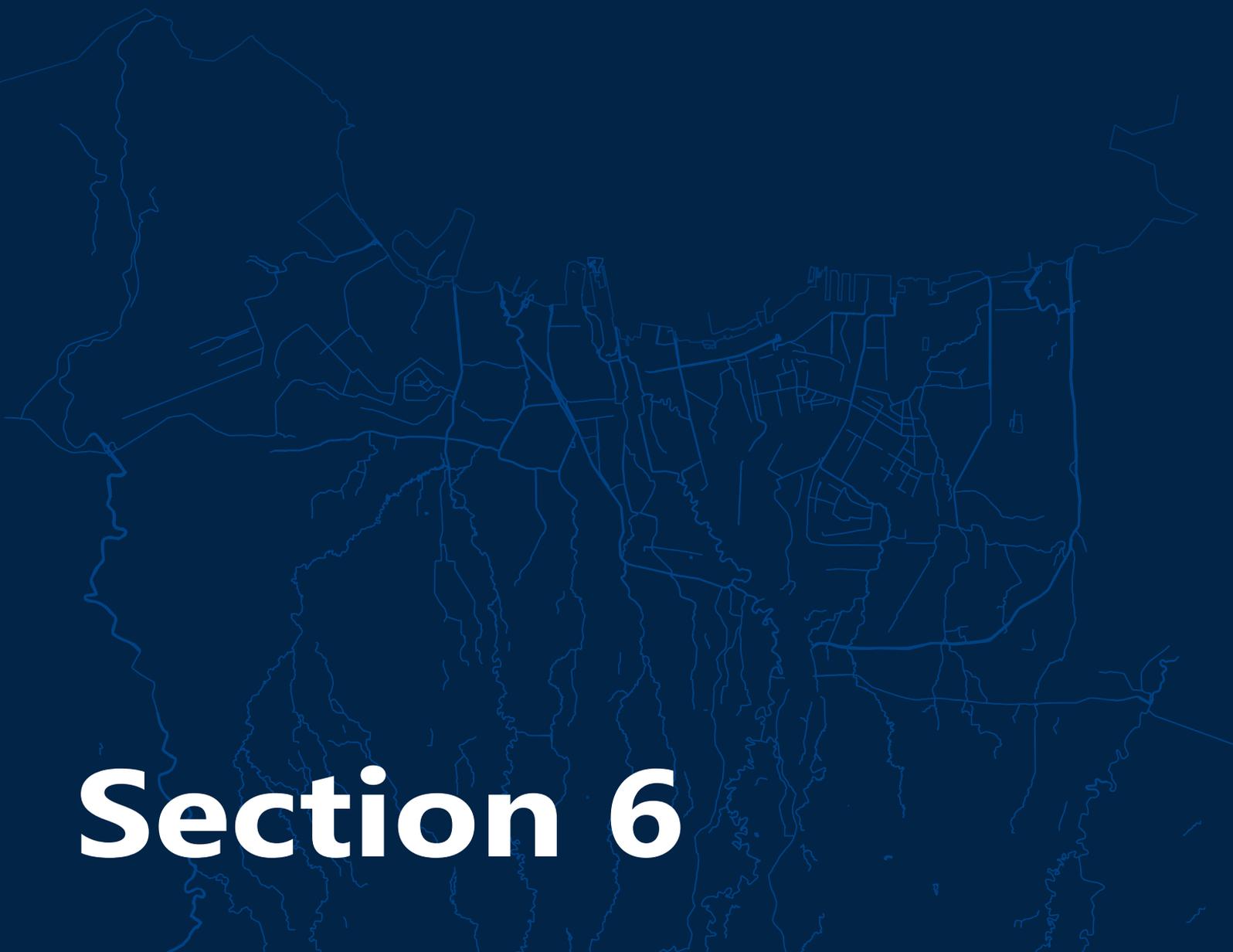
# Section 6

## Design Guidelines

mixed-use
activity

centralized waste
collection

public
workshop

evacuation center
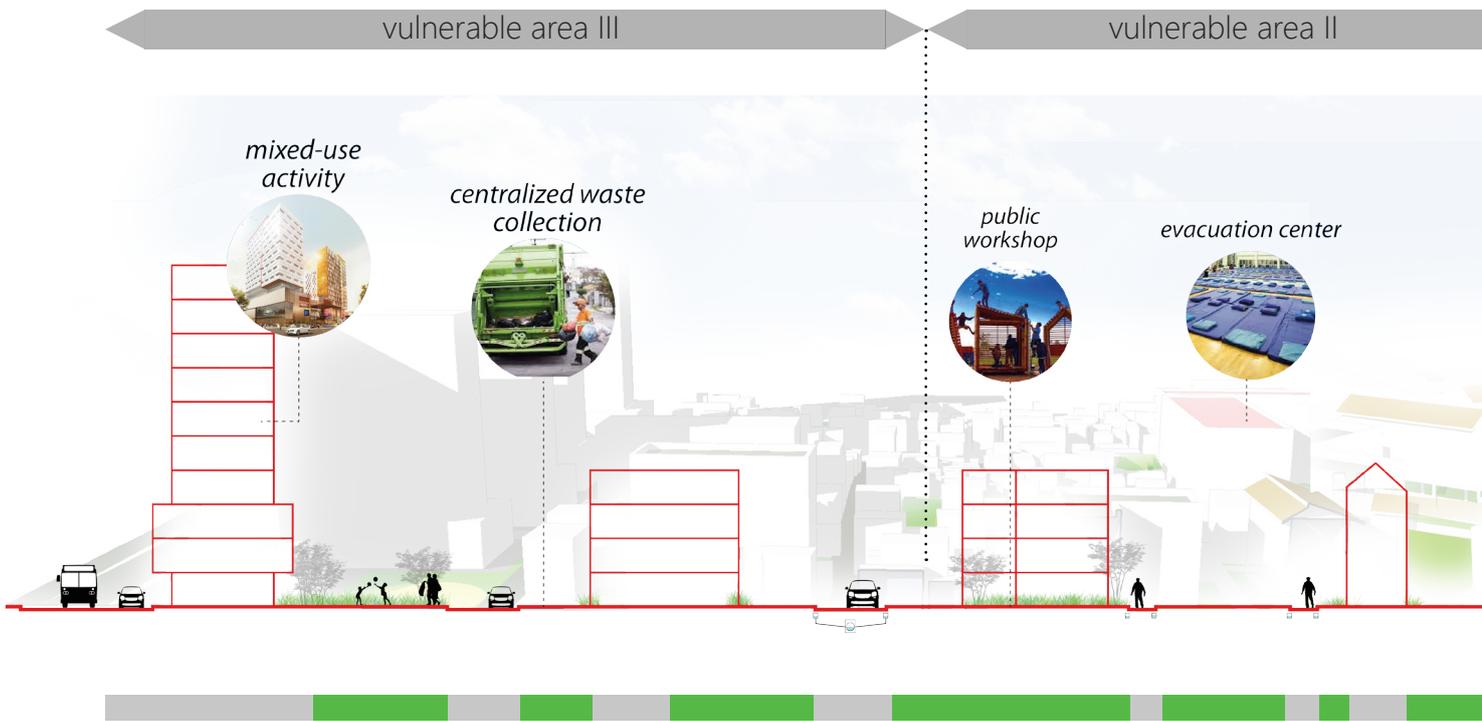
*Diagramatic section of Bukit Duri shows different development character based on vulnerable areas*
*(source: author)*

*Proposed plan for Bukit Duri neighborhood*
*(source: author)*

flood detention pool — local public space — directive path — communal self-defense — active promenade — flood water pump

a  main evacuation zone

b  community headquarter

c  school building - alternative evacuation zone

d  wood workshop zone

e  alternative evacuation zone

f  evacuation and resettlement zone

g  community center

h  thematic waterfront zone

i  mixed-use building (rental housing-office-commercial use)

j  train depot

☐  vulnerable area I - permeable area

☐  vulnerable area II - evacuation zone

☐  vulnerable area III - future development

## Spatial Framework

Each different area in the neighborhood is proposed by different development character which suggests different approach to mitigate the flooding. The section drawing (S'-S") shows the typical illustration of three different areas in terms of its spatial quality. The right part of the section explains area I in which the proportion of green space is allocated more to mitigate the water when the flooding occurs. This permeable area has formed by consolidating land plots to build an elevated co-housing building which allows absorption of the water on the ground level. Moreover, the introduction of new type of open space in this area is enhanced by combining engineered-functional infrastructure with the public space, for instance, the recreational detention pond.

Area II which is less vulnerable than area I is preserved as evacuation zone which is closely reachable from the flooded area. Hence, there are several evacuation buildings are located in this area to provide early mitigation of flooding. This area is also supported by a direct connection of city infrastructure network, such as sewage system, electricity, and water system.

*Development framework map*
*(source: author)*

| | |
|---|---|
| ![green] | water frontage development |
| ![pale yellow] | low density development (60% greenspace) |
| ![yellow] | medium density development (40% greenspace) |
| ![dark yellow] | high density development (20% greenspace) |
| ![pink] | high density commercial zone |
| ![cross hatch] | local economy cluster - woodcrafting |
| ![light green] | infrastructure boundary transformation zone |
| ![white] | government area |

Area III is defined as the safest area in terms of flooding as this area is highly connected to city infrastructure more than other areas. Properties of the household in this area are predominantly legal and formal that the support of infrastructure properly exists. Spatial transformation in this area is focused on the initiation of green public space within several clusters of households to build relation between the inhabitants and the environment.

Moreover, in the accommodation of future challenge of population growth, several blocks are preserved for the construction of mixed-use buildings which contains rental housing, office, and commercial function.

*Development Framework*

The first layer of implementation is defined by the development framework which contains direction of the transformation of specified blocks in the neighborhood. Intentions of mitigating flooding have been shown by reconfiguring interface between neighborhood and the water. This reconfiguration is manifested on the waterfront by putting some vegetations and permeable pavement. The reconfiguration of this interface will naturally reduce the magnitude of flooding which comes from exceeded river water.

Certain proportion of green space has proposed on each different zone to improve the capacity of mitigating flooding while also bring more relation of human-nature in the neighborhood. In area I, the allocation of green space is higher than other areas considering its need to absorb water as fast as possible. The installation of green space within this area also accommodates the need of communal space for workshop, recreation, and daily activities. Moreover, some wood workshop buildings in area I are also transformed into a more flood-proof building that reduce vulnerability to flooding.

Area II has been defined as the supportive zone in which several evacuation buildings and neighborhood headquarters are located. The spatial transformation on this area is proposed by modification of existing decayed buildings and slight configuration of plots. Moreover, revitalization of existing public space is the main highlight on this area.

Future development of the neighborhood is allocated on area III which is considered as the least vulnerable area to flooding. Benefitting from the high connection of city infrastructure, the development of this area is designed towards more complex-mixed function typology. Increasing number of neighborhood population will be accommodated on this zone by providing rental housing which can be managed by a joint-collaboration between public and private stakeholders.
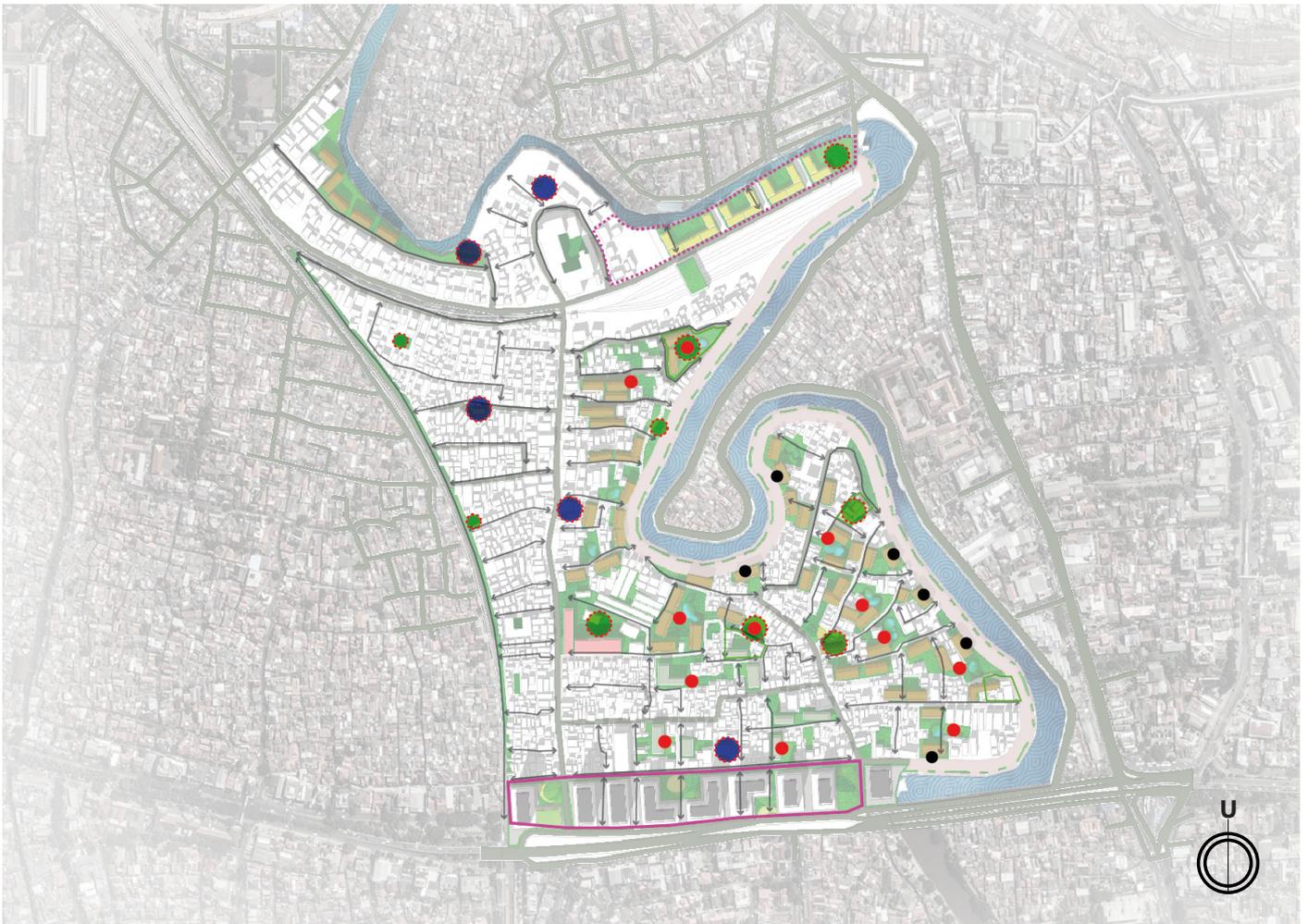
*Open-space framework map*
*(source: author)*

- • waterfront cafes+groceries
- • neighborhood groceries
- • green public spaces
- • community meeting point
- ⋯ local workshop+showroom
- ▭ high-scale commercial

*Open-space framework*

Addition of green space in the neighborhood has been proposed by defining some public-communal spaces. To create more natural exposure to the neighborhood, the green space has been located in between buildings where there are some casual activities happening. These green-public spaces are also defined as the evacuation zone once the flooding occurs that are reachable in a close distance by the inhabitants. Moreover, the aim of reaching high proportion of permeable space is also translated by installation of vegetations and permeable pavement within the area.
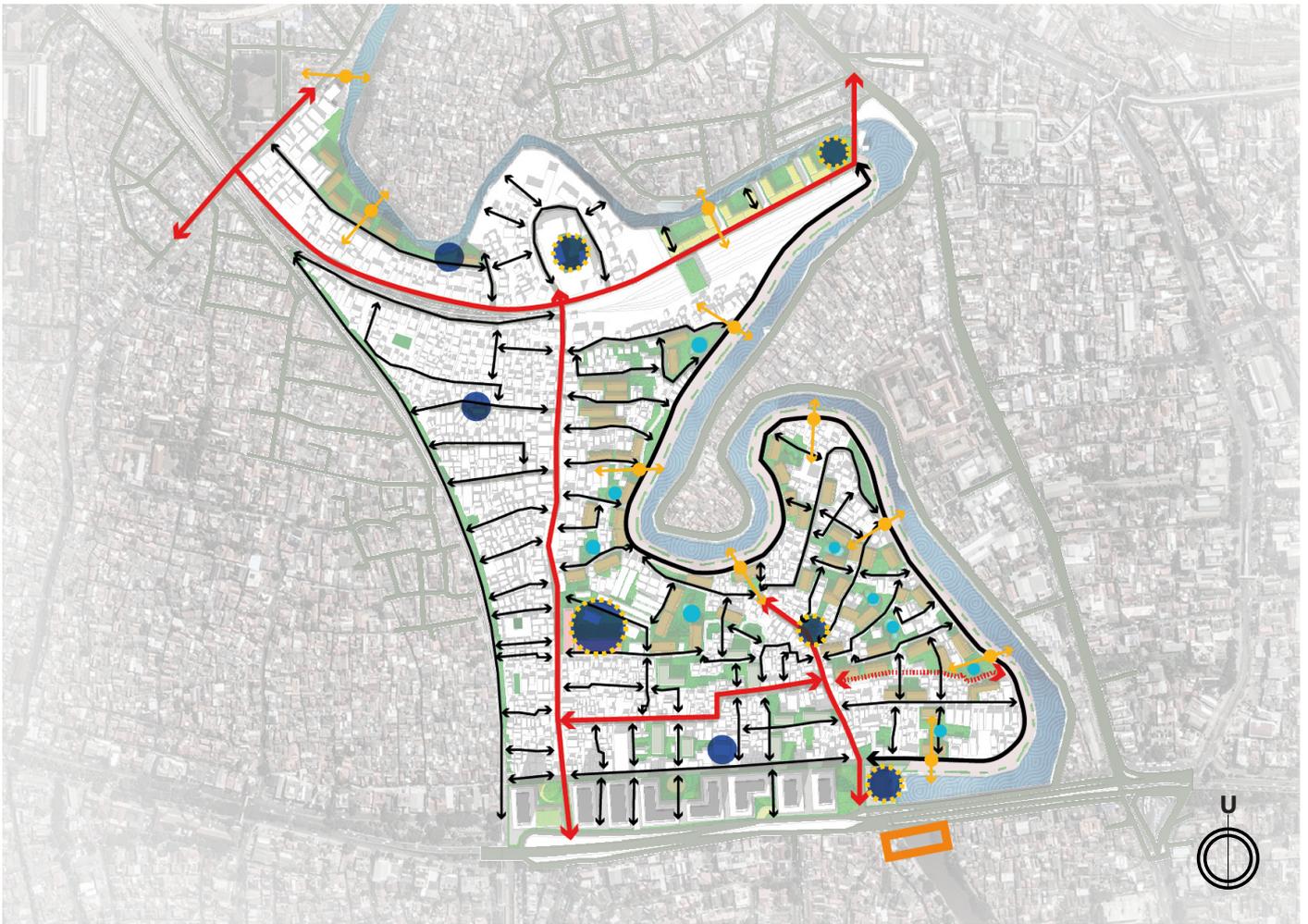
*Flood infrastructure framework map*
*(source: author)*



proposed evacuation points

existing evacuation points

proposed new floodgates

water detention point

flood pump location

*Flood Infrastructure framework*

Installation of infrastructure in the neighborhood are defined based on the vulnerable area. Several existing facilities are improved to support the whole system of flood mitigation. Moreover, there are also some proposed facilities that is defined by modifying its existing function. For instance, the old-decayed building on area II is transformed into a functional facility for resettlement and flood evacuation. This intervention is supported by the scheme of public-private partnership (PPP) in which the owner of the building will also get benefit from redevelopment. For instance, the owner of the properties will get tax production of the properties.

Within area I, the intervention to mitigate flooding is manifested by initiation of several detention ponds which aims to mitigate and absorb flooding water in a more natural way. This engineering infrastructure is combined with the open-public space for the inhabitant to accommodate daily activities.

Furthermore, an interconnection of local infrastructure to the broader system is initiated by defining main and secondary line of infrastructure network (red lines). Based on the mapping and spatial analysis of Space Syntax, these defined-lines has certain degree of integration both in neighborhood scale and wider scale. All those defined lines are working as infrastructure backbones for the neighborhood which support the performance of the local system.
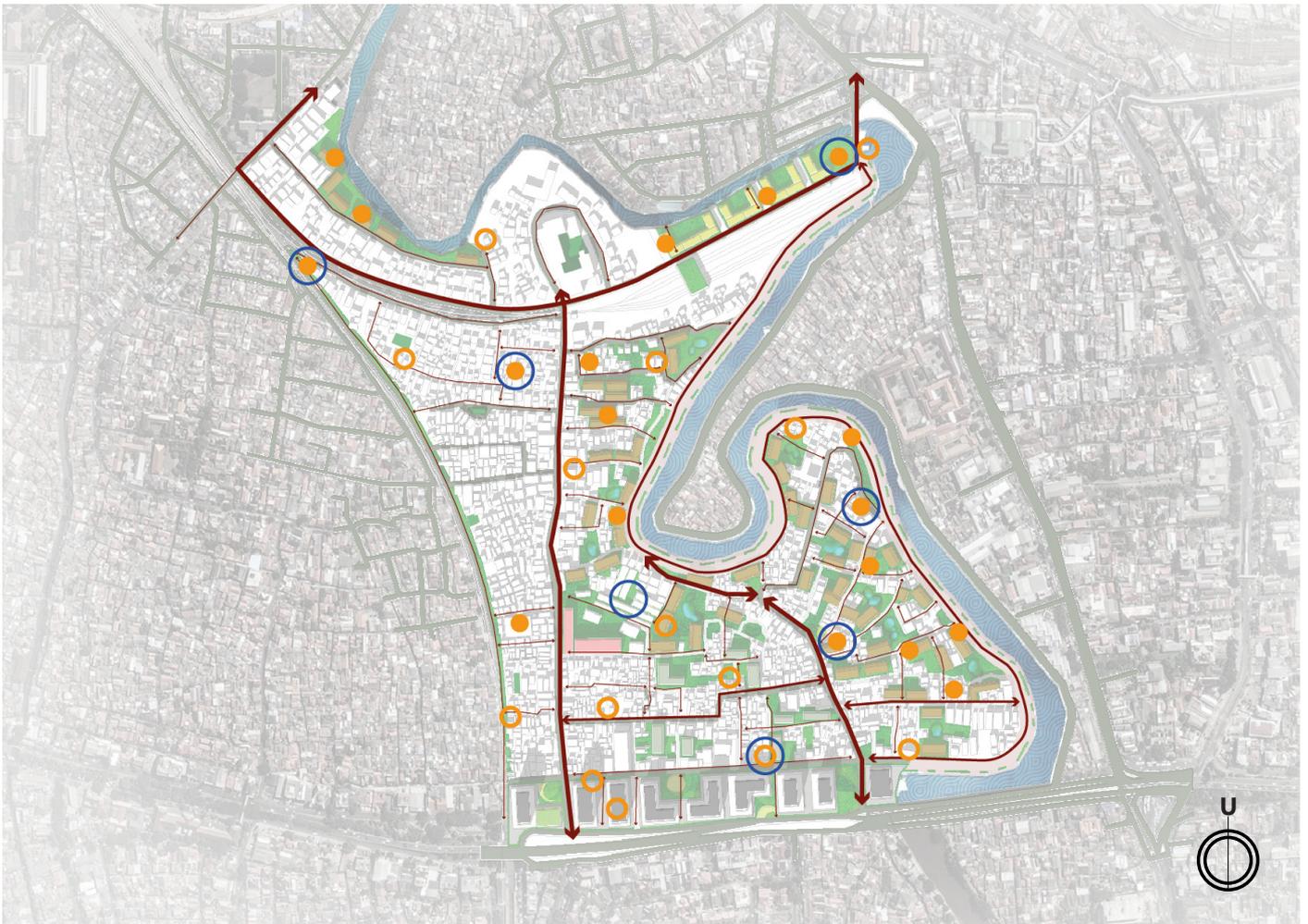
*Basic infrastructure framework map*
*(source: author)*

○ existing facilities (public bathroom)

● proposed facilities (public bathroom)

○ proposed facilities (waste collection point)

— carrier line

*Basic Infrastructure framework*

Lack of infrastructure provision in the neighborhood is tackled by proposing a network of basic infrastructure, such as waste collection points, public bathroom, and water facilities. The facilities are connected to the carrier line to support mobility of materials and resources. Most of the facilities are located in area I where is currently lack of infrastructure provision. Moreover, the new-proposed facilities will support the mitigation of flooding (disaster).

Co-housing pattern

Active waterfront
pattern

Flood-proof workshop pattern

COMMUNAL STORAGE

SHOWROOM

TO NEIGHBORHOOD

RIVER

Thematic waterfront pattern

RIVER

Recreational detention
pond
pattern

Educative infrastrcture pattern

HOW
TO

HOW TO
PUMP?

RIVER

WC
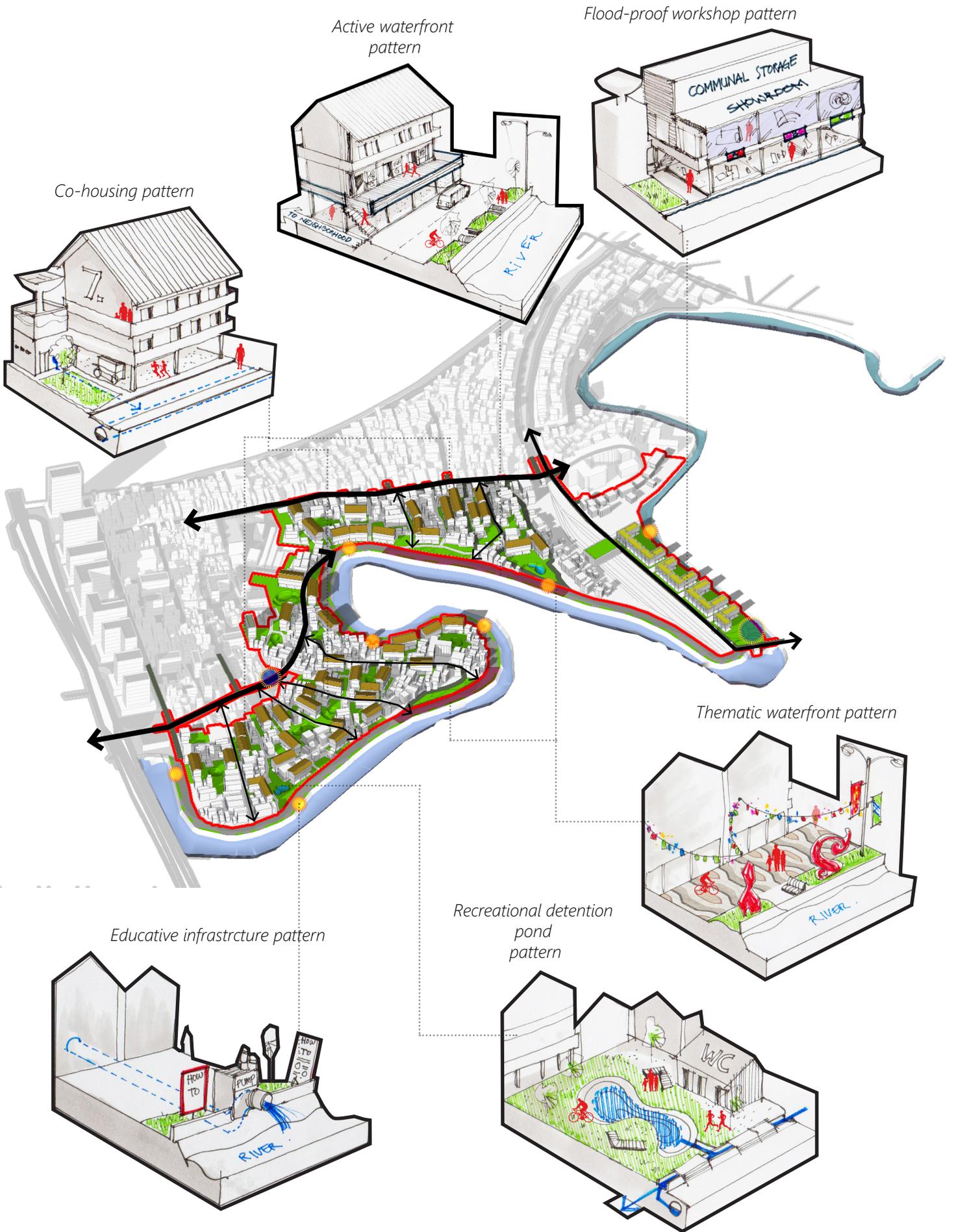
Explorative design of area I and its applied design patterns
(source: author)

## Design Exploration + Patterns

Some design patterns are proposed to tackle the specific problem that each vulnerable area have. In area I, there are 6 (six) main design patterns that conclude the approaches of infrastructure performance, human-nature engagement, and development transformation.

- Co-housing pattern: this pattern explains the transformation of housing typology while also introduces new system of land ownership. To provide more natural space in the ground level, the building typology is formed as elevated housing consist of 4-12 households.

- Flood-proof Workshop pattern: this pattern suggests a transformation of existing local wood-crafting workshop by proposing elevated communal workshop area. Similar to the typology of co-housing, this typology of workshop building consists of 3-4 business units which together are sharing the communal workshop area.

- Active-waterfront pattern: to create more relation to the water, this pattern is introduced by initiating activities along the waterfront. For instance, by opening ground floor of the housing as open space and functioning commercial uses in several locations.

- Thematic waterfront pattern: intervention in the waterfront is defined by specific design of public spaces. Thematic waterfront pattern proposes initiation of activity in the waterfront that can build more interaction between the inhabitant and water.

- Recreational Detention pond: this pattern suggests the combination of engineered infrastructure provision and communal public space within the neighborhood.

- Educative infrastructure pattern: to build more sense of belonging to infrastructure facilities, this pattern is introduced as an interactive feature that invites the user (inhabitant) to learn the procedures of mitigation.

## Co-housing pattern
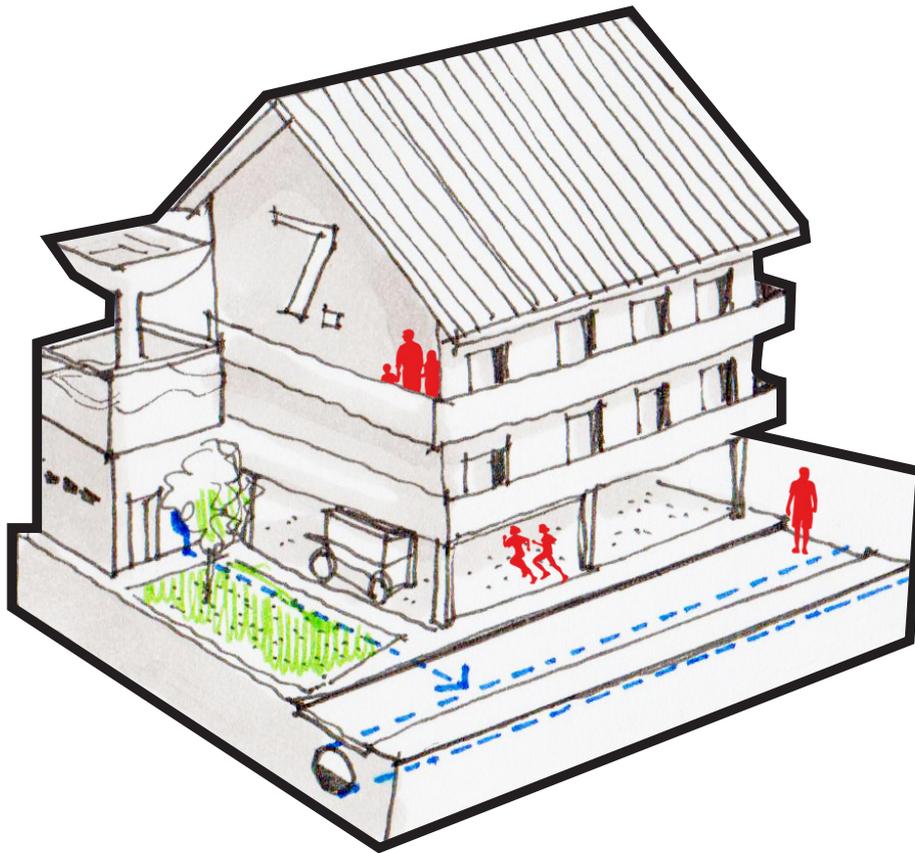


Rainwater harvesting and water treatment
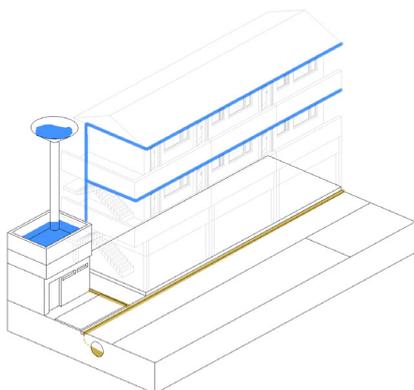
Storage space
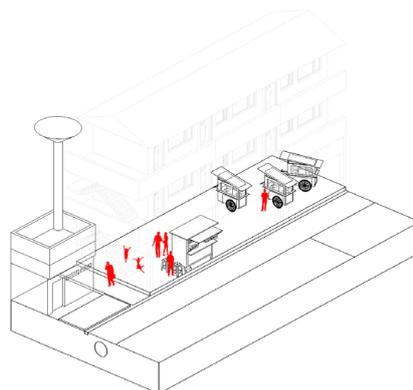
Communal self defense
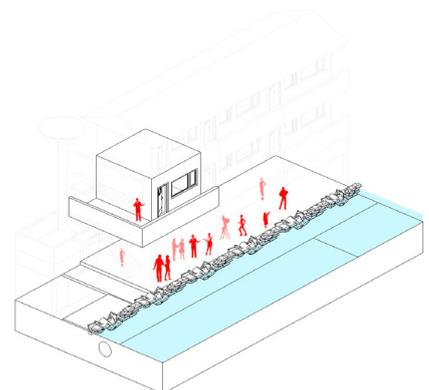
## Programs



*communal maintenance*



*rainwater harvesting*



*communal self-defense*



*storage*

*Patterns Details (Area I)*

The improvement of livelihood in the neighborhood is first proposed on the basic entity of household by organizing a communal housing typology to accommodate multiple families in one single housing building. The objectives of this pattern are to prepare a better adaptation to flooding by introducing several physical infrastructure and non-physical infrastructure. Moreover, the building is constructed by elevating the living space on the upper level to avoid destruction of properties caused by flooding.

New infrastructures of rainwater-harvesting and water treatment are introduced to provide the inhabitants with a proper and good sanitation of water supply. The connection to broader network of infrastructure, for instance sewage system, is enhanced by connecting every co-housing building with the sewage channel.

Daily activities such as social gathering and workshop are accommodated in a designated space on the ground level. Initiation of open space also triggers a more intimate interaction among the inhabitants which shares the activities communally. As an addition, the space on the ground level can be utilized as the storage for carts, workshop utilities and any other business properties which predominantly used by the inhabitants.

## Active waterfront pattern



Ground floor activation

Initiation of anchor activities such as kiosk and taverns

## Programs



*active promenade*



*groceries and/o cafetarieas*



*groundfloor public space*

Initiation of new type of public spaces is also introduced on the waterfront by initiating a lively promenade along the river of Ciliwung. Together with the shared open space on the housing's ground level, the interface between neighborhood and the river is formed as active space which can be used as daily leisure and also other casual activities.

The activation of the promenade consists of additional installation of public furniture, such as bench and signage, as well as lighting. An improved quality of the space along the river projects to a better relation between the human (inhabitant) and nature (river). Furthermore, the activation of promenade is also supported by the additional functions of kiosk and taverns in which people can do gathering and use the space.

**Flood-proof workshop pattern**
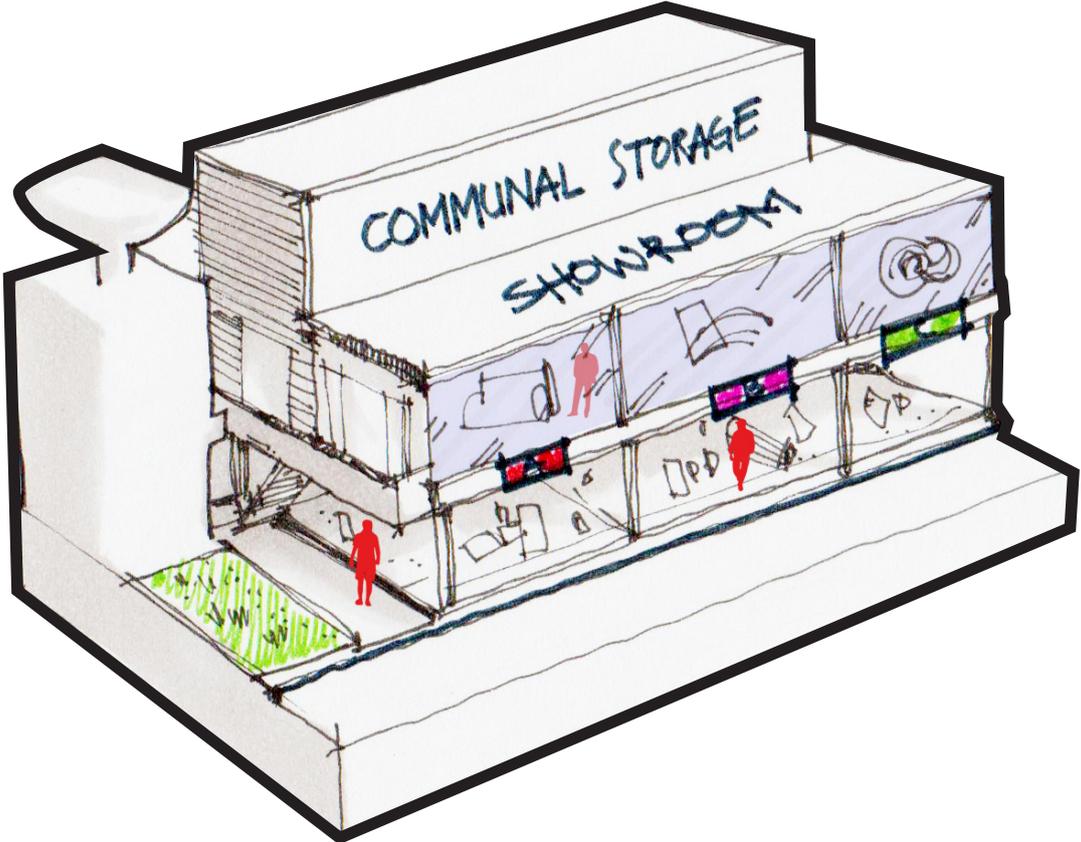




Shared workshop space on the ground level

Shared storage

Showroom space communally used for exhibition
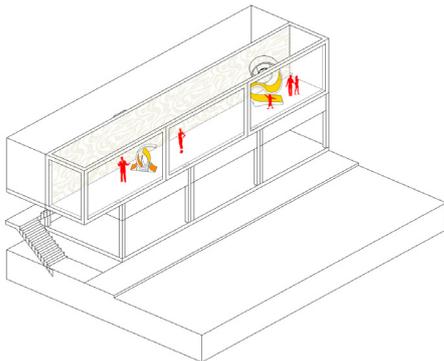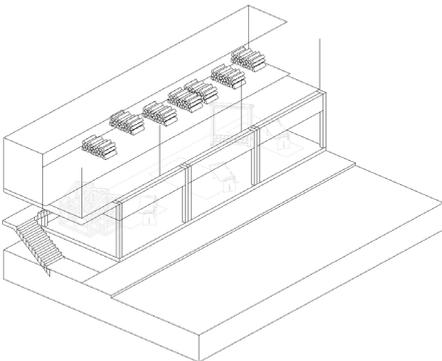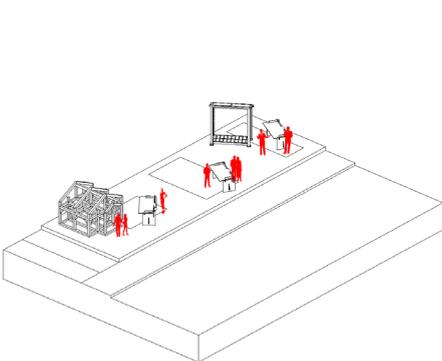
**Programs**



*open workshop*



*showroom*



*communal storage and resources*

Intervention to safely improved local wood-workshop business is developed by introducing new typology of communal-elevated workshop building. Elevated space on the second level is constructed to avoid destruction of the properties, resources, tools and most importantly the artwork. Shared utilization of ground space as communal workshop area mainly aims to improve sense of interaction among user (worker) which also contributes to the shared maintenance of the properties.

Shared space for resources storage is provided to perform a more legible management of resources for the workshop. Furthermore, the system of communal utilization of resources will also avoid any informal supply within the cycle of production and consumption which may disturb selling the market. In addition, the function of showing off the artwork is accommodated on the shared-exhibition space where the buyer/consumer.

## Educative infrastrcture pattern
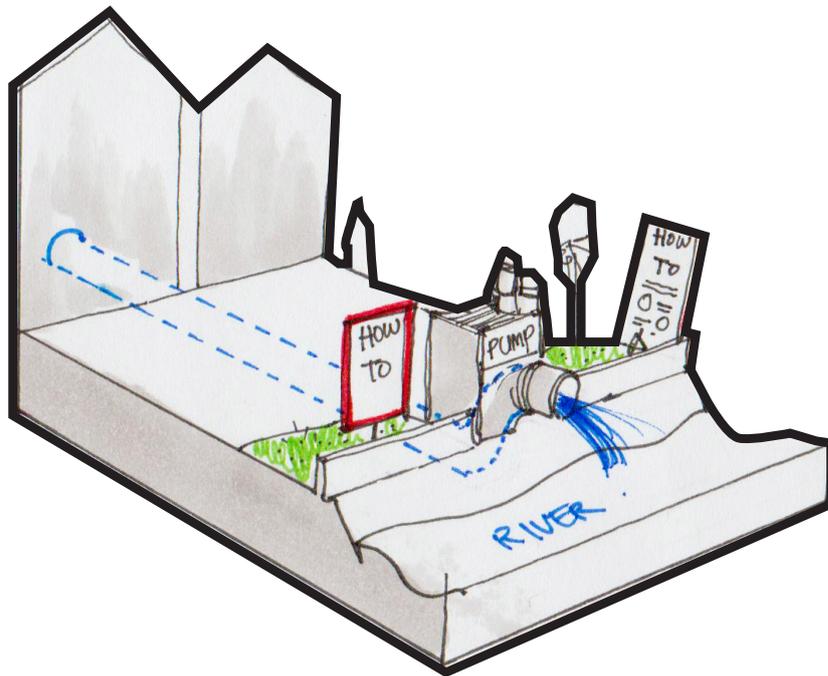


Interactive utilization of the machine
builds a sense of belonging to the facility
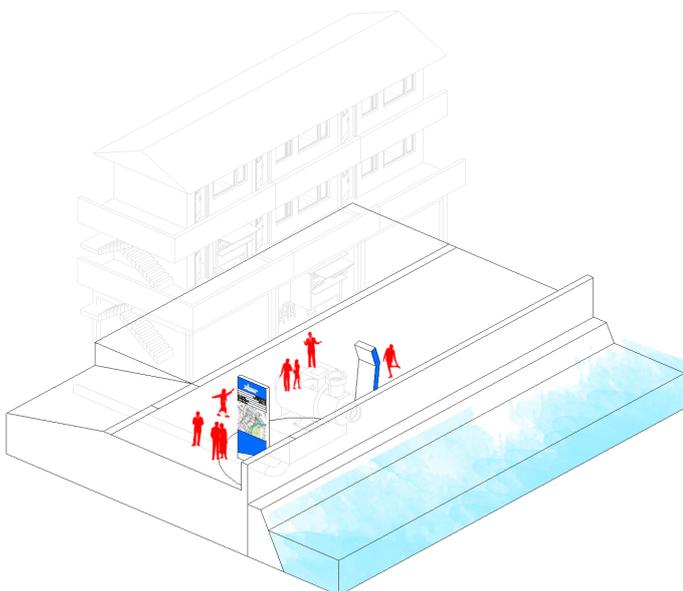
Direct mitigation of flooding is supported by using flood
pump to reduce the flooding water as fast as possible
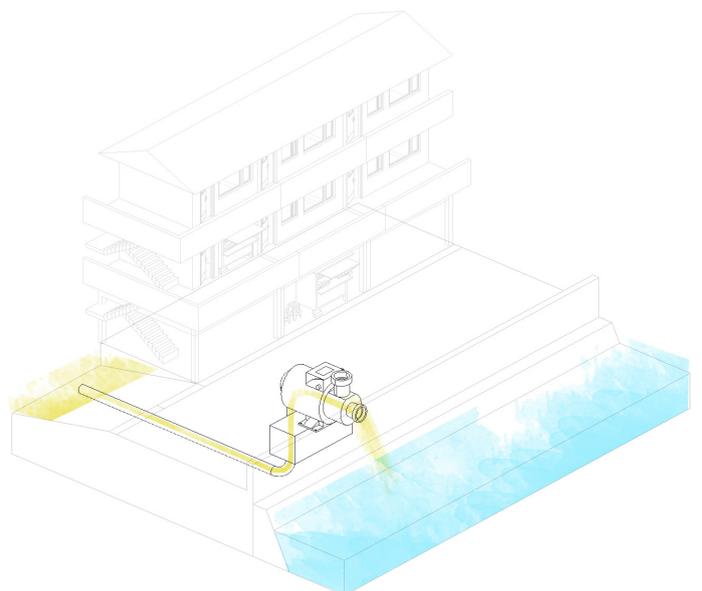
### Programs

**flood water
pump**

**interactive
installation**

**flooding
mitigation**

Additional infrastructures are installed on several locations to increase capacity of flooding mitigation. Water pump that connects the neighborhood and the river helps to reduce the water level within neighborhood as fast as possible during the flooding occurrence. Practically, the utilization of the pump cooperates with the warning system from the municipality that it is efficiently actives during the flooding.

Moreover, the introduction of new infrastructure is followed by invitation to the inhabitants to communally manage and maintain the machine. To create sense of belonging to the infrastructure, water pumps are also formed as an interactive installation in which the user or inhabitants can learn to use and utilize.

## *Recreational detention pond pattern*
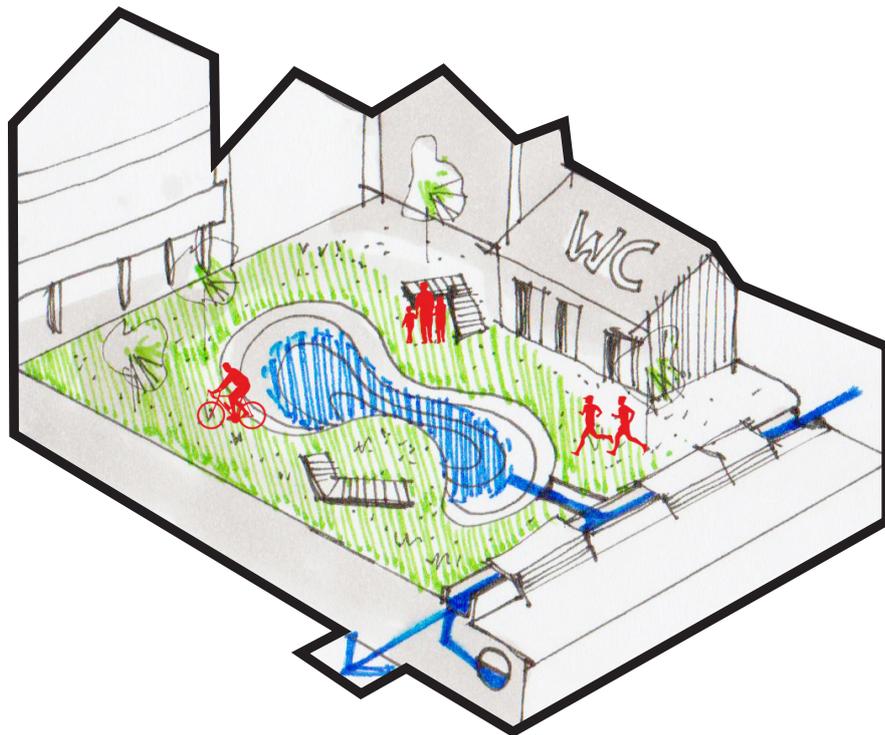


*Engineering infrastructure of detention pond which can be used also for recreational space*

*During the wet season and flooding this infrastructure naturally filtrate the water to ground layer*
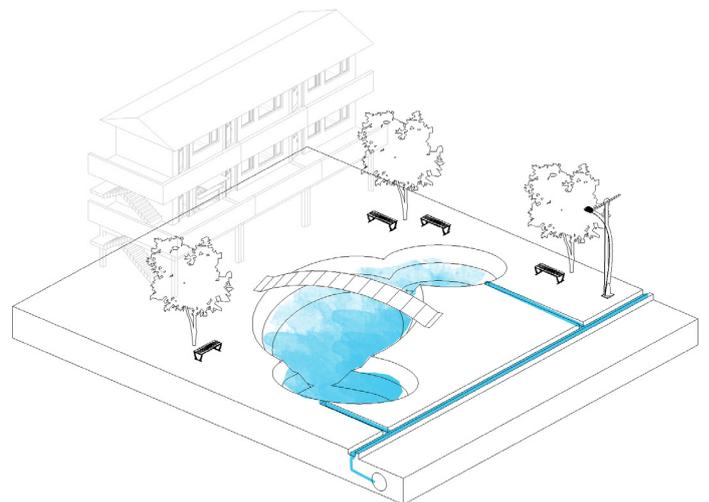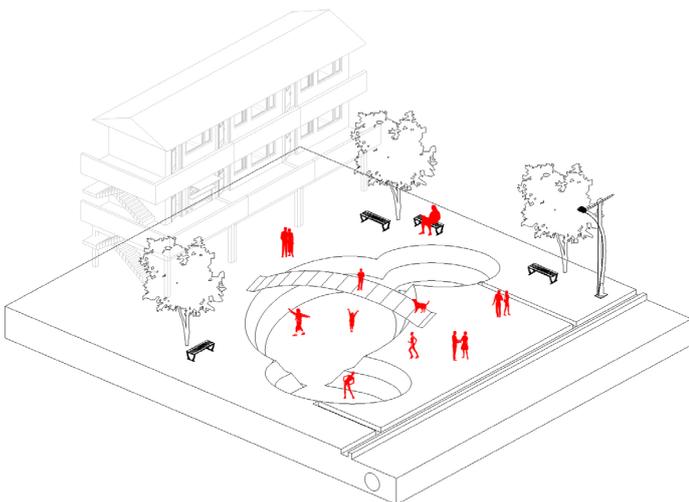
**Programs**



*flood retention pool*



*local public space*



*urban farming*

The issues of flooding are also managed by introduction of detention pond which can store the water during the flooding and naturally filtrated the water into the ground. A connection of the detention pond to the city network of infrastructure also enhances the capacity of fast-recovery during flooding event.

In a dry season, this infrastructure can be used as public space for any activities and leisure. Moreover, lack of active space within the neighborhood is also tackled by this new typology of open space which can accommodate more functional and casual activities, such as local market and urban farming.

## Thematic waterfront pattern
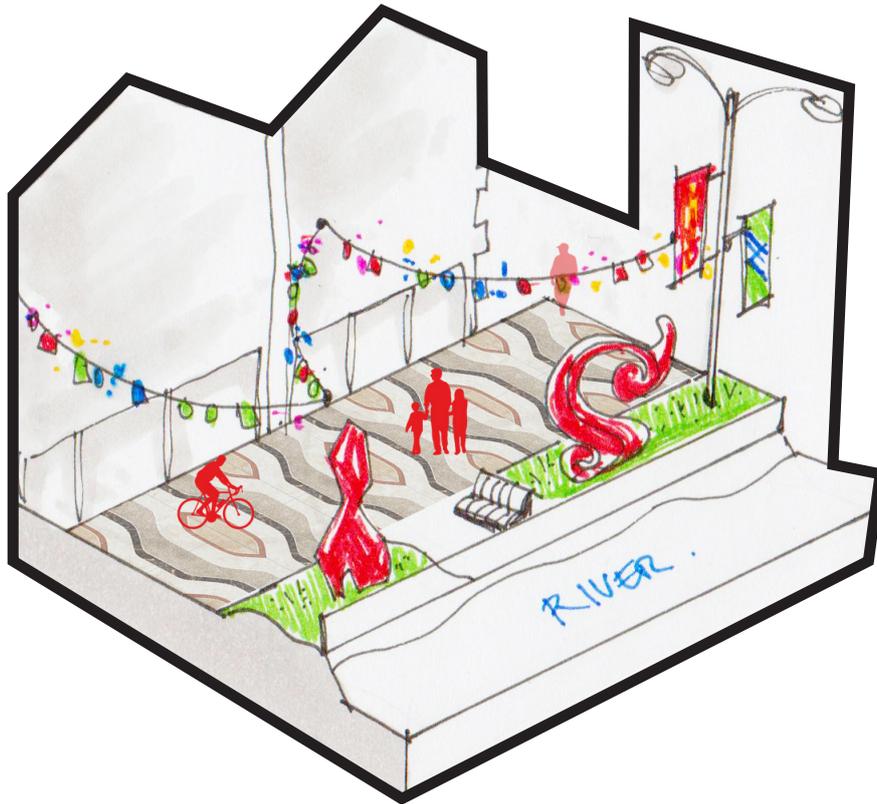


*Festive activities accommodated on this pattern to revive the existence of public space*
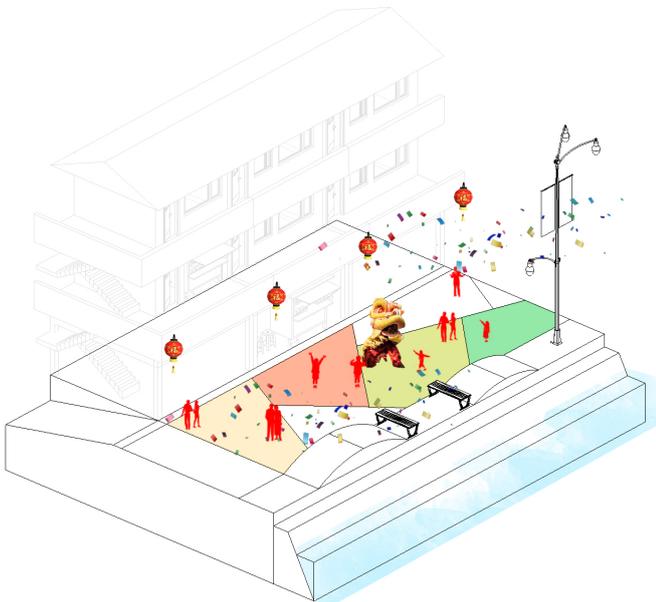
*Public installation along the space creates more interactive activities*
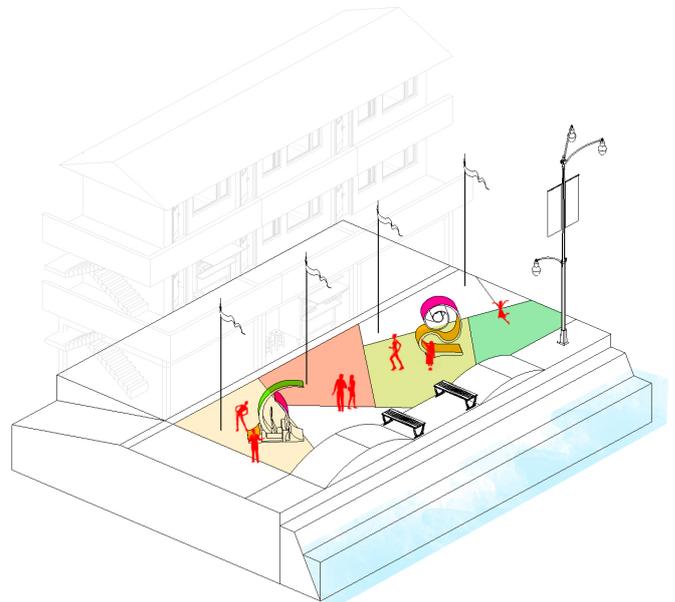
### Programs



**waterfront
festival**



**public
installation**



**'Kerja Bakti'**

Thematic activities on the waterfront are proposed to increase a better relationship between neighborhood and nature.  Several defined locations along the river are designated to accommodate festive activities and recreational uses. Moreover, it enhances by the installation of thematic and vibrant pattern on the pavement. Accommodated spaces for public art installation are dedicated to licing activities along the space. Moreover, a program of *Kerja Bakti* (communal cleaning and maintenance) is proposed to initiate a sense of belonging of the inhabitants to the space.
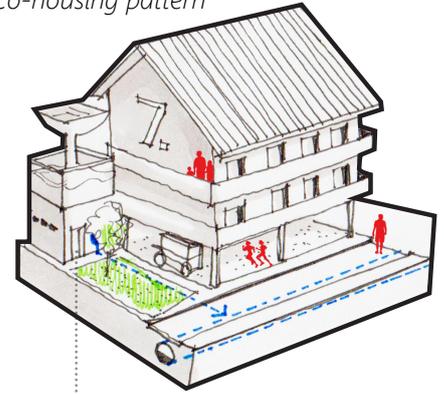
Open co-working space
pattern

Building transformation pattern
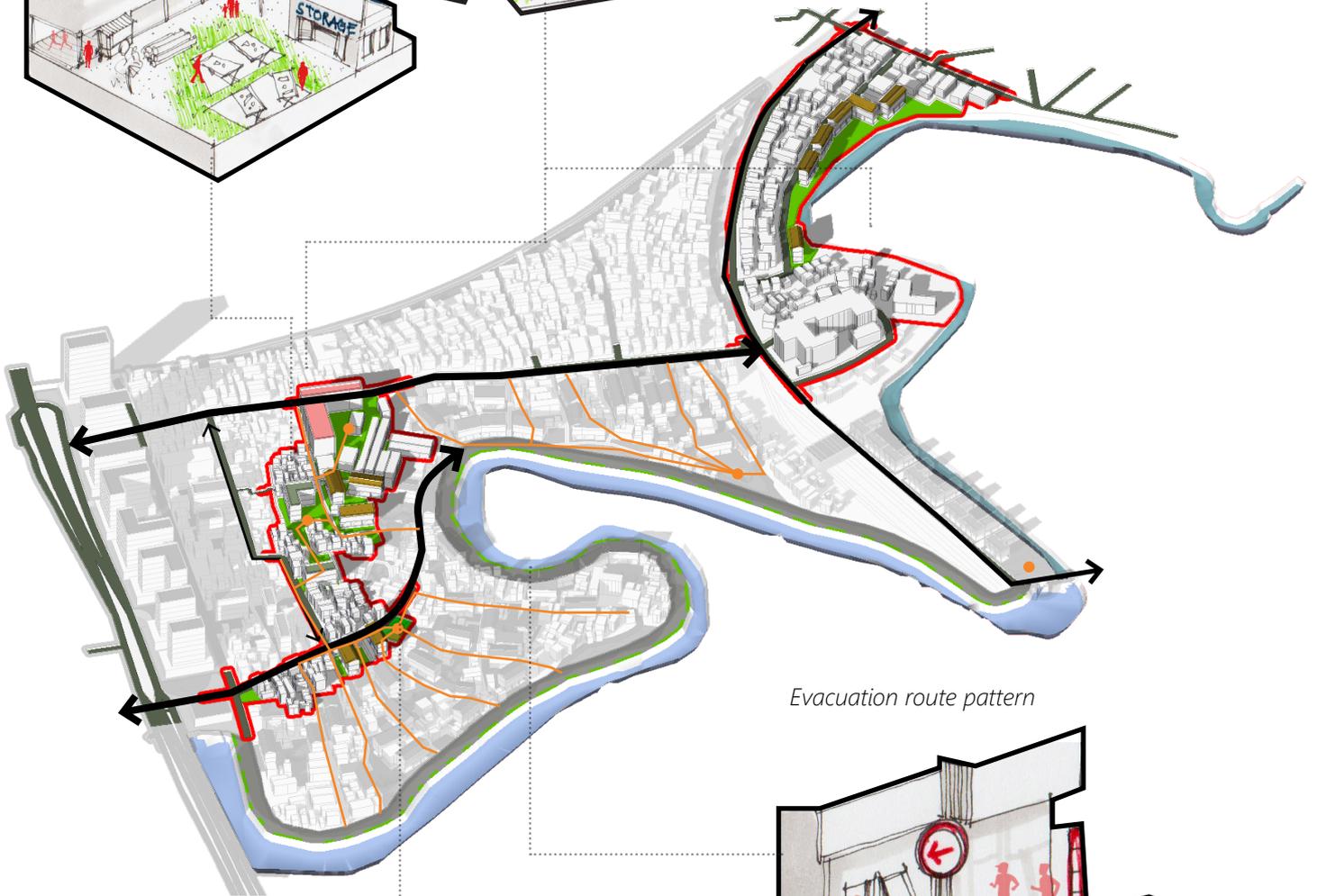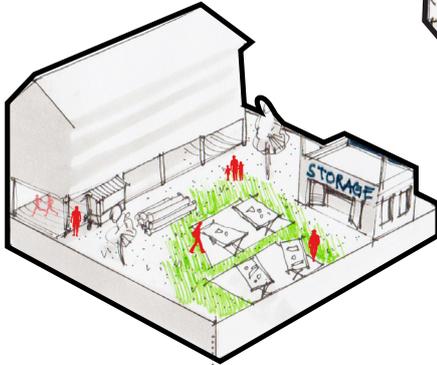
Co-housing pattern

Evacuation route pattern
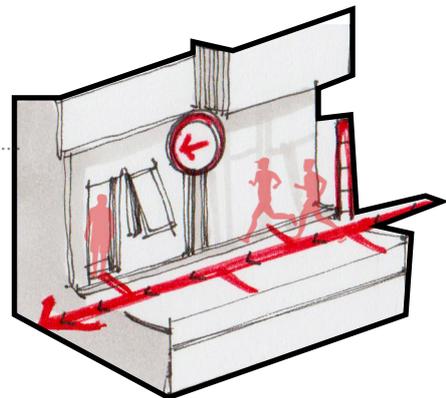
Evacuation zone pattern
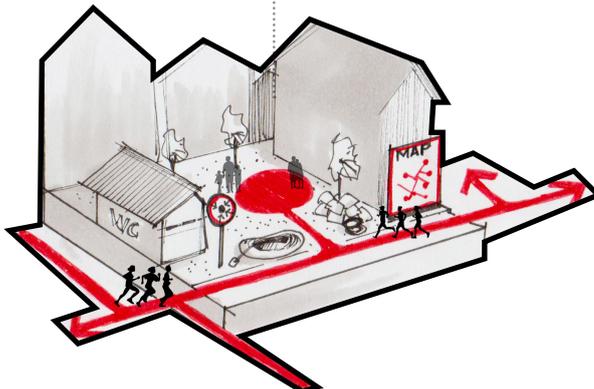
Explorative design of area II and its applied design patterns
(source: author)

Area II as transition zone possess 4 (four) main design patterns with additional co-housing pattern. Since this area is proposed as evacuation zone, the patterns exist in this area are mostly supporting the system of mitigation.

- Building Transformation pattern: this pattern suggests the intervention of adaptive reused of old-decayed existing building. This transformed building is preserved for evacuation zone and resettlement zone that functionally support mitigation of flooding.

- Evacuation route pattern: it explains the pattern of route evacuation in the neighborhood which is installed on the network of alleyways. The route of evacuation is connected to defined shelter locations within a close distance.

- Open co-working space pattern: this pattern addresses limited space for workshop and production activities by preserving open-space as the communal workshop area. As an addition, the shared-storage facilities are installed in this area that can be used by inhabitants.

## Open co-working space pattern
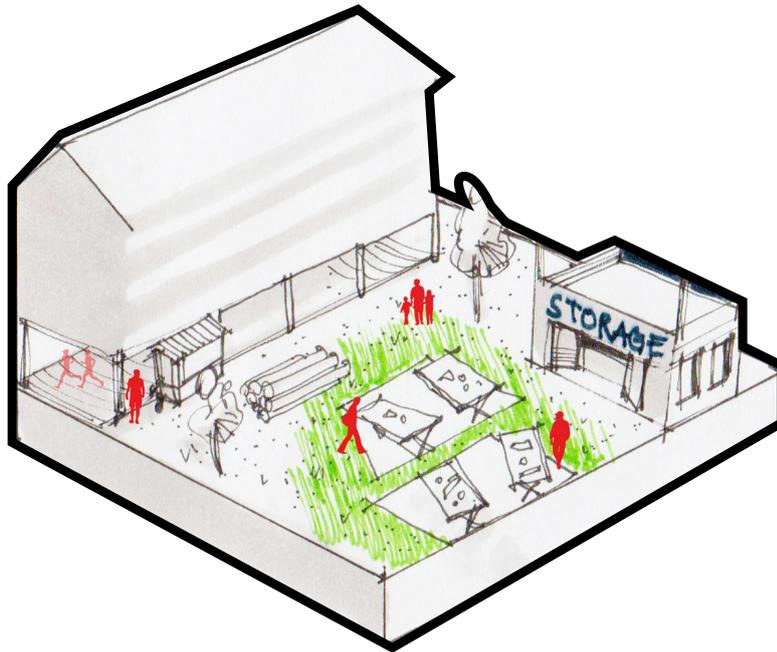


Communal shares of the space for workshop activities



Local market initiated on the space to contructs sense of belonging to the place
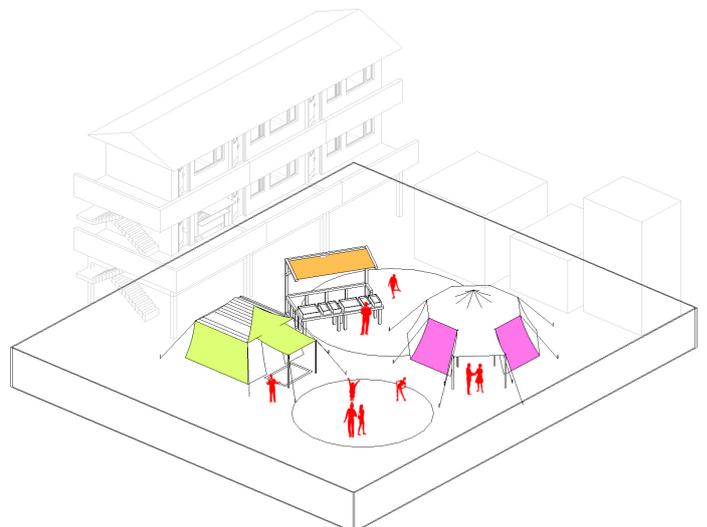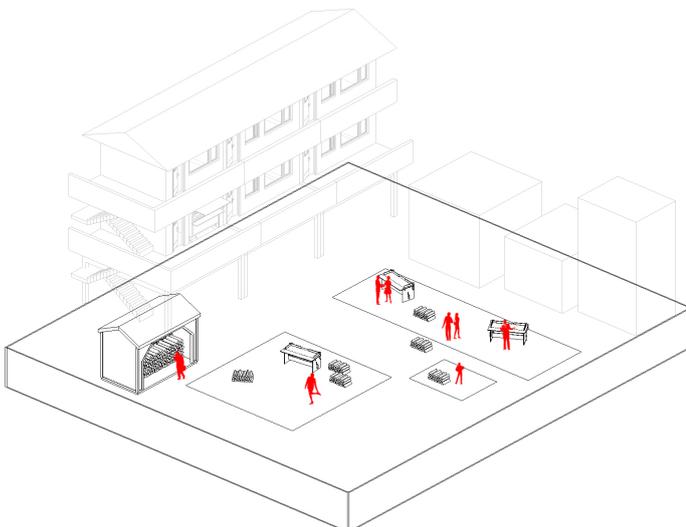
### Programs

**communal market**

**public workshop**

**communal storage**

Another active space within the neighborhood is initiated by introducing new communal working space which can be used by the inhabitants to expand their production space. This space mainly aims to accommodate multiple kinds of activities in a different layer of time. The communal usage of the space will create a more active interaction among the inhabitants which then leads to better social interaction. The local communal market is proposed on this space to initiate a sense of the place within the neighborhood which can sustain the activation of the space.

Moreover, shared storage accommodates number of logs and other resources which can be communally maintained and preserved by the inhabitants.

## Building transformation pattern
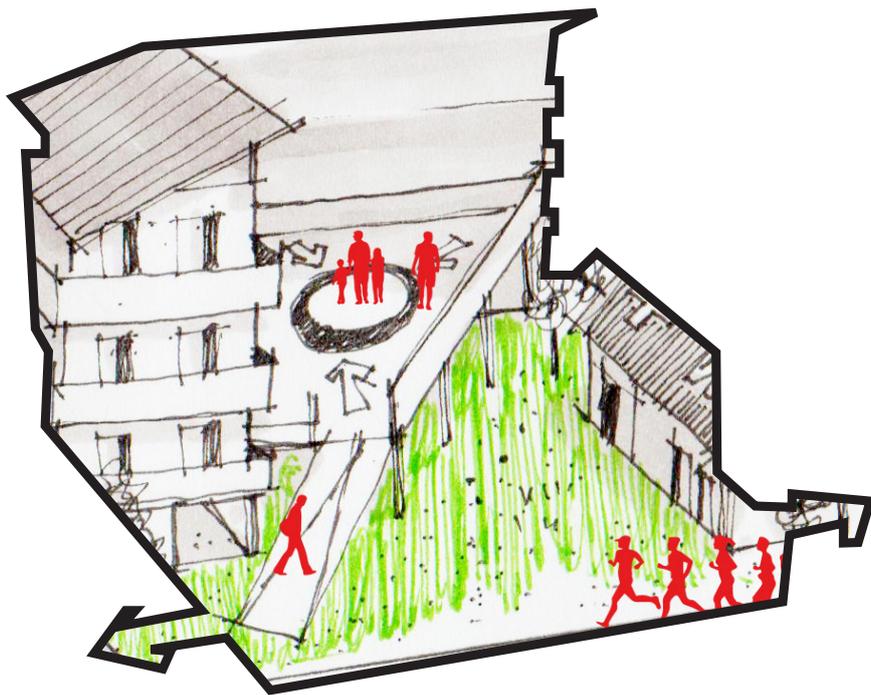


Temporary space for resettlement

Communal defense to flooding
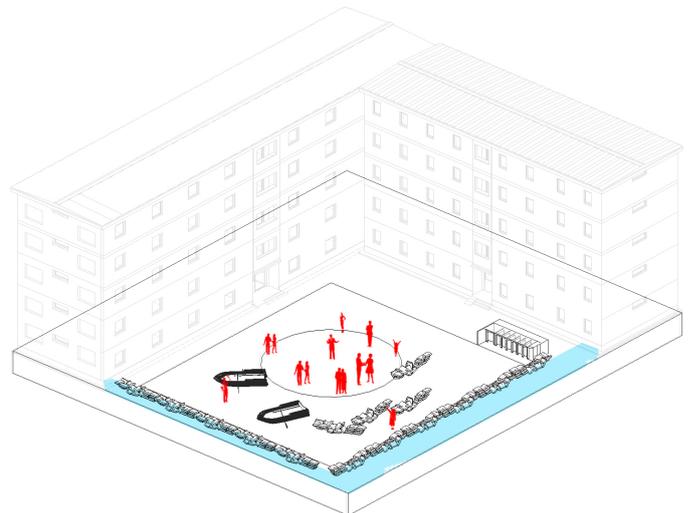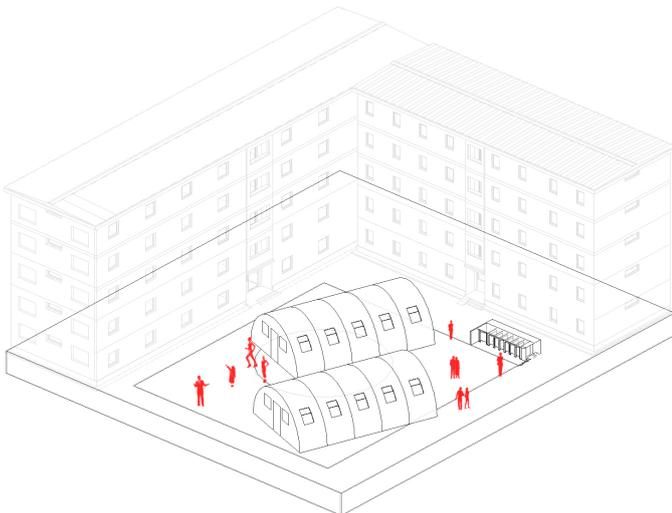
## Programs



### temporary resettlement



### evacuation center

Re-utilization of decayed buildings plays important role to provide more space for resettlement and temporary evacuation zone during the flooding. This pattern is proposed by initiating a scheme of public-private partnership between the owner and the authority (municipality) to utilize the building as a more functional uses. The main functions of this building are accommodating the temporal need of resettlement while also during the disaster can be shaped into an evacuation zone.

## Evacuation zone pattern
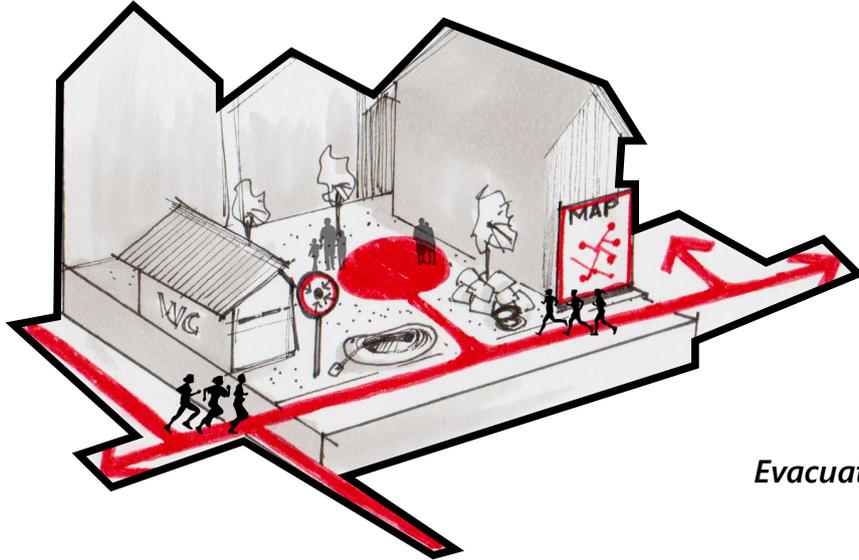


## Evacuation route pattern
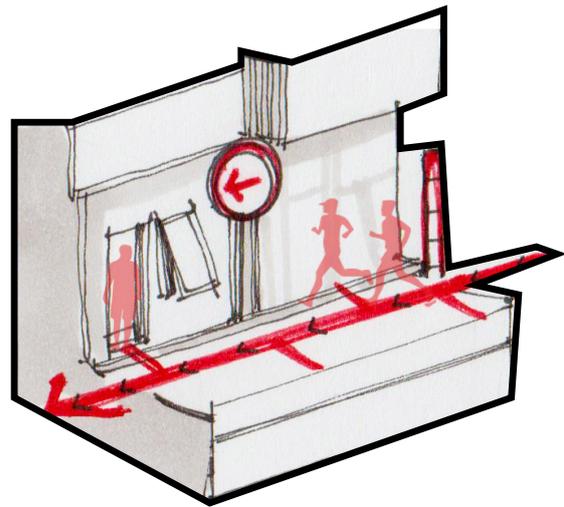


*Allocated space for evacuation zone*
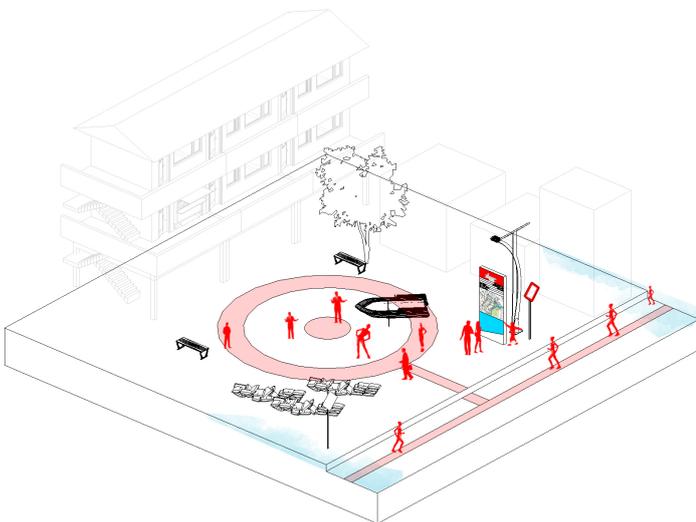


*Directional path on the alleys helps evacuation process*
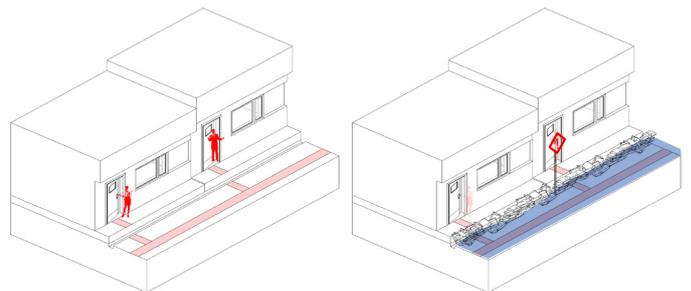
## Programs



flooding
evacuation



online early
warning
system



**FLOOD ALERT**
FLOODING IS POSSIBLE. BE PREPARED.

**FLOOD WARNING**
FLOODING IS EXPECTED. IMMEDIATE ACTION REQUIRED.

**SEVERE FLOOD
WARNING**
SEVERE FLOODING. DANGER TO LIFE.

flood mitiga-
tion signage



directive path



flood risk
meter

Along with the previous pattern of evacuation zone, this pattern is proposed to link the evacuation area with the existing fabric within the neighborhood, such as alleys, pathways. Directional path and signage along the network will help the inhabitants to evacuate during the disaster, especially flooding. The installation of flooding signage and evacuation map are distributed in the whole neighborhood to helps the inhabitants finding the closest evacuation zone within the distance.

*Active border
pattern*
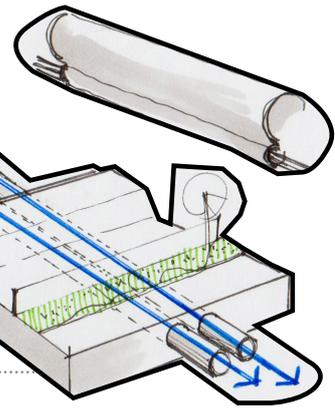
*Infrastructure network
connection pattern*
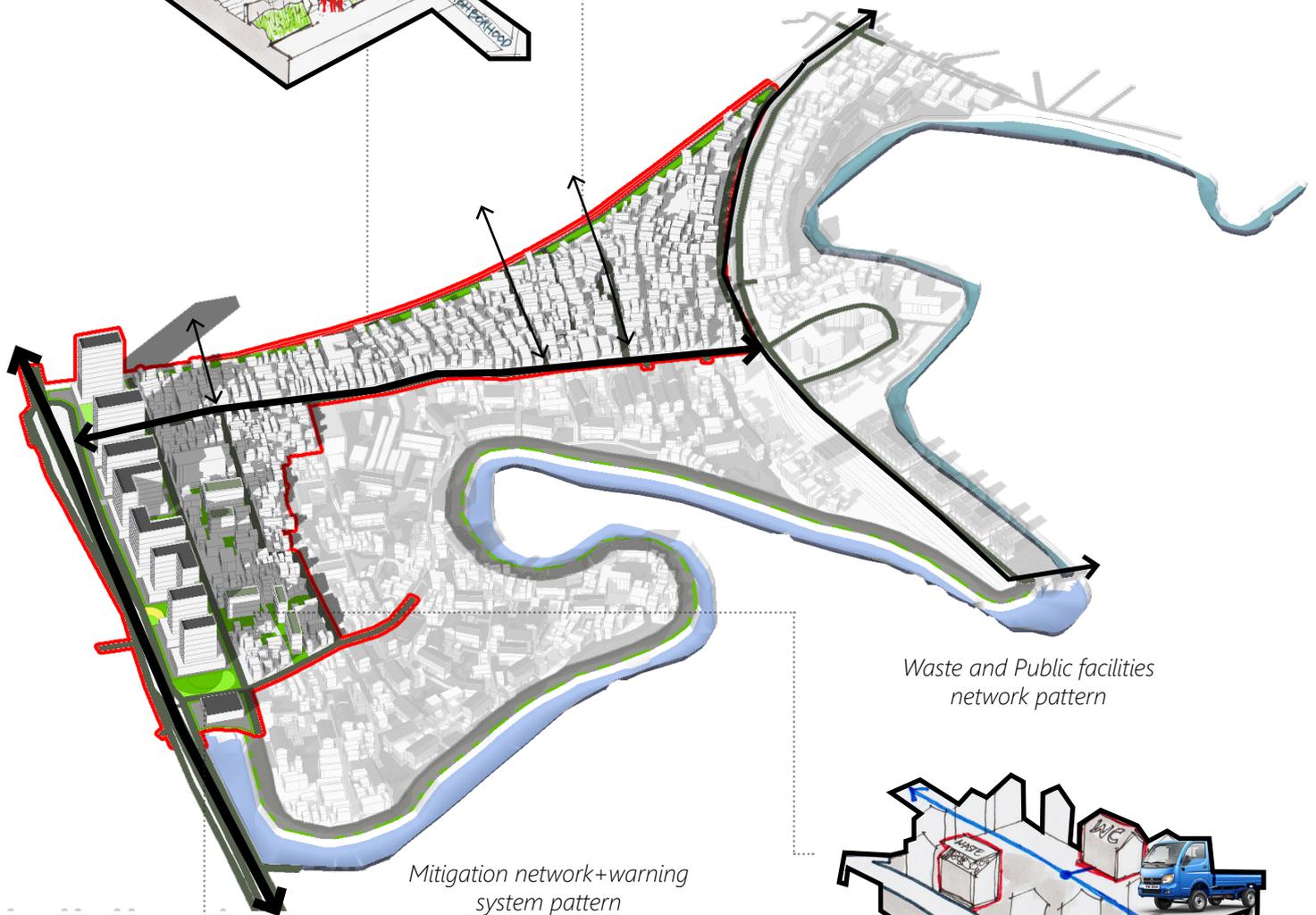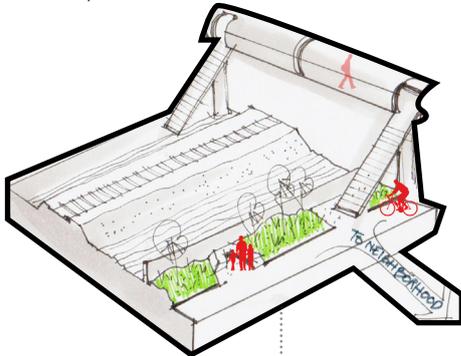
*Waste and Public facilities
network pattern*
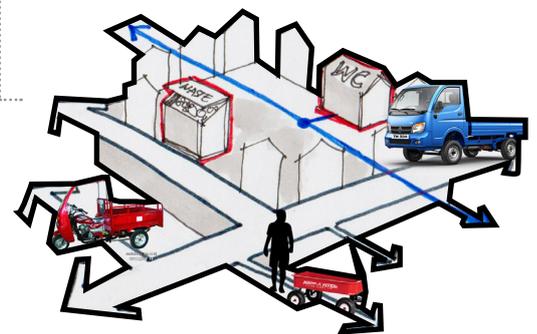
*Mitigation network+warning
system pattern*
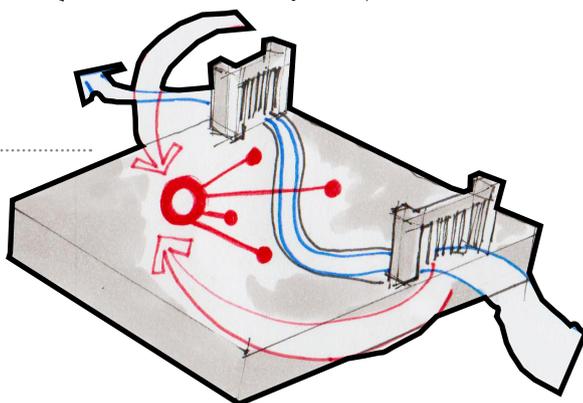
*Explorative design of area III and its applied design patterns
(source: author)*

Development character in area III will be defined by several patterns of infrastructure connection and improvement which support the whole system of the neighborhood.

- Active border pattern: this pattern defines the intervention in the border of infrastructure on the west side of the neighborhood. The existing negative space of the border has been transformed into more active space by providing shelter, vegetation, and pedestrian connection to the adjacent neighborhood.

- Infrastructure connection pattern: the connection of local infrastructure to city network is defined by this pattern which suggests engineering innovation of underground channel containing smart system of sewage and water.

- Mitigation network + warning system pattern: this pattern suggests a platform of mitigation system in the neighborhood which defines flow of information and early warning procedures. The operation of this pattern connects the existing and proposed evacuation zones with the floodgate facilities to provide real-time information of flooding (disaster)

- Waste and Public facilities network pattern: this pattern suggests a cluster of waste and public facilities within certain number of households. Each cluster of 10 (ten) households will be supported by at least one facility of waste collection and public facility (bathroom, clean water facility).

## Active border pattern
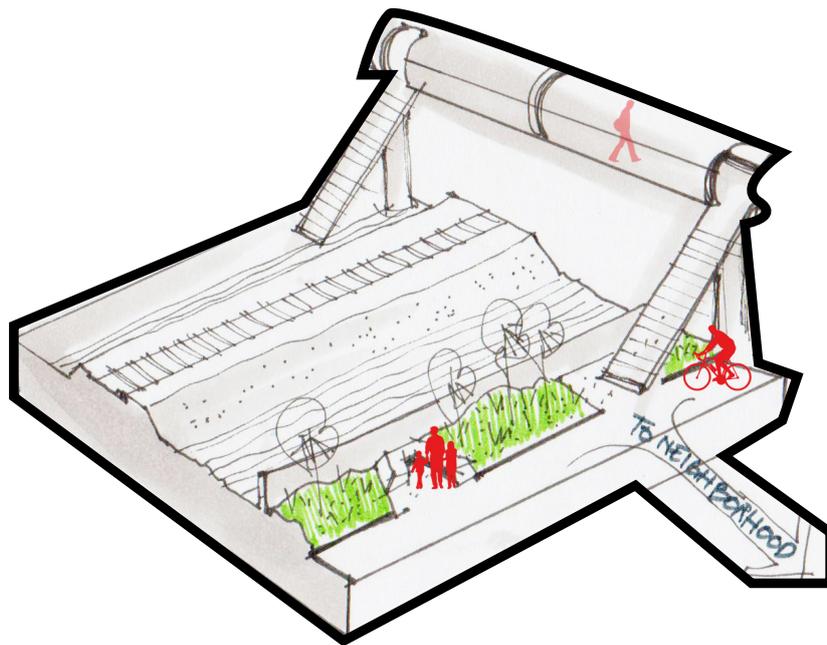


Activation of space along the border improves the spatial and social quality

Better connection from and to neighborhood is enhanced by installation of pedestrian bridge on the border
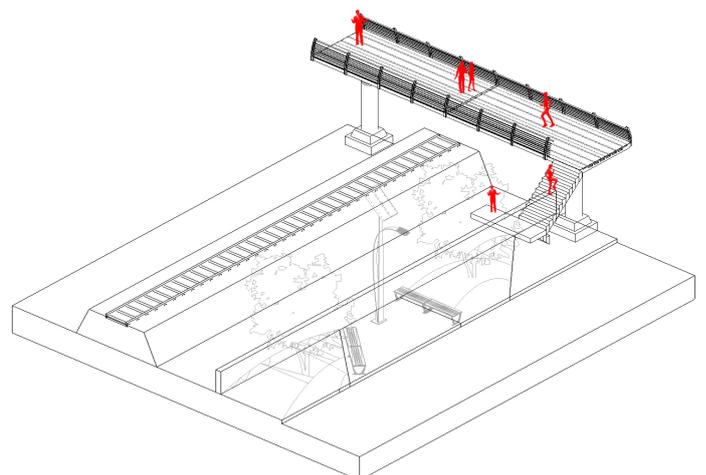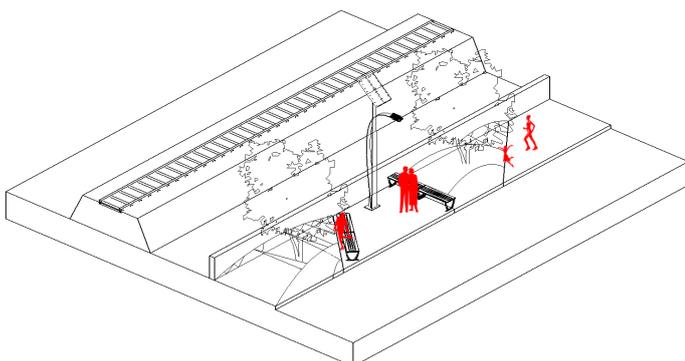
**Programs**



active open
space



pedestrian
connection

*Patterns Details (Area III)*

Retransformation of the border on the west area of the neighborhood is shaped by constructing new active public spaces that can attract people to perform any casual activities along the border. Furthermore, the improvement of spatial quality on the border will help reducing deterioration of the space which is still abandoned in the moment. Furthermore, proper connection between neighborhood and its adjacent area is enhanced by installing new pedestrian bridge for the people to cross the border of infrastructure safely.

## Infrastructure network connection pattern
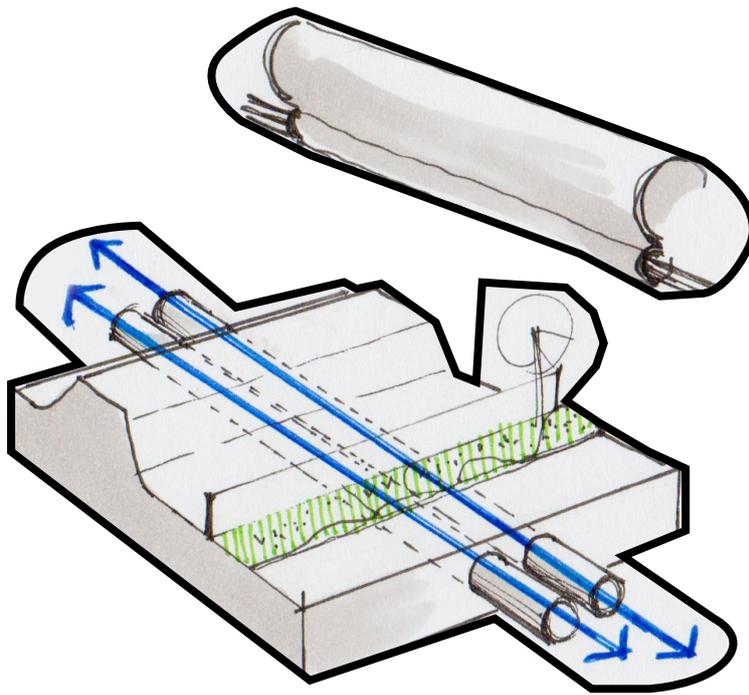


*Better connection of infrastructure is proposed by installing underground
and overground channel on the neighborhood border*
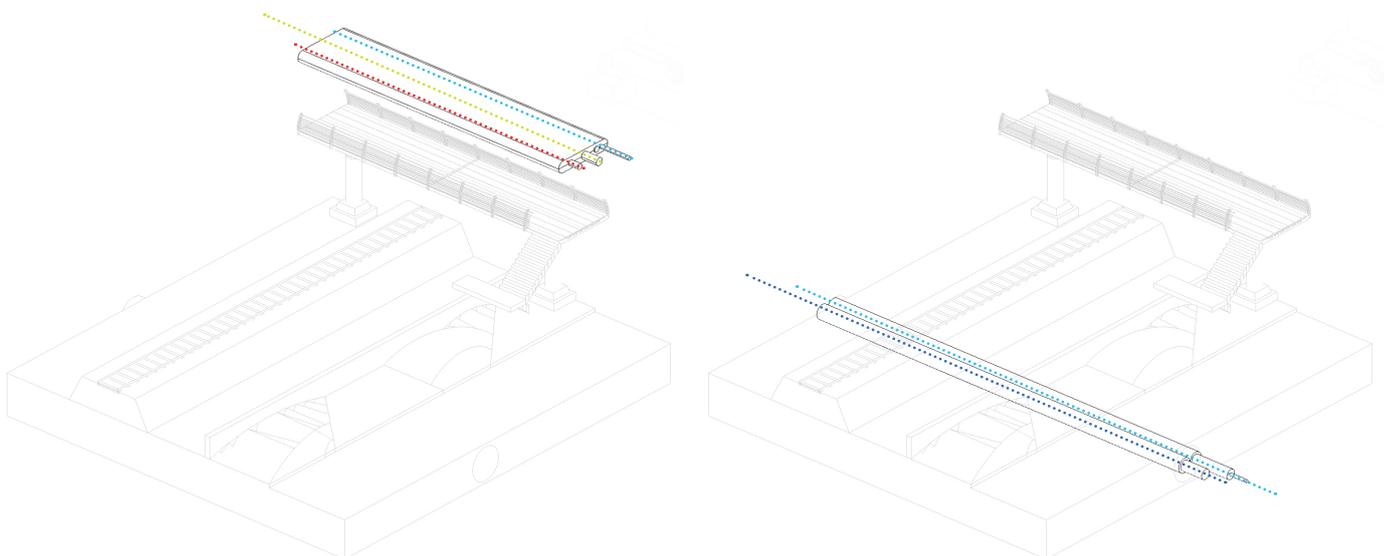
### Programs



*underground infrastructure connection*

Moreover, the connection of infrastructure network is also performed by proposing direct link by using underground and over-ground channel of infrastructure. This new connection of infrastructure will directly give the access to electricity, gas, and others necessary link.

## *Mitigation network+warning system pattern*





BBWSCC

*Warning system distributes flow of information directly from responsible authority to each group of households*

Municipality of South Jakarta

Flood Gate

H     H     H
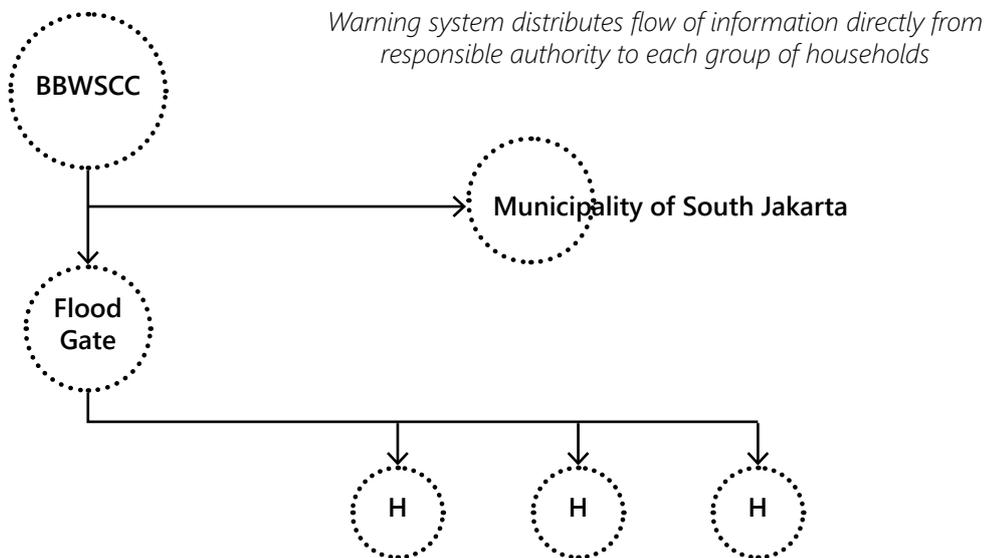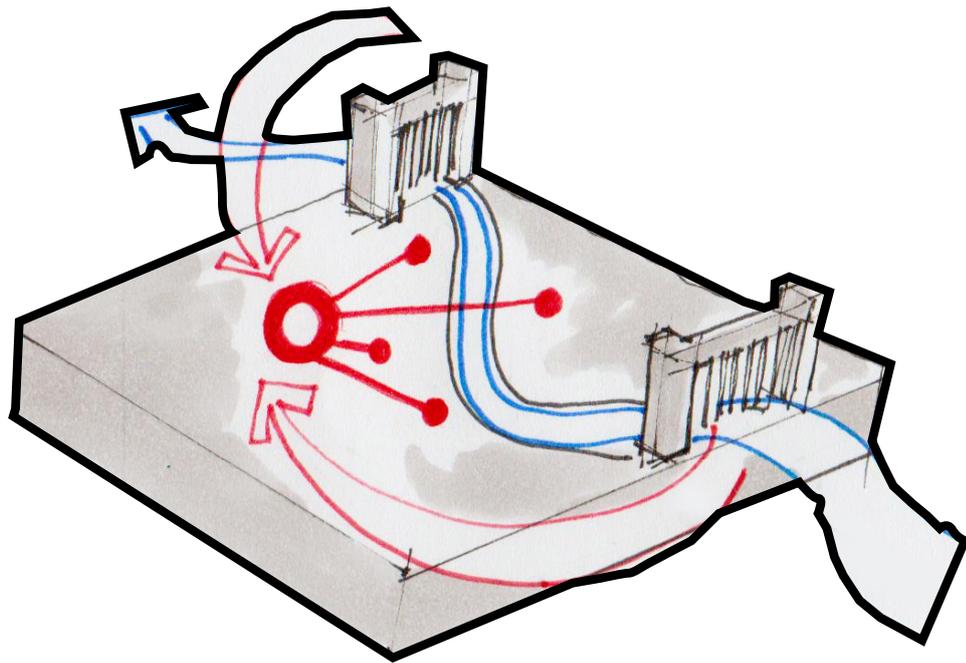
## Programs

### early mitigation system

### local-communal procedure

The most important system of flooding mitigation is the network of early warning system which manages the performance of infrastructure and coordination of stakeholder during flood occurrence. Invitation to local stakeholders, such as the leader of community and leader of *RT-RW*, is highlighted on the system of flood warning to manage the evacuation and mitigation efficiently. In the practice, each of the responsible local actor is connected to the flood gate installation which directs the flow of information among the actors more especially during the disaster.

*Waste and Public facilities
network pattern*
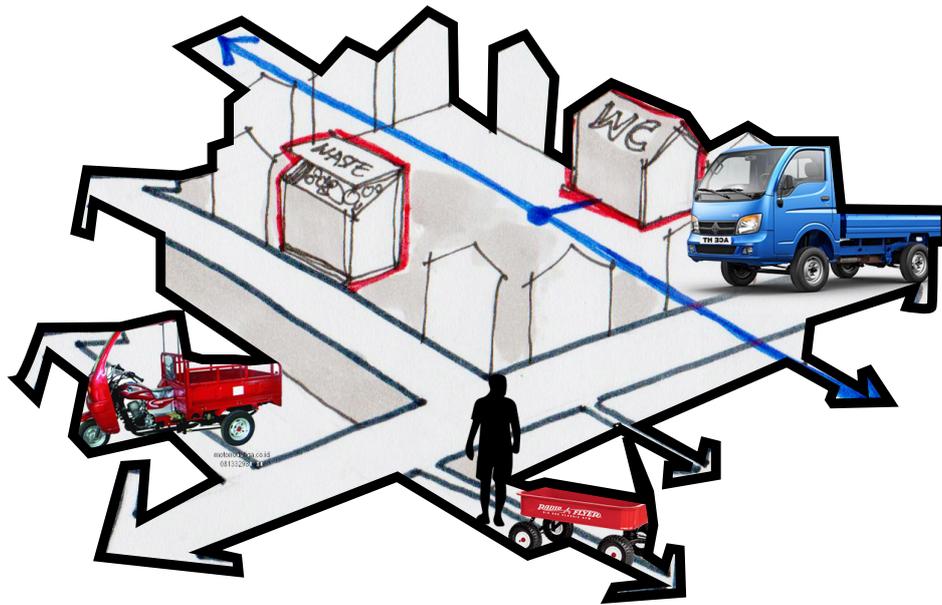


*Provision of basic infrastructure such as public bathroom
is initiated with a direct connection to broader network of
infrastructure*
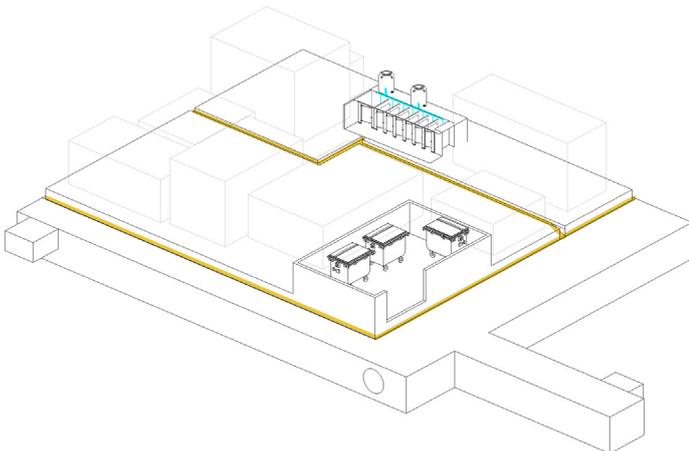


*Improvision of waste management by reaching every
single corner of the neigborhood using different type of
transport mode*
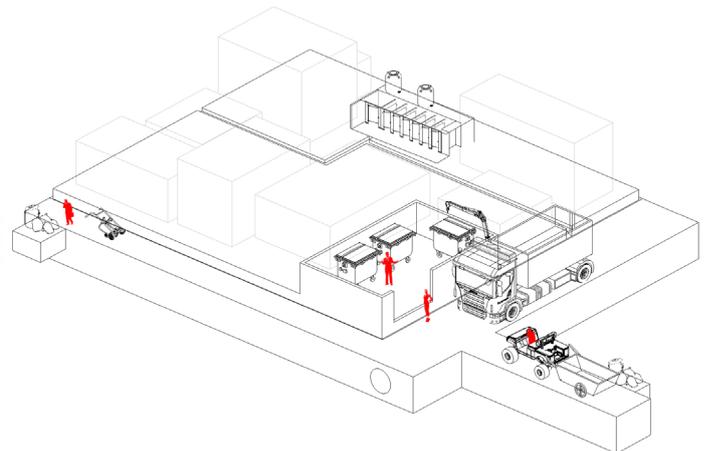
***Programs***



*centralized waste
collection*



*public bathroom
infrastructure*

Improvement of waste and basic infrastructure is proposed by initiating a more efficient system of waste collection and public bathroom. This pattern suggests implementation of clustering 8-10 households with support of one waste collection point and one public bathroom. Moreover, waste collection on the cluster is supported by various mode of logistic transport depends on the path and route. On the main road, the waste is transported by using pickup truck while on the smaller alley it is transported by using smaller vehicle mode, such as pickup motor and cart.

Provision of public bathroom suggested on this pattern mainly aims to improve and add the number of facilities in the neighborhood which is considered lacking. To have better access from the facilities to broader network, there is a direct connection linking the facilities to the network, such as sewage system.

Recreational Detention Park

Neighborhood Park+
Community center
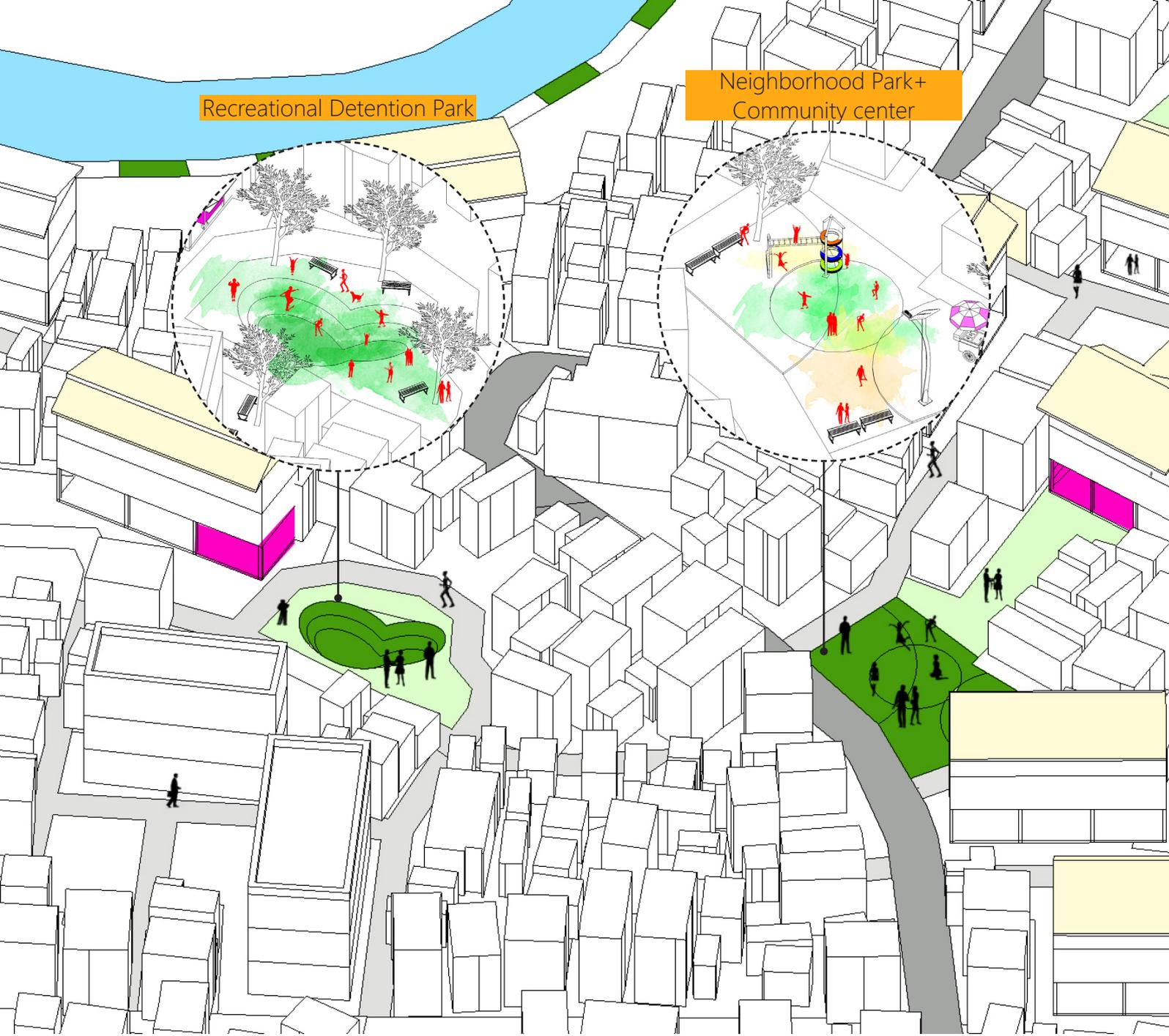
## AKSONOMETRIC ILLUSTRATION

*Reviving the Spaces*

The drawing shows several locations that are proposed to be open-public space for inhabitants to perform various activities. Three different typologies shown on the drawing explains the character of public spaces, such as detention pond, neighborhood park, and communal space between housing. Those 3 (three) different typologies of the space suggest utilization of space to support an active interaction among inhabitant in the neighborhood. Moreover, accommodating activity on those space will help increasing sense of belonging of the inhabitants to the place.

Assembly Point+
Logistic Center

*Communal Mitigation to Flooding*

Different adaptation to flooding is performed together among the inhabitants by initiating communal self-defense and evacuation zone on some predefined location. The drawing above shows the example of adaptation during the flood occurrence which invites contribution of groups of inhabitants to share the same task of mitigating the flooding. In the smallest entity, multiple households collaborate communal action to keep the water away from the properties. At the same time, an evacuation zone accommodates a number of people which need logistics and aid.

Temporary Resettlement Building
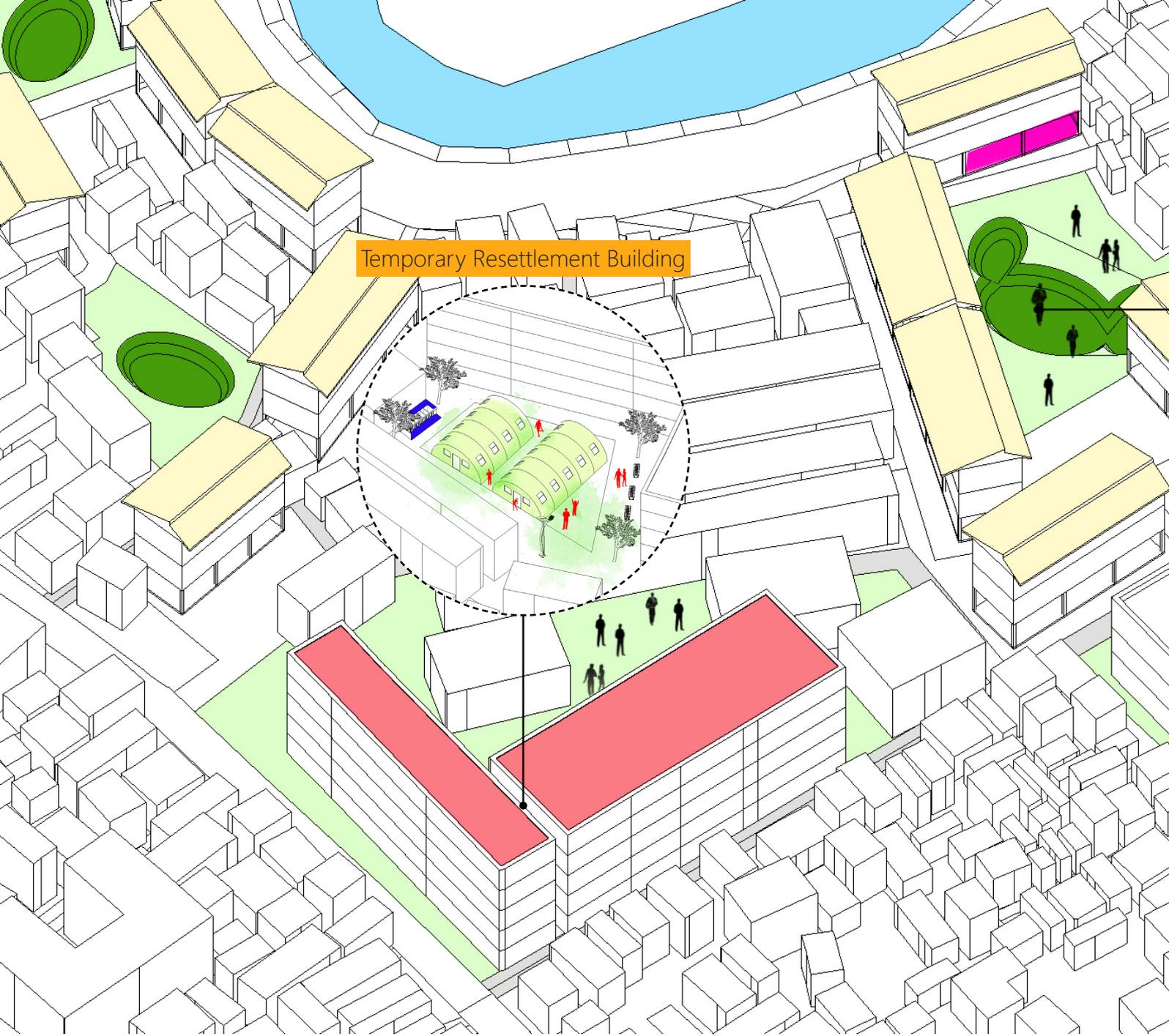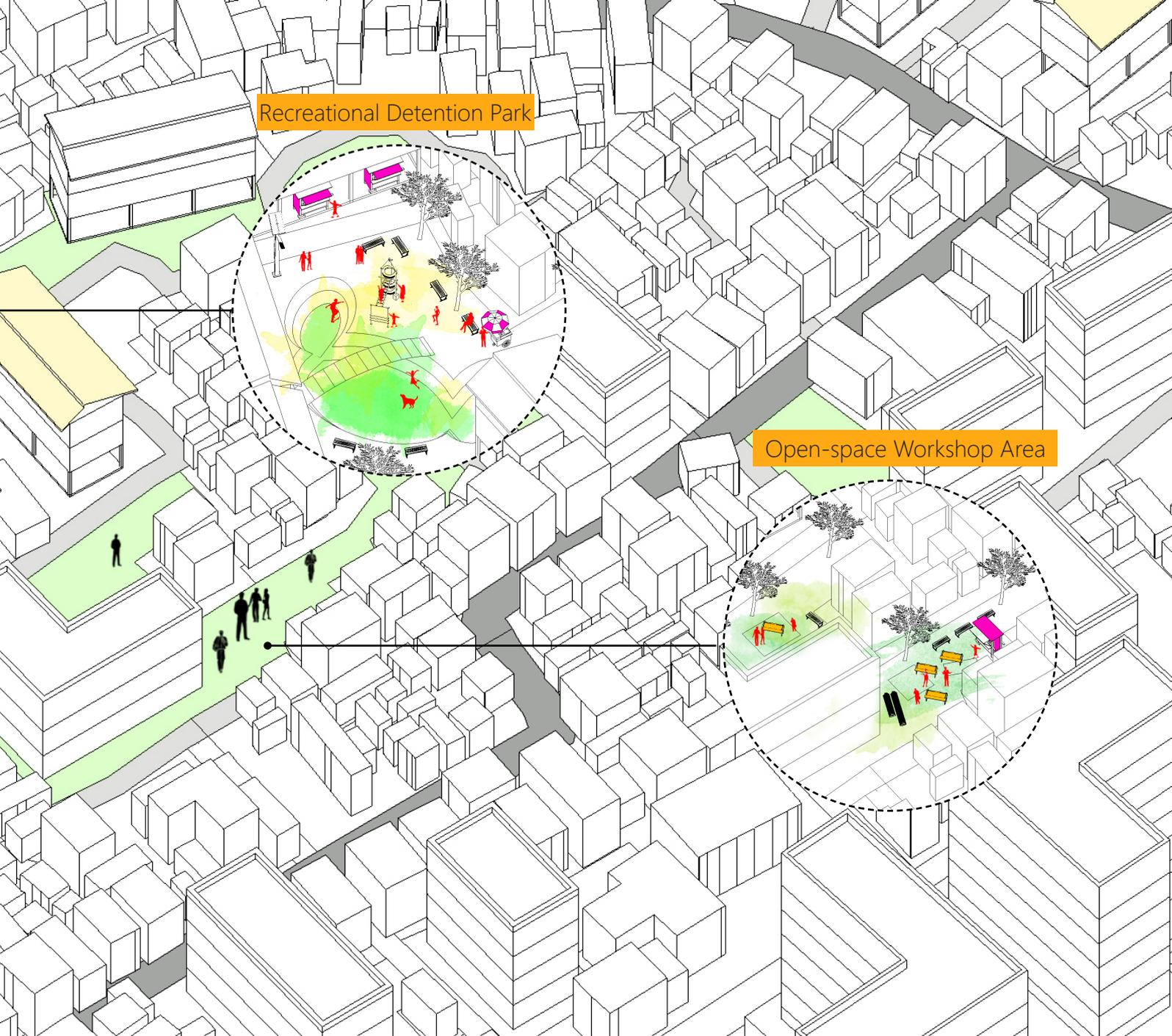
Recreational Detention Park

Open-space Workshop Area

*Multi-use Spaces*

The drawing explains several functions of space which can be used for different type of activities. New utilization of decayed building provides space for any temporal function and adequately increase the amount of public space within the neighborhood. At the same time, different areas in the neighborhood are also transformed into a more active space which accommodates daily and casual activities. As it has been shown in the drawing, the local-specific business activity such as wood workshop can be accommodated on the space.

Community Center+
Evacuation Building

**Water Mitigation**
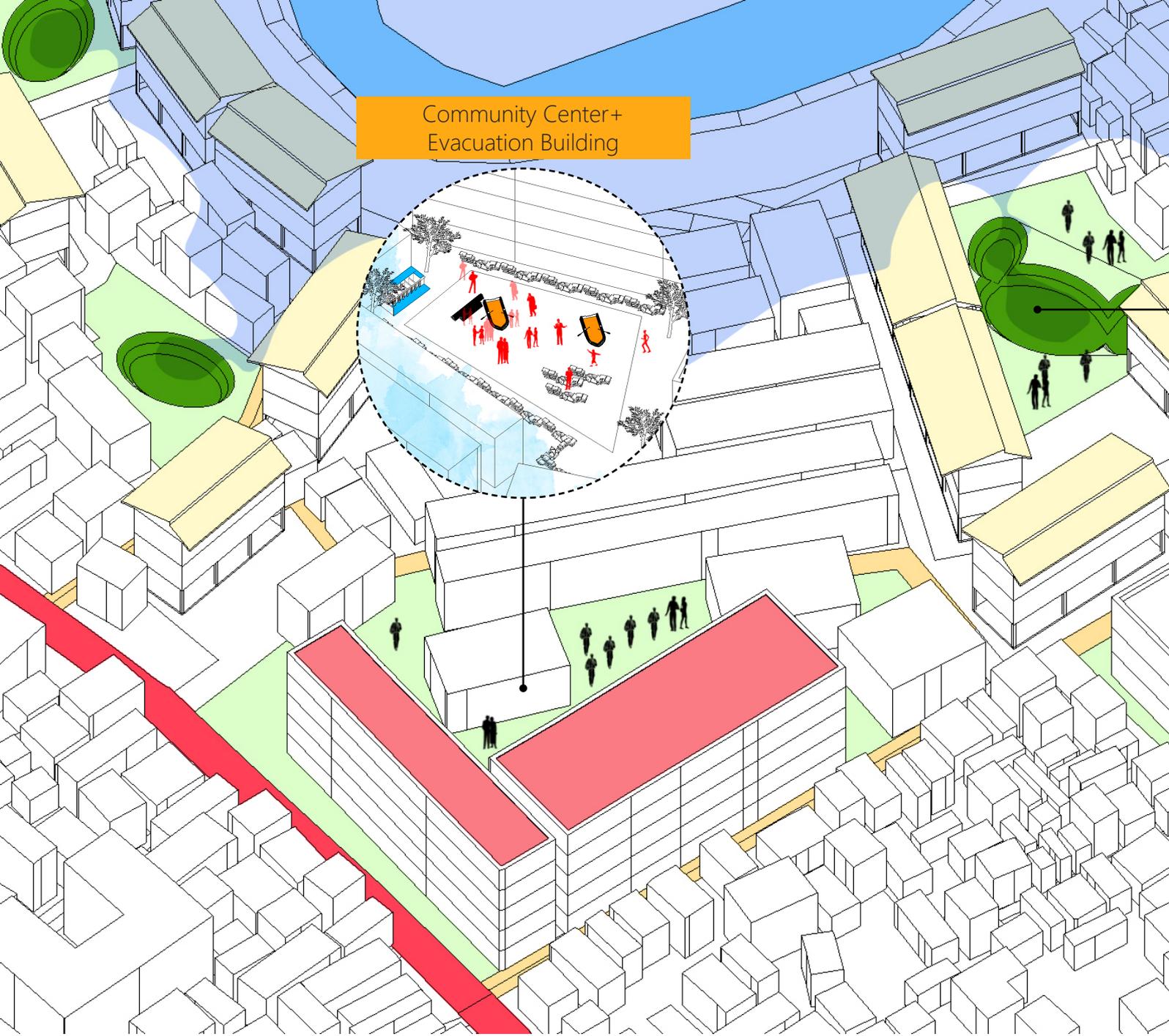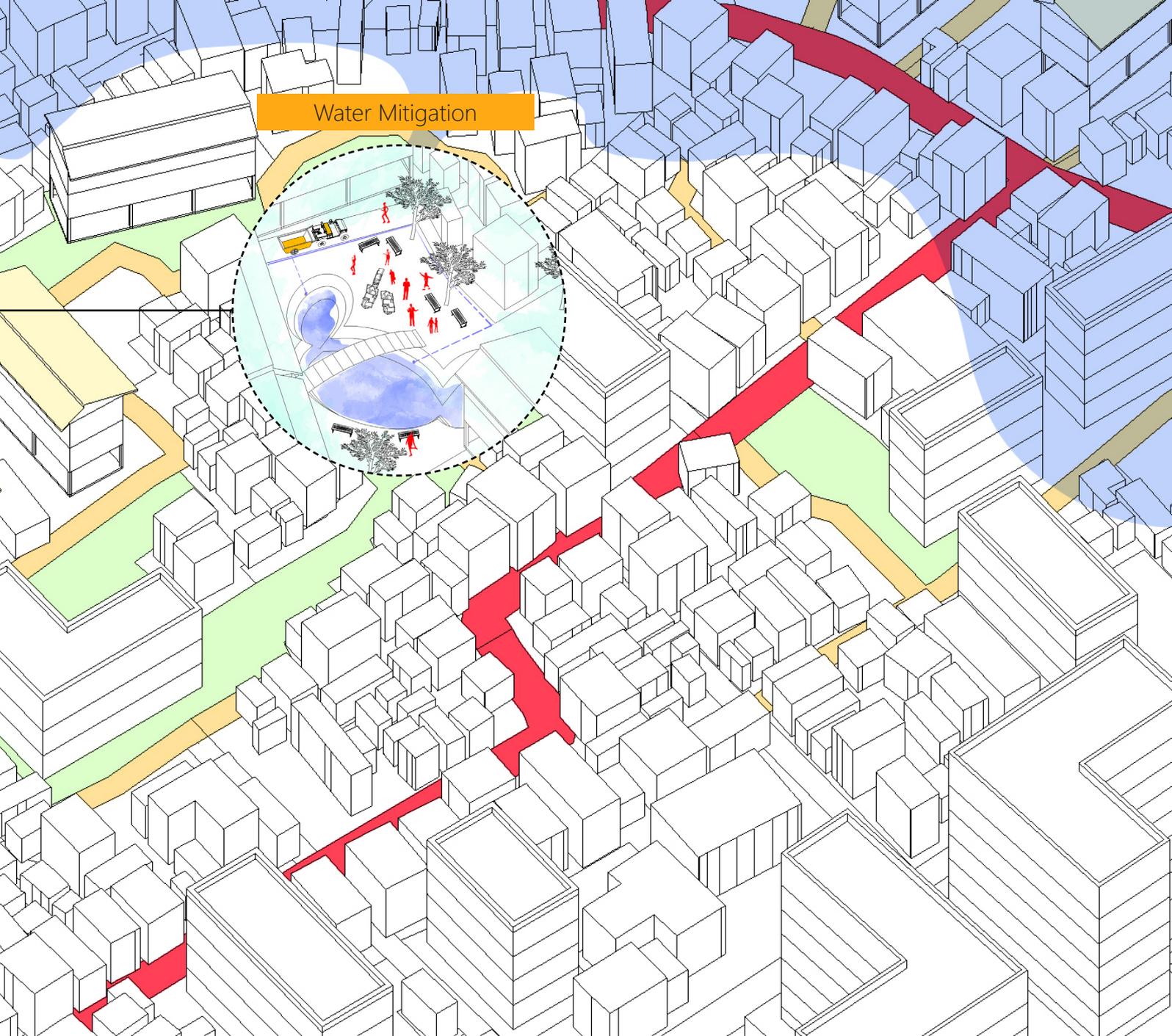
*Social-Engineering Infrastructure of Flooding Mitigation*

Not only technically improve the flooding infrastructure, but the construction of resilience in the neighborhood is also enhanced by socially build awareness and capability to mitigate flooding. The drawing shows the examples of flooding mitigation and evacuation on 2 (two) cases which performs different approaches to mitigate the flooding. The first case shows a communal evacuation and self-defense on specific area performed by groups of inhabitants. In this case, the role of *RT-RW* as the local social network has been considered important to direct and manage the flow of information.

On another case, detention pond as the engineering infrastructure is technically mitigating the water to as fast as possible reduce the amount of water which are inundating the area.
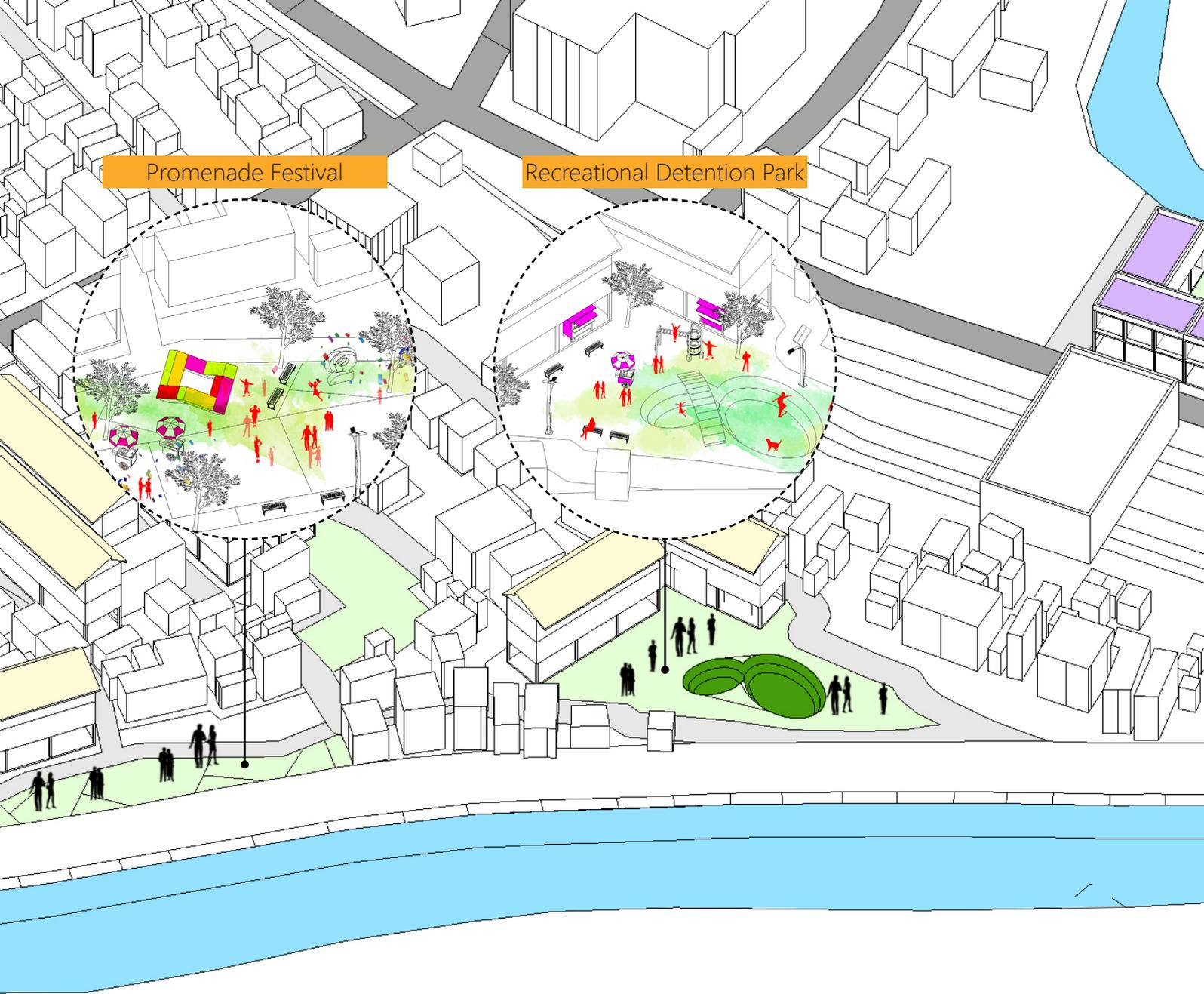
Promenade Festival

Recreational Detention Park
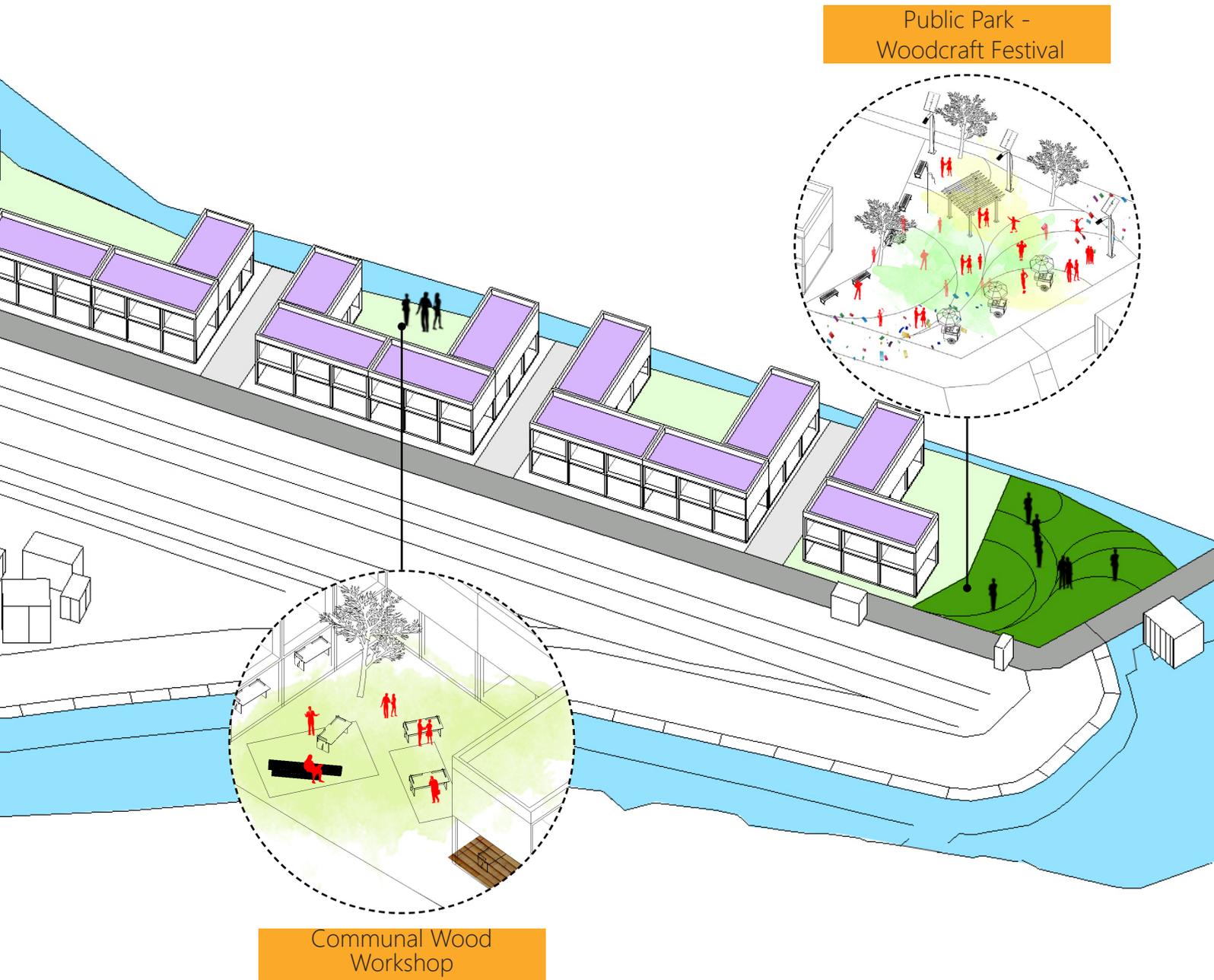
Communal Wood
Workshop

*Introduction of Various Typologies of Public Space along the River*

To create a close and intimate relation between the neighborhood and the river, several activities are proposed on different locations along with the improvement of its spatial quality. A more vibrant situation on the promenade attracts people to perform active usage of the space by organizing events and festival. The open-communal wood workshop is constructed on the interface between the workshop building and the river. One of the main objectives of bringing people closer to the water has been importantly highlighted by preserving space along the area. Moreover, thematic activities of woodcraft festival have been proposed to exhibit local business to broader market.

Water Mitigation

Assembly point +
Logistic Center
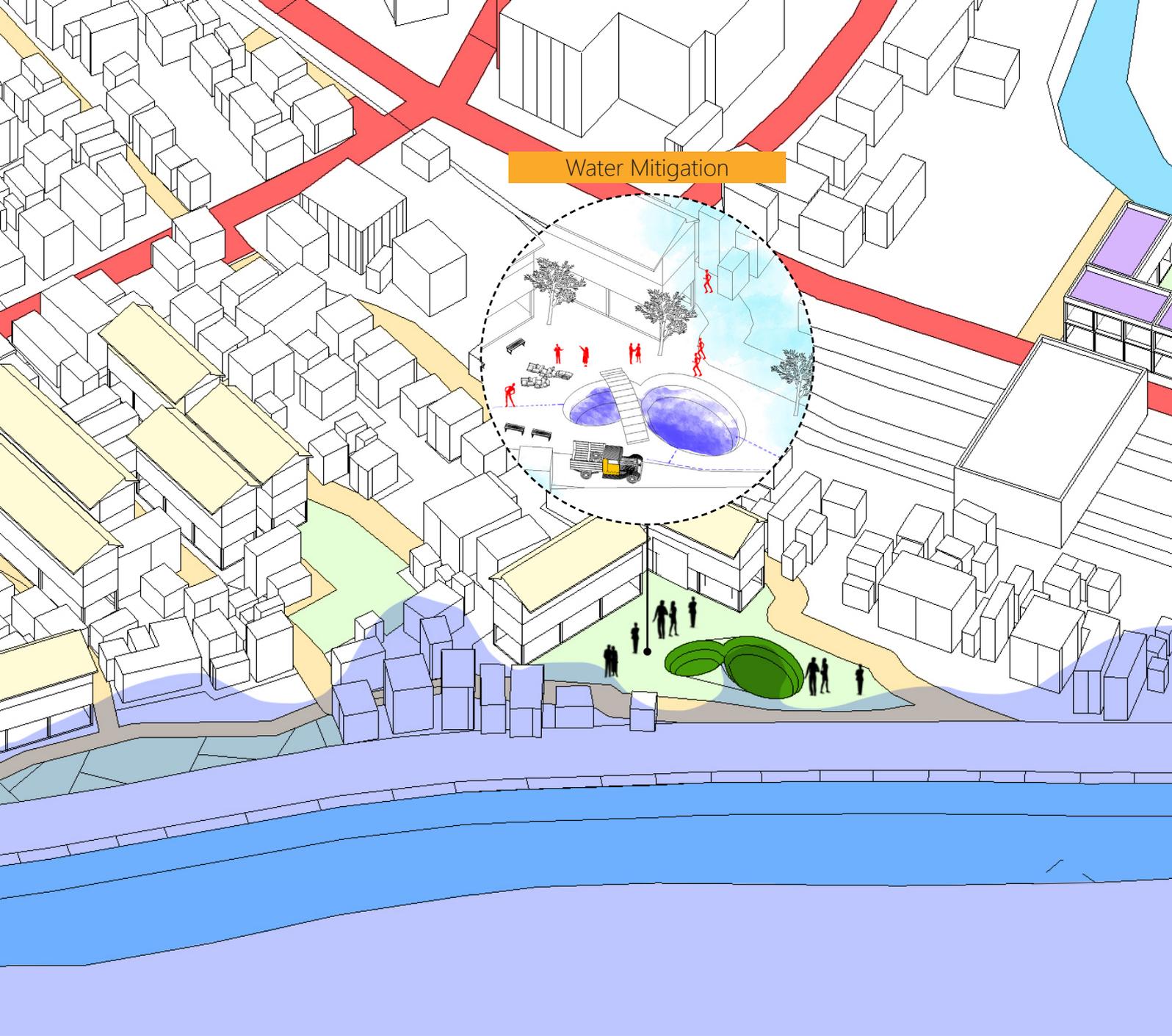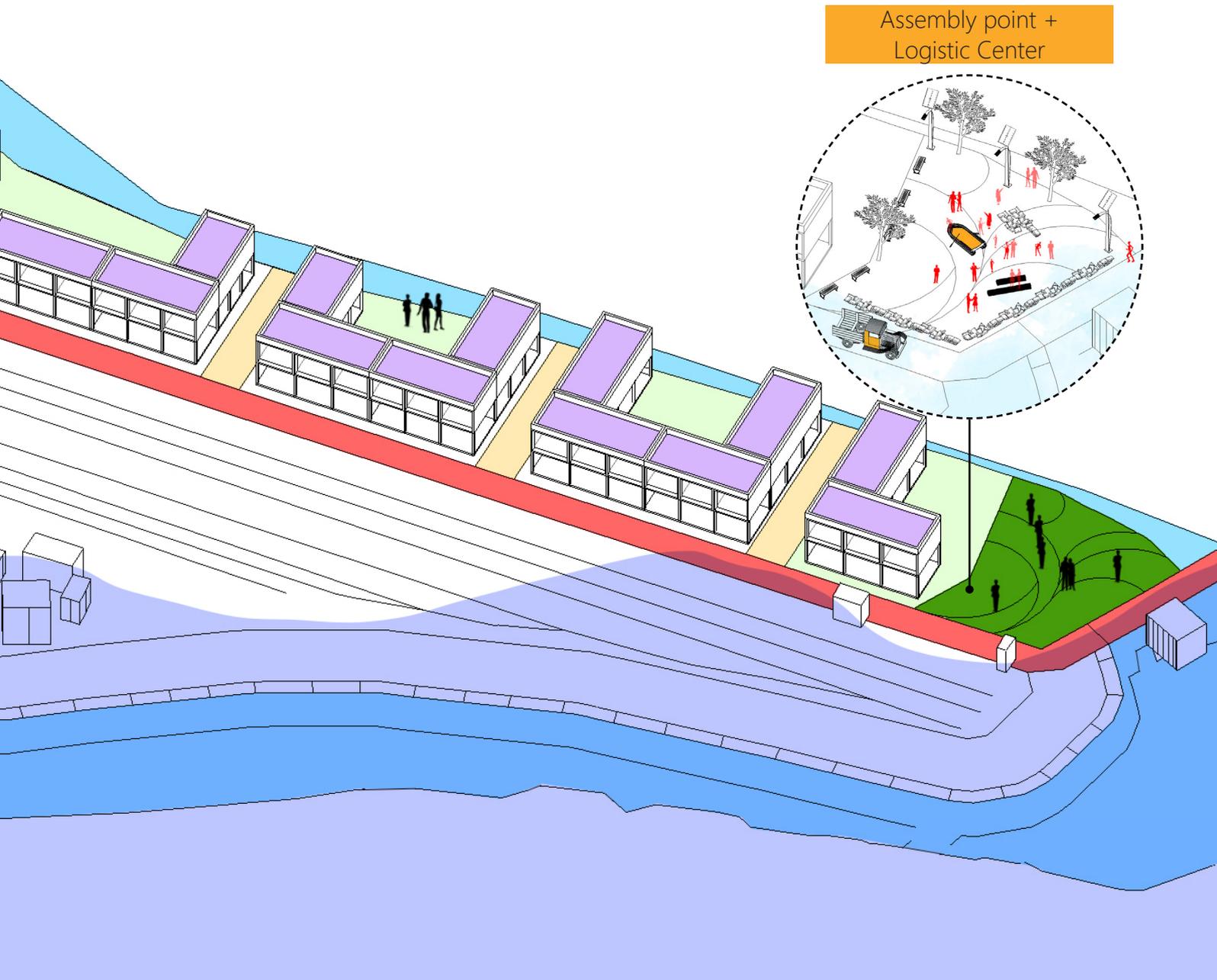
## Distribution of Action to Mitigate Flooding

Direct action to distribute the water will be an important part of the process of mitigating flooding as soon as possible. Intervention on the frontage between river and neighborhood is proposed to reduce the amount of water before entering the neighborhood directly. By installing detention pond on several locations along the river, penetration of the water to neighborhood will be mitigated naturally to avoid more significant destruction caused by the water.

Distribution of logistic center on several defined locations is also important to manage necessary aid for evacuation and recovery. Furthermore, a specified location for evacuation also helps on efficiently transferring the information and coordination from responsible authority.
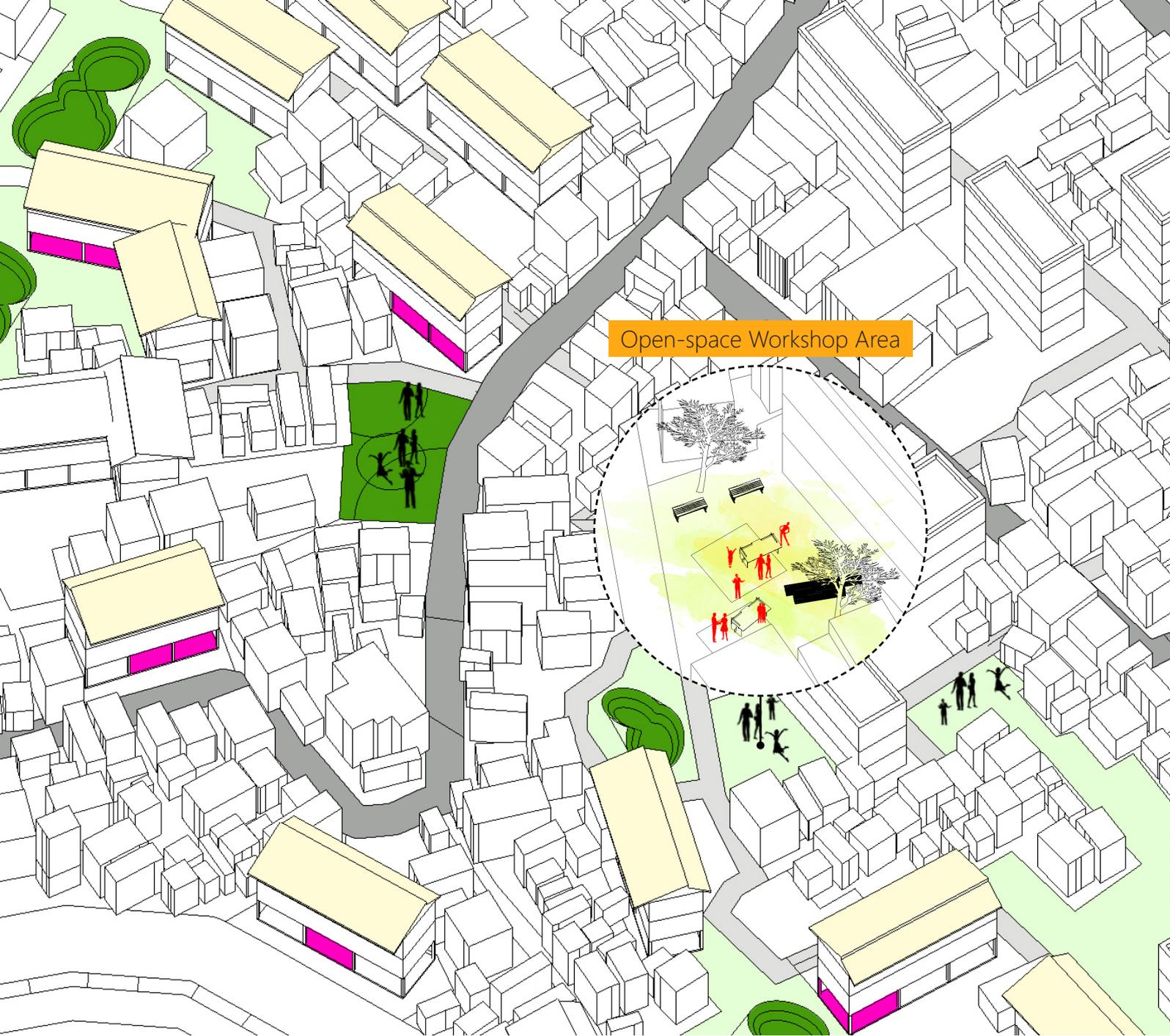
Open-space Workshop Area
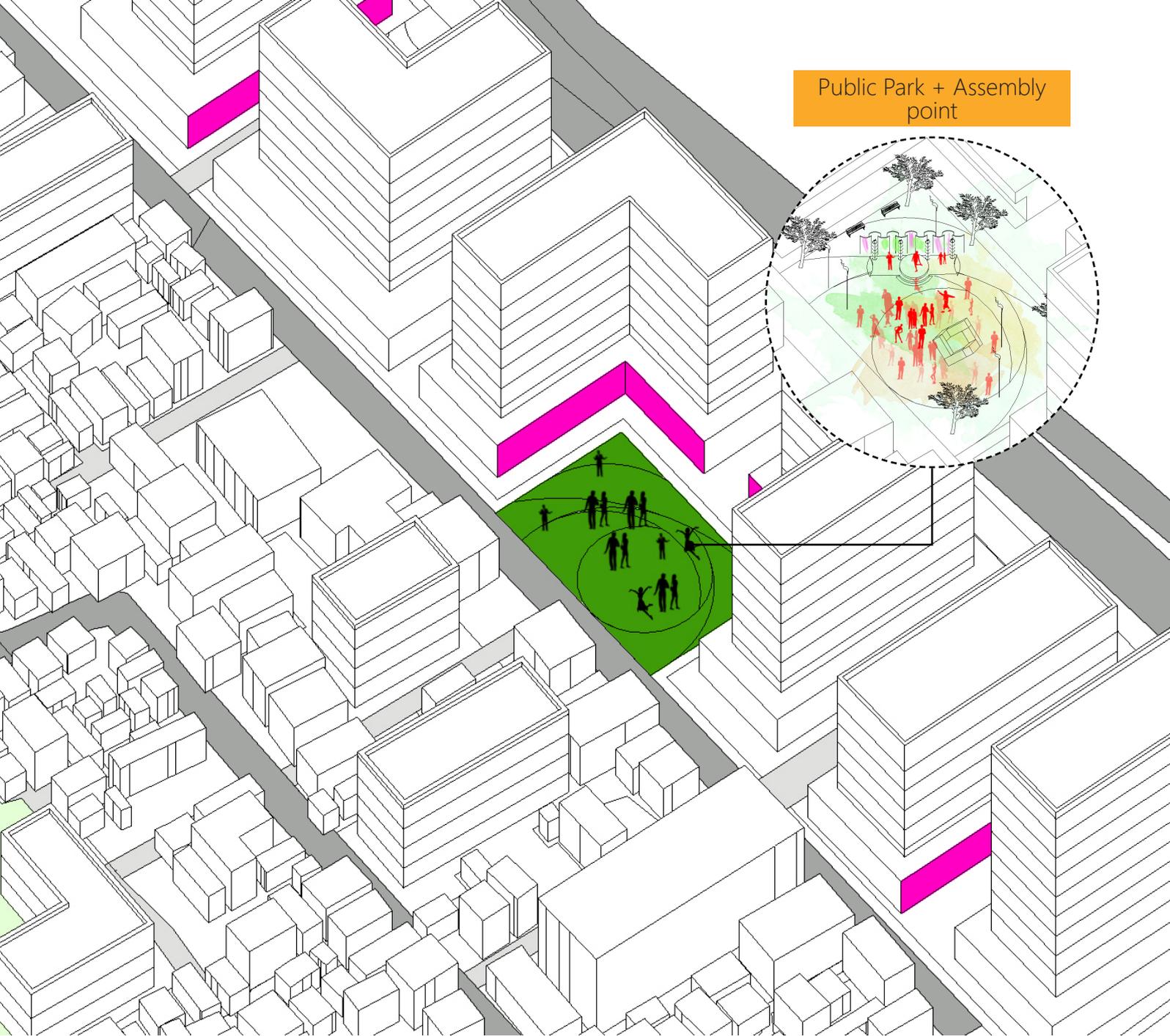
## Custom-made Activities

The dynamic activities in the neighborhood is accommodated by allowing some spaces to be an active temporal space for any functions. As it has been shown in the drawing, the occupied space for workshop and other activities encourages the inhabitants to actively use the space for a productive function.

Another type of public space is also introduced on this proposal on the defined location of future development. Allowing more vibrant usage of the space, this proposal suggests extended version of utilization of space within the neighborhood. As it is located on the frontage area of the neighborhood, this proposal gives opportunity to perform more festive and lively activities, such as mini concert, public market, etc.
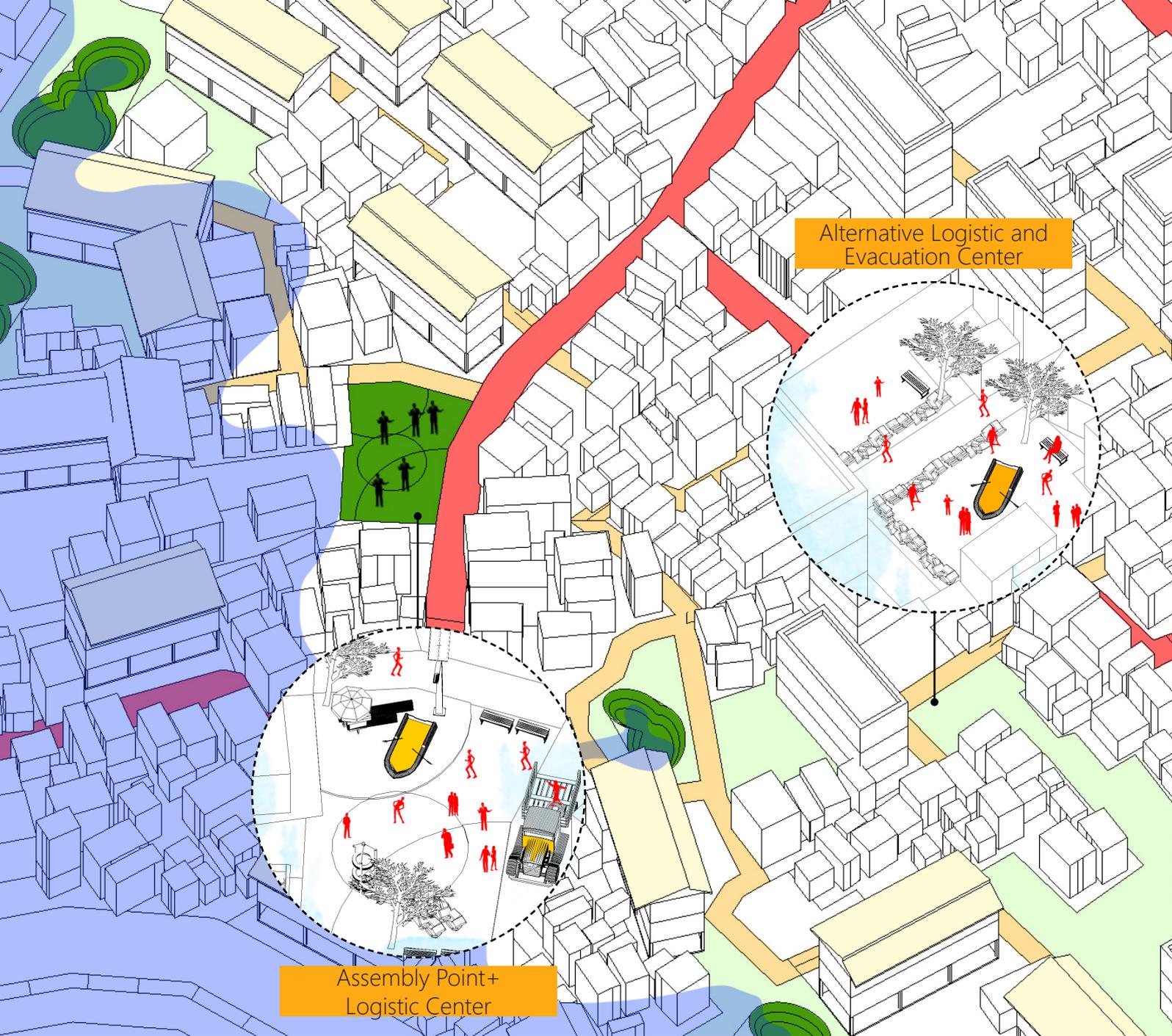
Alternative Logistic and Evacuation Center

Assembly Point+ Logistic Center
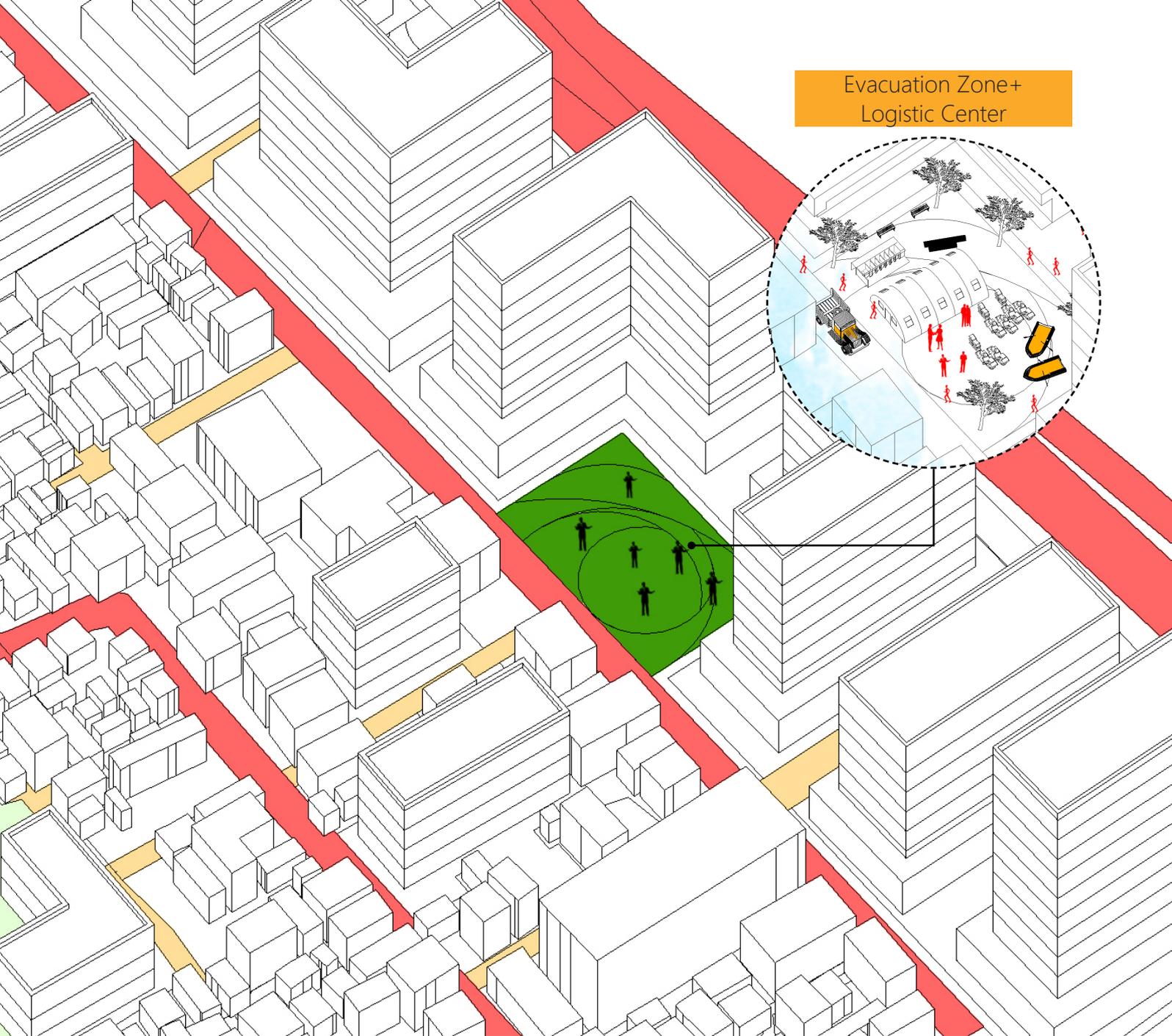
Evacuation Zone+
Logistic Center

*Optimal Usage of the Space for Flooding Evacuation*

The drawing shows 3 (three) different types of space which are used as evacuation zone and assembly point. Due to the massive magnitude of the disaster, a distribution of evacuation zone will necessarily allocate number of people to several locations and reduce destructive impact of the flooding. Each evacuation zones are supported by the transport line (red line) which allows fast-direct distribution of logistic and aid.

rainwater harvesting

Recreational detention pond

evacuation path

public park + evacuation zone

permeable-low foot print

co-housing

sewage connection
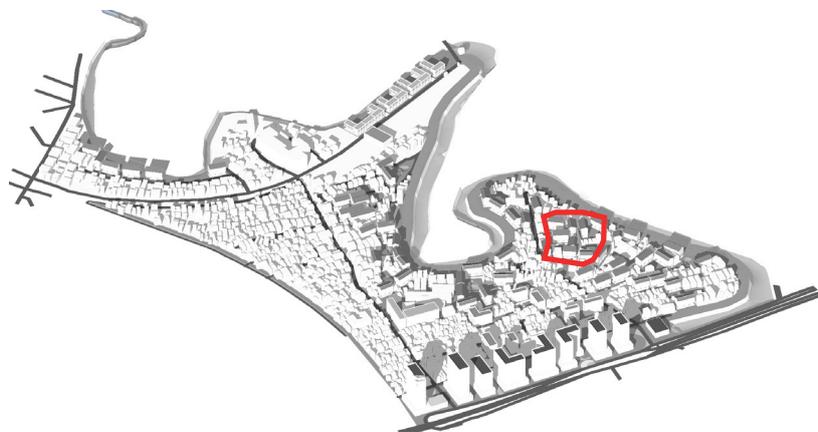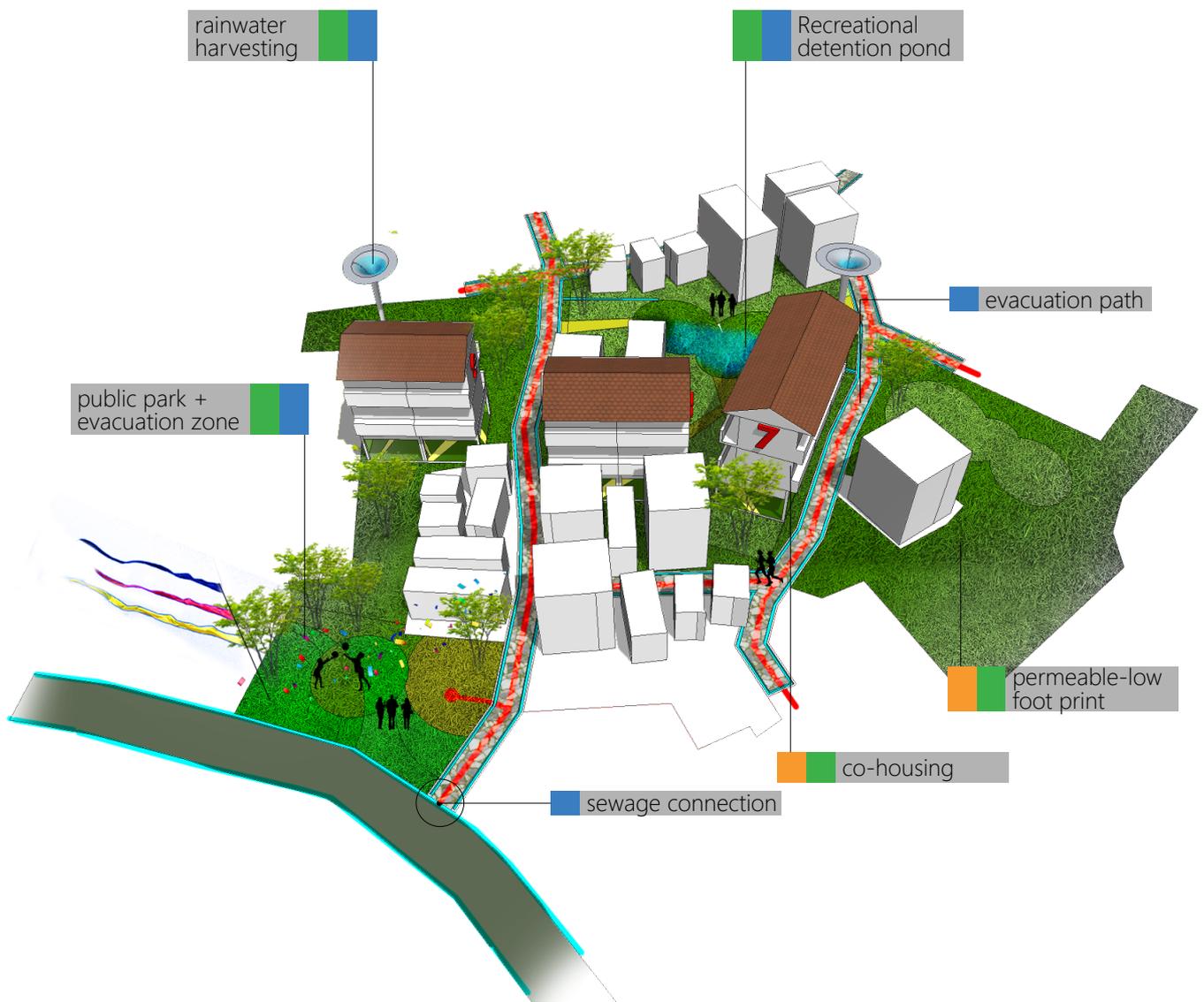


*Chosen cluster for pilot project in area I*
*(source: author)*

| Total Area | 1,716 m2 |
|---|---|
| Green Space area | 773 m2 (40%) |
| Proposed flood infrastructure | • 1 Detention pond<br>• 1 Evacuation zone |
| Transformed Households | 28 households |
| Co-Housing allocation | 3 two-stories buildings |

## Pilot Project

To provide guidelines for project implementation, some locations are selected as pilot project to give the impression of interventions. The selected location in area I shows several interventions in one cluster of housing, public space, and alleys. The infrastructure performance of this cluster is manifested by connection of sewage system, integration of evacuation path, communal rainwater treatment and set of water detention pond. Some clusters of land plots are consolidated into 3 (three) units of elevated co-housing building which each of them accommodates 8 (eight) households. The consolidation of the land plots creates more space on the ground level up to 60%. Moreover, a public space for recreation and evacuation can be created on the ex-occupied land plots.

public park +
evacuation zone

re-used building

rainwater
harvesting

EVACUATION BUILDING

evacuation path

co-housing

public park+communal
workshop area

sewage connection
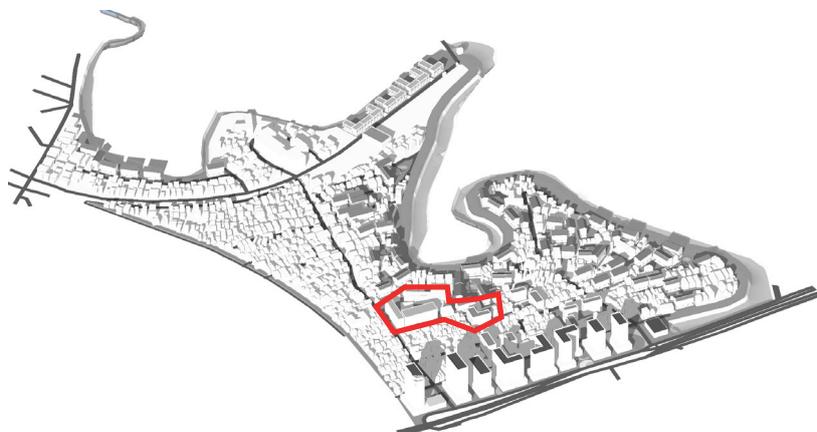
*Chosen cluster for pilot project in area II*
*(source: author)*

| Total Area | 3,675 m2 |
|---|---|
| Green Space area | 514 m2 (15%) |
| Proposed flood infrastructure | • 1 Detention pond<br>• 1 Public park+communal workshop area<br>• 2 Evacuation buildings |
| Transformed Households | 59 households |
| Co-Housing allocation | • 2 three-stories buildings<br>• 1 two-stories building |

The pilot intervention on area II suggests the illustration of evacuation and mitigation system in this area. Flooding evacuation infrastructure is illustrated by the intervention of directive paths and evacuation building. The evacuation building that is used in this area has been provided by transforming existing decayed building. Furthermore, this transformed building also functioned as the storage for flood infrastructure.

rental housing

public park

sewage connection

commercial-zone
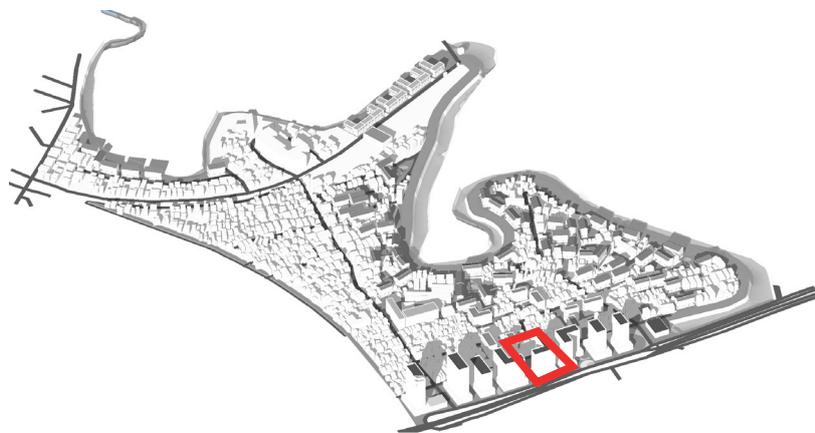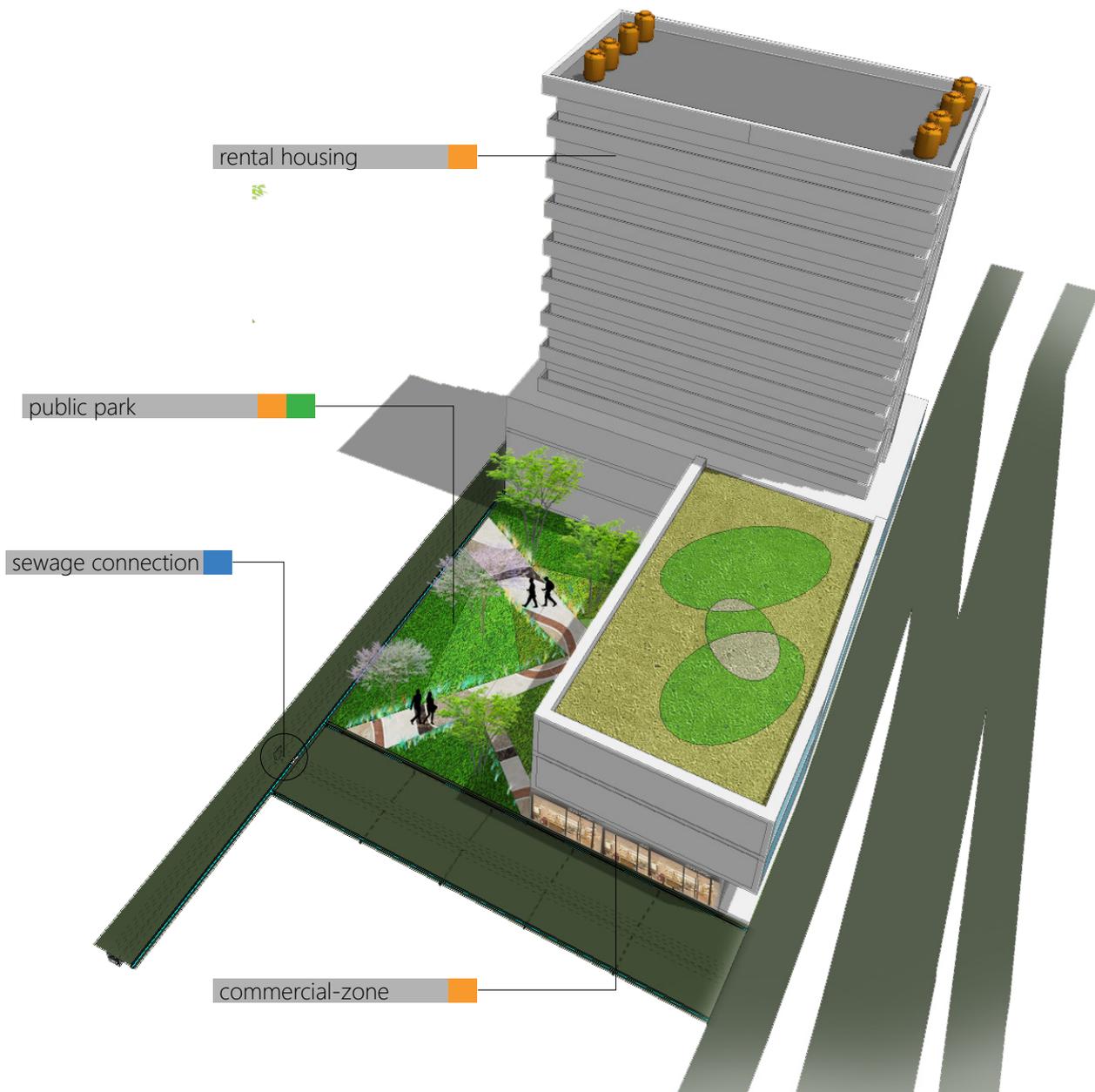
*Chosen cluster for pilot project in area III*
*(source: author)*

| Total Area | 1,306 m2 |
|---|---|
| Green Space area | 417 m2 (30%) |
| Proposed flood infrastructure | • 1 Detention pond<br>• 1 Evacuation zone |
| Transformed Households | 41 buildings |
| Co-Housing allocation | • 8 stories of 308 m2 rental housing<br>• 2 stories of 874 m2 office area<br>• 2 stories of 787 m2 commercial area |

Selected location on area III illustrates typology of function such as rental housing, commercial zone, and public park as part of mixed-use development. The important highlight of natural spaces provision is translated on this area by allowing at least 30% green space. Moreover, as the frontage of the neighborhood, this location performs active interaction with surroundings by allocating commercial stores on the ground level.
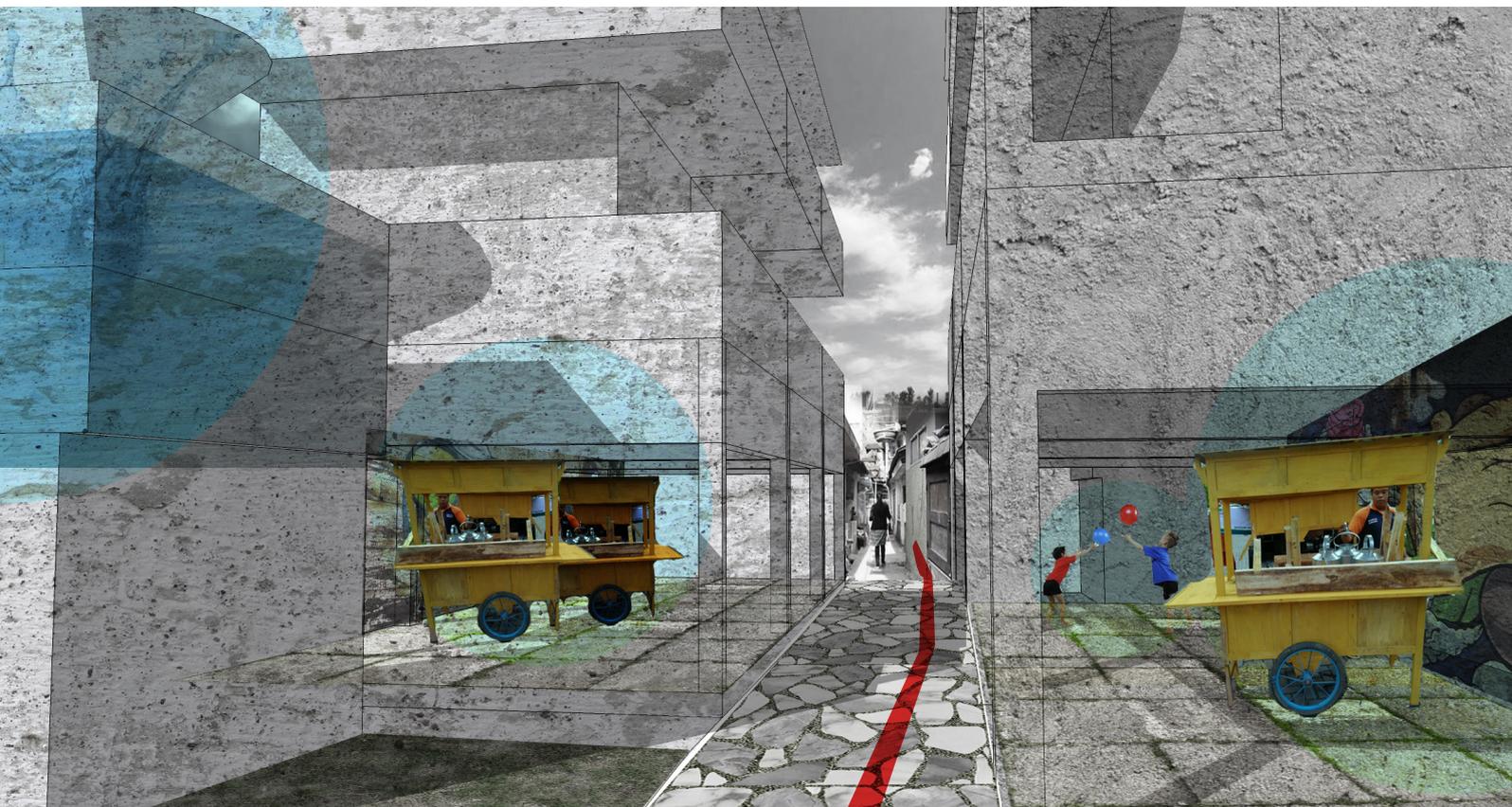
*Illustration of space between new typology of co-housing*
*(source: author)*
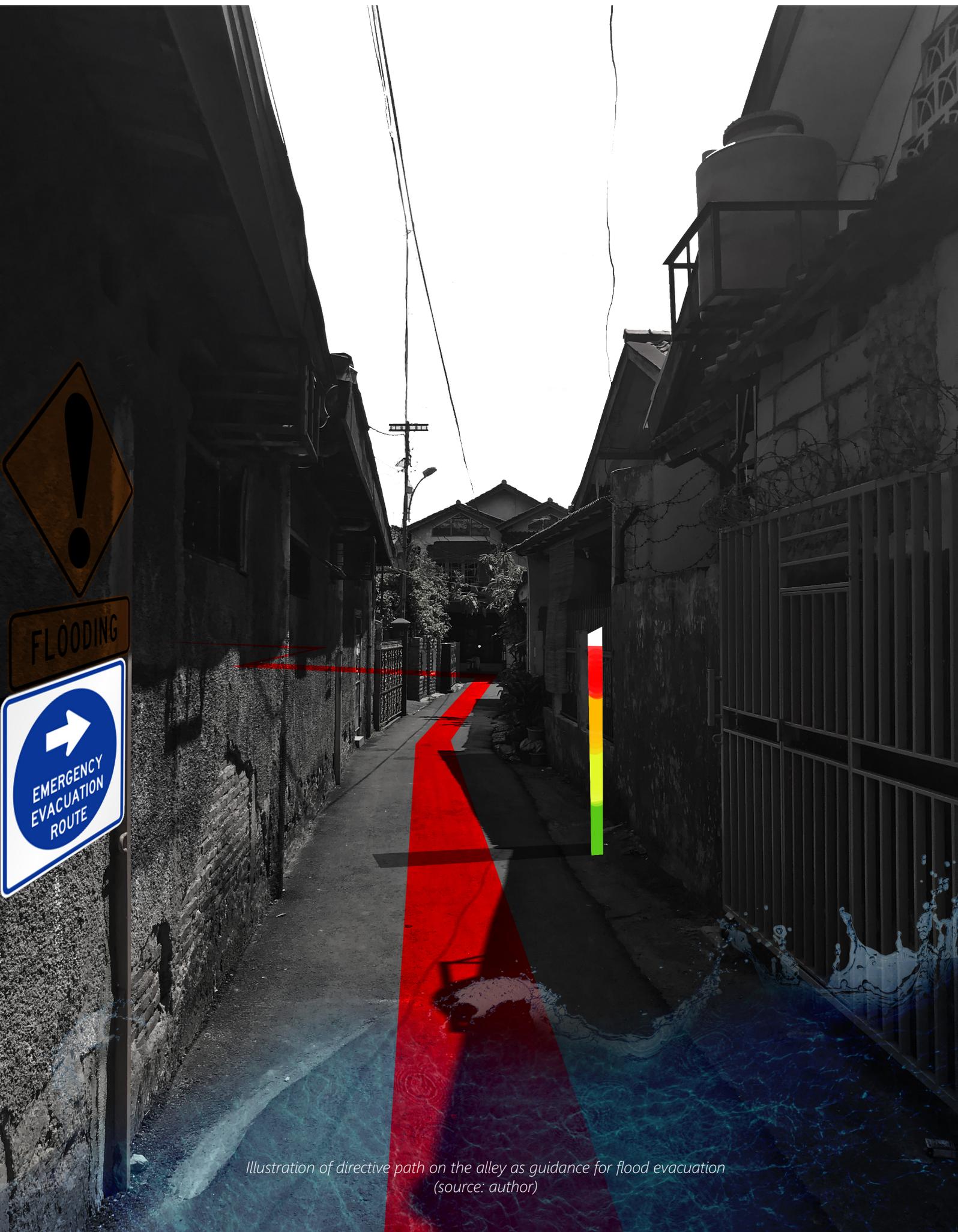
*Illustration of directive path on the alley as guidance for flood evacuation*
*(source: author)*

*Illustration of interaction between neighborhood and the river in the waterfront
(source: author)*

*Illustration of new typology of wood workshop area*
*(source: author)*
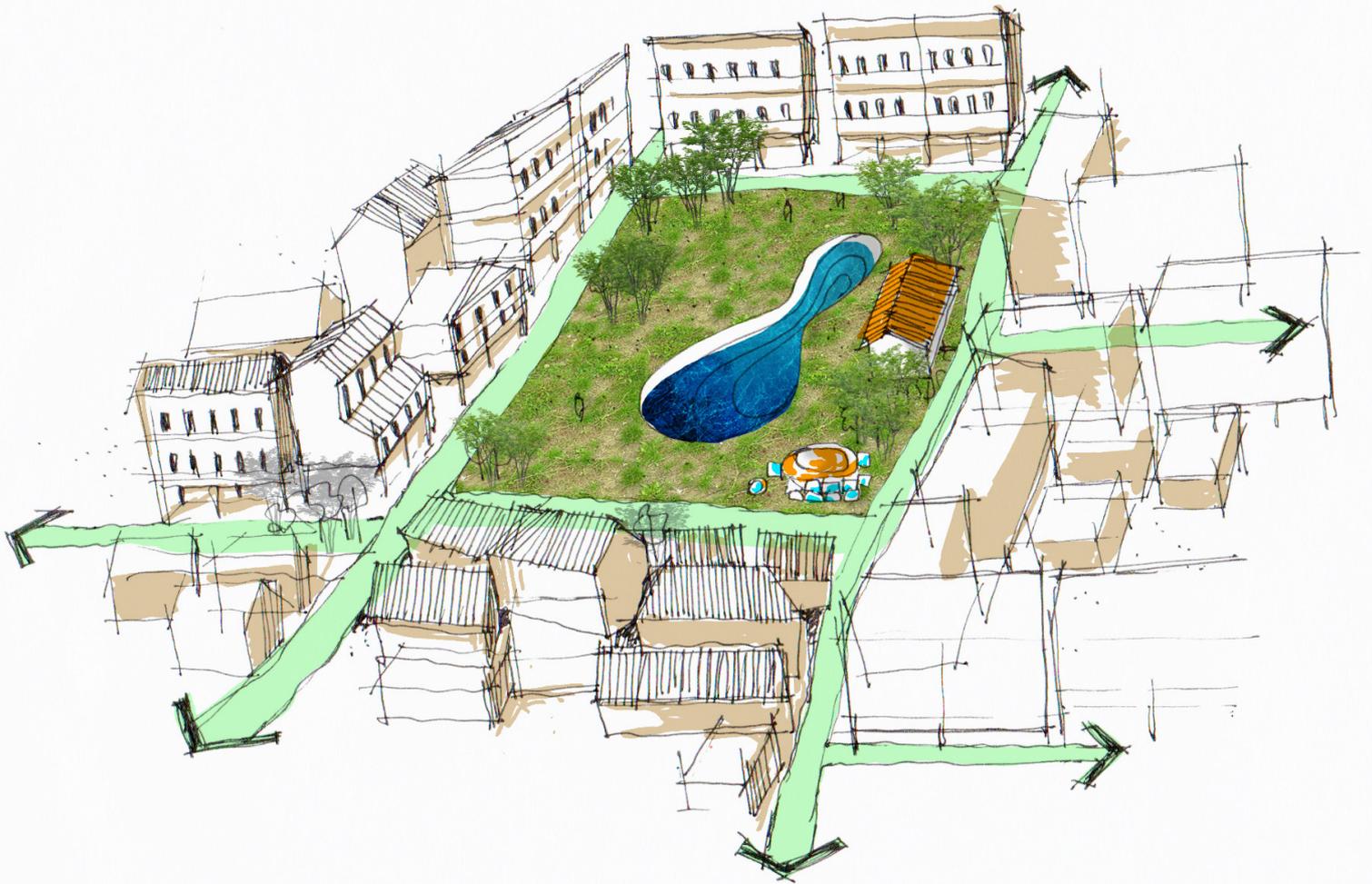
*Illustration of new typology public space which contains function of water detention and recreational activities (source: author)*
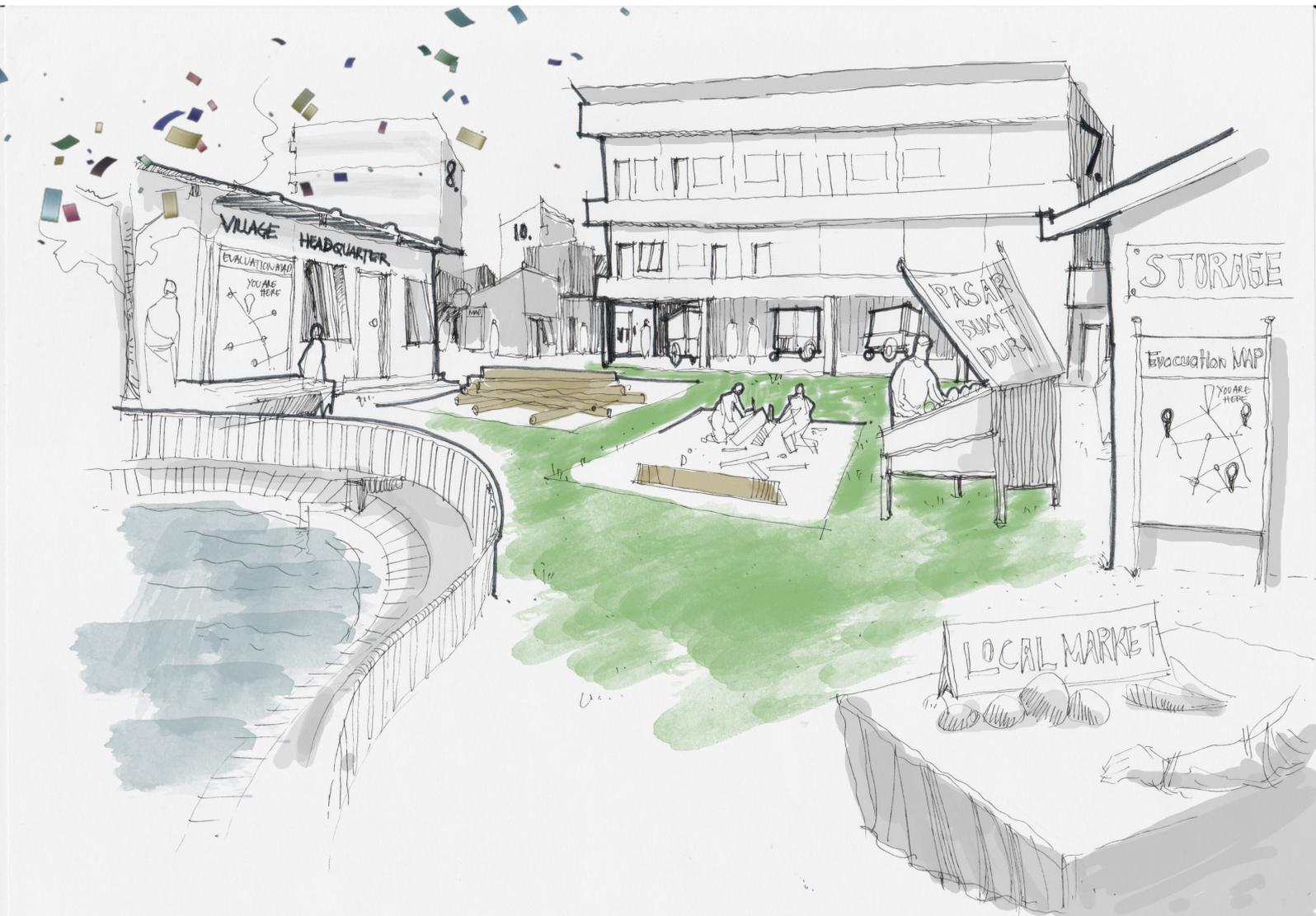
*Illustration of activities in the new public space, market space, workshop area and storage*
*(source: author)*
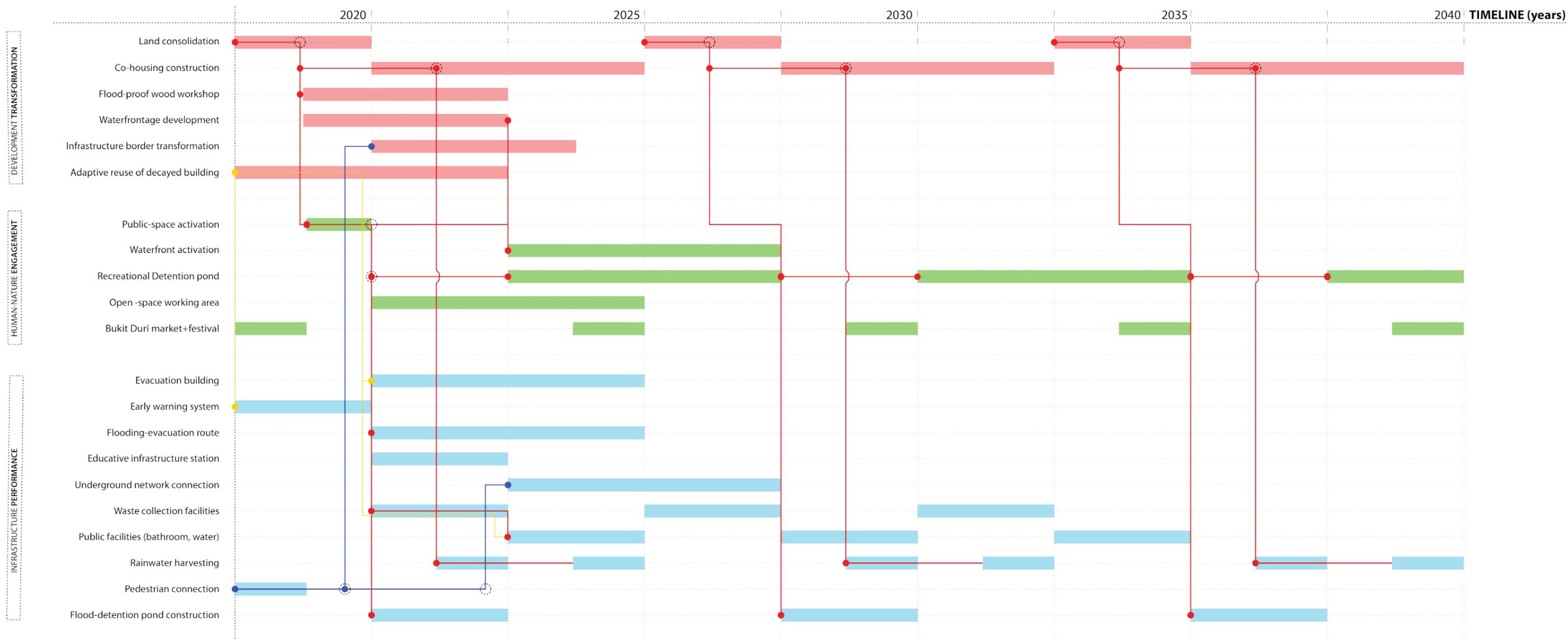
Table of project pathways which contain flow of actions and its interrelation to others
(source: author)

**TIMELINE (years)**

DEVELOPMENT TRANSFORMATION

- Land consolidation
- Co-housing construction
- Flood-proof wood workshop
- Waterfrontage development
- Infrastructure border transformation
- Adaptive reuse of decayed building

HUMAN-NATURE ENGAGEMENT

- Public-space activation
- Waterfront activation
- Recreational Detention pond
- Open -space working area
- Bukit Duri market+festival

INFRASTRUCTURE PERFORMANCE

- Evacuation building
- Early warning system
- Flooding-evacuation route
- Educative infrastructure station
- Underground network connection
- Waste collection facilities
- Public facilities (bathroom, water)
- Rainwater harvesting
- Pedestrian connection
- Flood-detention pond construction

2020    2025    2030    2035    2040

**Key**

- ⊘ transfer point to new action
- —— vulnerable area I
- —— vulnerable area II
- —— vulnerable area III
- ▬ infrastructure performance
- ▬ human-nature engagement
- ▬ development transformation

## Project Phasing

The plan of improvement of Bukit Duri neighborhood has been defined on time-based intervention in 40-year interval. Every single action is referring to the approaches that are mentioned in previous chapter, which are infrastructure performance, human-nature engagement, and development transformation. Each different approach will be implemented in certain particular time referring to the priority that each vulnerable area has. As it has been mentioned in previous chapter, the neighborhood of Bukit Duri is divided into 3 (three) vulnerability-based area which each of the areas suggest certain degree of intervention.

Pathway of implementation shows the flow of actions while also defines its interrelation among action within the timeframe. The colored-lines shows the path/route in which each vulnerable area is needed to improve the performance of infrastructure, the engagement of human-nature, and also the degree of spatial transformation. The execution time of each action is defined by the colored-bars which indirectly suggest interaction in the process.

The very first part of the timeline is defined as preparation time in which several platforms of action are prepared, such as reconfiguration of existing network of infrastructure, land acquisition, land tenure system modification and some required mappings. This period of time is highlighted as a basis to direct further flow of the process.

At certain points in the timeline, there are also transfer-tipping points which suggest a directional-move of the actions depends on the objectives of each vulnerable area. The idea of the tipping point is to show a more path-dependency among the actions which define its priority and urgency for the whole process.

Ministry of Finance

Ministry of Water and Irrigation

Bogor Forestry Institure

Japan International Cooperation Agency (JICA)

PT. Brantas Adipraya

Ciliwung Cisadane River Basin body (BBWSCC)

Ministry of Public Work

Housing Estates

PT. Waskita Karya

Ciliwung Merdeka

Community land Trust Organization

University of Indo-nesia

Local Economic Cooperation (Koperasi)

Resilient Bukit Duri

*DEGREE of INTERACTION AND INFLUENCE*

Drinking Water Company

Drinking Water Company

PT. Adhi Karya

Water and Infrastruc-ture Sub-Body

Water Treatment-Company

Ministry of Economic Affairs

PT. Hutama Karya

Provincial Govern-ment of DKI Jakarta

Forum Warga (Citizen Forum)

PT. Wijaya Karya (WIKA)

Ministry of Public Housing

World Bank

Development Plan-ning Agency

● *GOVERNMENT*

● *ACADEMIC*

● *COMPANIES*

● *ORGANISATION*

● *SOCIETY*

*Defined cluster of stakeholders and its degree of influence to the project.*
*(source: author)*

## Stakeholder Map

Some clusters of stakeholder participation are defined on this project based on their degree of interaction and influence on making a resilient Bukit Duri. Considering its complex nature of the project, there is a proposal to collaborate with different sectors of stakeholder in the project to introduce a more beneficial solution for every actor. The stakeholders in this project are divided into 5 (five) sectors, which are: government, academic actor, companies (private sector), local organization, and the society (inhabitants). All those stakeholders are compiled from several interviews and observation during the research.

Government stakeholders are defined on a multi-layered structure in which the central-regional actors are positioned on the outer ring as a coordinator which have the role of making legal protection of the policy. Moreover, central-regional government also has a responsibility to construct a roadmap that accommodates low-layer actions in the broader scheme. While the subordinate bodies of government are taking role as an assistive companion which implements the policy in the neighborhood with a collaboration with the grassroots actors.

The involvement of academic sectors is also proposed in this project to construct a more scientific intervention which suggests certain degree of accountability. Moreover, it also gives opportunity for the researcher to do a practical work based on their expertise.

The most important involvement of stakeholders is contributed by the private sectors which possess certain capability of supplying funds and introducing new kind of technology. The contribution of private sectors can be in a form of corporate social responsibility (CSR) which predominantly manifested on a provision of public facilities, such as public furniture, lighting, vegetation in the open space. Moreover, several companies can also contribute to the capacity of project budget by funding certain sub-project. Involvement in the sub-project will also invite the companies to join the construction process by participating project tender at the beginning of the process.

The existence of local organization as one of the stakeholders in the grassroots level is enhanced by allowing specified involvement for the neighborhood, such as economic support for the local business, community empowerment, and community land trust association. As most of the local organizations are positioned on the inner circle of the stakeholder map, there are some direct interactions between those organizations with the inhabitants. The role of inhabitants as the user and active actor is highlighted by enhancing the performance of existing community forum and association, such as *Rukun Tetangga* (RT) and *Rukun Warga* (RW). Furthermore, inhabitants will then take the responsibility to preserve their own neighborhood by proactively involve in the project.

*Existing capacity of resilience*
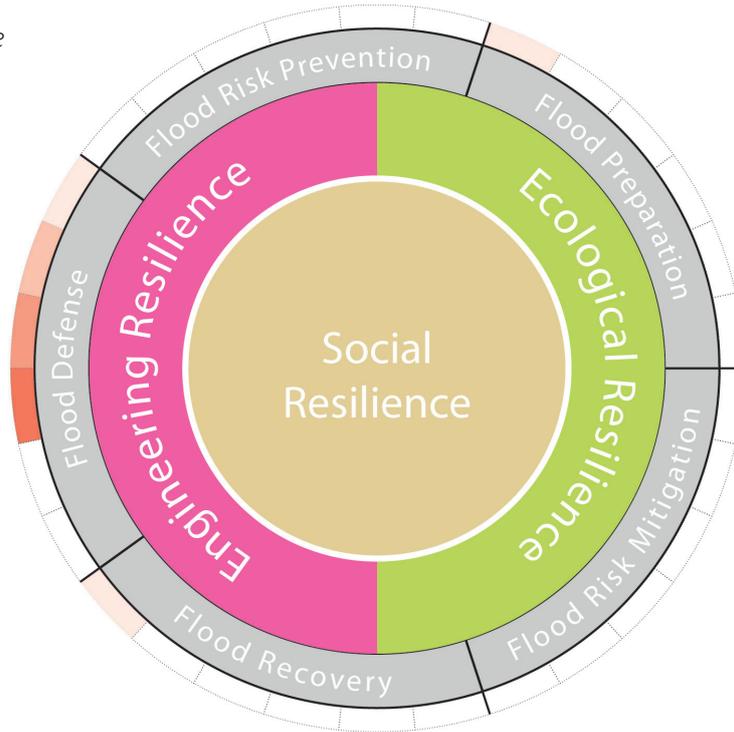
*Proposed capacity of resilience*
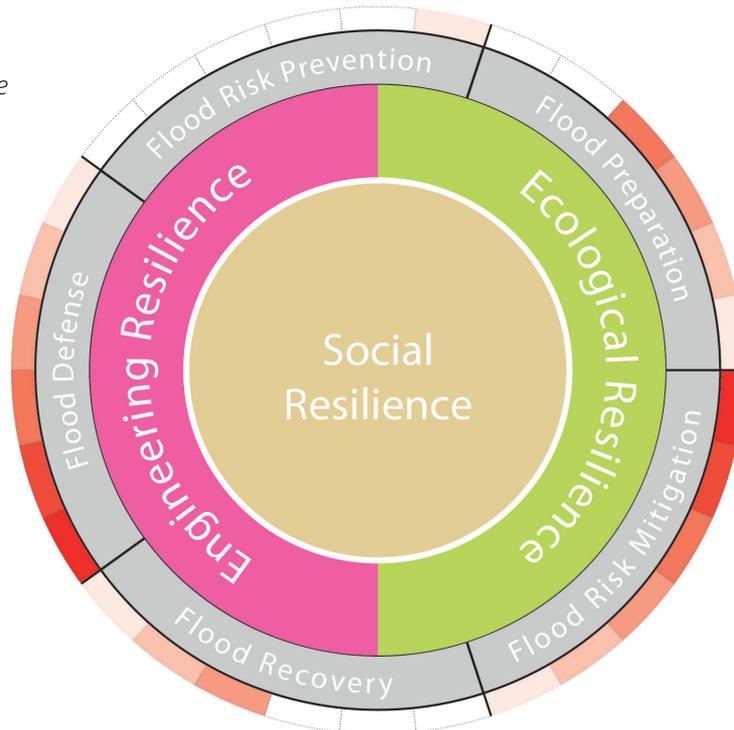
low degree �_____ high degree

Comparison between existing and proposed capacity of resilience of Bukit Duri
The capacity of resilience is assessed by referring the proposed intervention with the measurement of flood-risk
governance
(source: author)

## Conclusion

Interventions that are proposed for Bukit Duri neighborhood are defined by 3 (three) main frameworks: development, open-space, and infrastructure framework. Those project frameworks are implemented in three different vulnerable area and supported by design pattern for each typical problematic issue. Modification of space and infrastructure predominantly occurs in area I in which the complexity of the problems is higher than other areas.

Moreover, the proposal of intervention for Bukit Duri not only try to solve existing problem of flooding but also accommodate future challenge, such as population growth. Therefore, plots of future development are preserved in defined location in the neighborhood where the exposure of flooding is low.

All those interventions are addressed in a project timeline that suggests the direction of actions. The project timeframe also explains adaptive path-dependency among actions that suggest non-linear direction of intervention. As an addition to the project, stakeholder involvement for the project is also clustered based on their capability and interest to the project.

*Contribution to Resilience and Flood Governance Framework*

As a summary of design conclusion, the assessment of the design is reflected in the working framework of resilience and flood governance. Based on the character of design intervention, several contributions to flood-risk measurement are made, to enhance capacity of resilience of the neighborhood.

The existing resilience approaches that are made by government mostly contributes to engineering resilience by constructing flood defense and adopting recovery scheme. While the proposed intervention of this project tries to suggest a more balance proportion between engineering and ecological resilience by implementing a more environment-friendly design intervention.
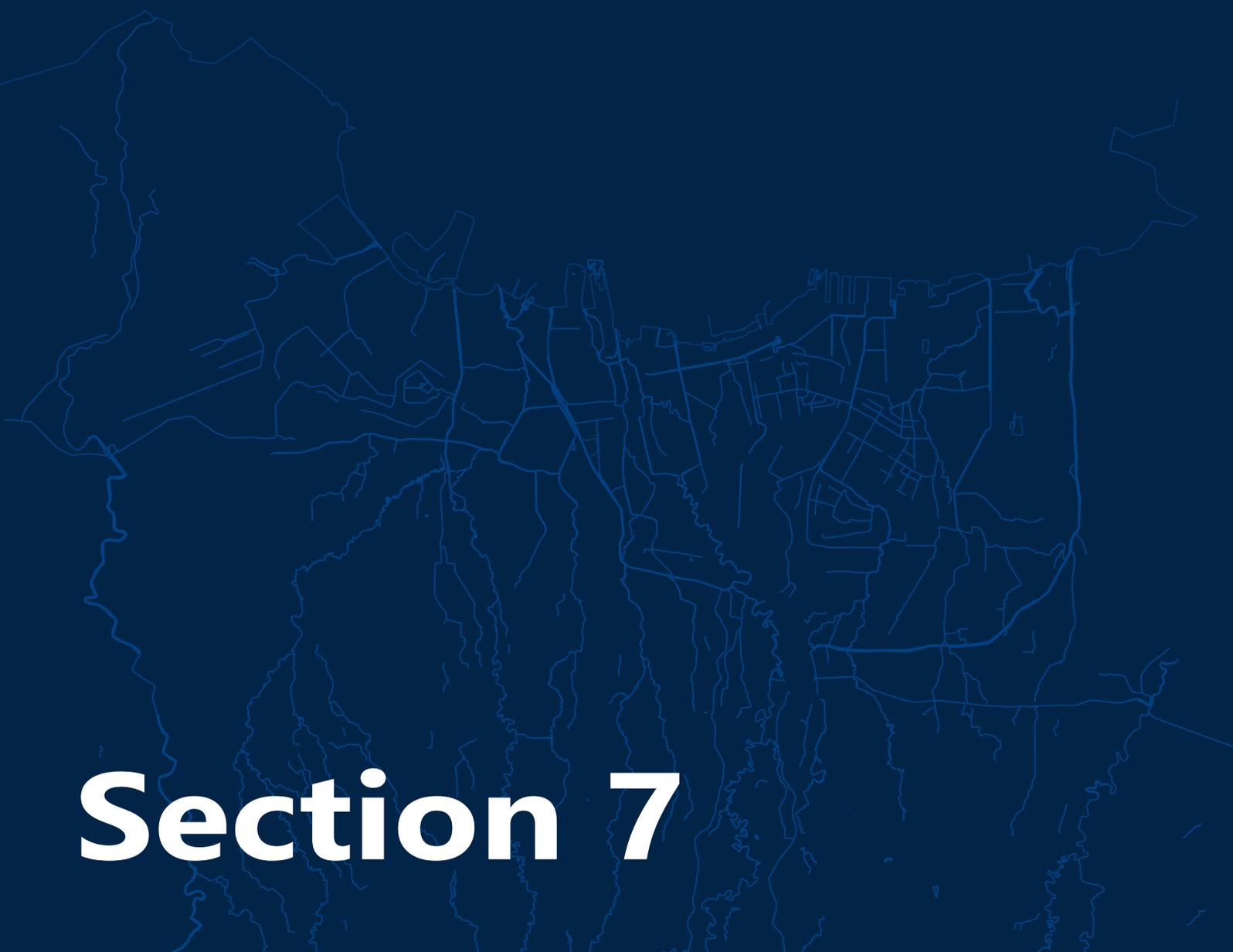
# Section 7

# Reflection

Scientific Consequences
Societal Reflection
Ethical Consideration
Designer/Planner Reflection
Relation to Recent Developing-Framework

## 7.2 Reflection

In general, this project is trying to propose interconnection between policy production and implementation while at the same time also suggest reinforcement for spatial quality, infrastructure performance, and the relation between human and nature. Those objectives are being more than important since the context which is introduced on this project has shown a problematic situation in many aspects in which taking priority is very essential to take a step further. Despite the complexity of the issues, Bukit Duri as the chosen context has attracted possibility to be explored and developed towards more resilient-to-flooding neighborhood.

As a part of learning and design process, there are some issues which come into consideration since it has inter-related consequences in a bigger picture. The issues which will be explained on this reflection are already taken as background arguments which helps to build the project understanding.

## Scientific Relevance and Consequences

Informal settlement has been an ongoing discourse in many developing countries not particularly in Indonesia. The production of research which develops general understanding and approach towards informality has also been introduced in several projects. On the other hand, resilience is also coming into the surface as an extensive agenda in many policy productions in Indonesia, especially in Jakarta as one of the selected cities in *Rockefeller Foundation's 100 Resilient Cities* list. It attracts attention to elaborate those two subjects, informality and resilience in certain research. However, the connection and relation between research and project are still yet to be common in Indonesia as each of the stakeholders is involved in different framework.

This project has specifically tried to seek the possibility to bridge the gaps by introducing further development of the subject in a design framework which later it can be used by the local actor/user to perform their own resilient lifestyle. Nevertheless, as the approaches on this project are more into specific site and context, there is a suggestion to see the properties not as an obligatory to-do-list but as distinctive locality.

## Societal Reflection

As it has been mentioned early in the problem analysis, there is a complex situation which suggests clash of rationalities between government as the policy-maker and the citizen as the user/recipient. The different perspectives of seeing the issues of flooding have led to unproductive dialogue among them especially on implementing the action.

The general objectives of this project which try to bridge the gap are highlighted along the process of doing the research. Understanding the nature of governance while also knowing the real interest of grassrootss stakeholders is important to advocate proper intervention. However, to produce that interaction, there are some approaches which have not been brought in the bigger picture on this project. Social mapping, in particular, is one of important tool that suggests more contextual impression of the neighborhood in terms of the relation among the inhabitant. However, this project suggests this approach as further development of proposal which will be necessary for the future implementation.

## Ethical Consideration

During the observation and research process, the writer has found many system and sub-system within the informal context which is beyond the map. For instance, the informal system of buying and renting house in the neighborhood still exists in certain extent which carries problematic situation to propose new intervention. However, this project has taken those properties as background and try to propose more normative and legible intervention to the neighborhood.

As a lesson learned, there is a crucial point where the intervention need to be elaborated in multiple dialogues especially at the local level. An even understanding needs to be brought by each citizen and actor to implement such an action.

Moreover, in a bigger picture of the society, there is a subject of spatial justice which can be elaborated in further research especially in terms of provoking intervention in marginalized community. Considering the complexity of problem that the city has, a priority-based policy is important to determine direction of government will while also provide argument for the society.

## A designer/planner reflection

Starting this project as a designer, the writer personally found some critical point during the research in which introduce different perspective on how to see the project and design as only one of many tools to reinforce such a context. In further elaboration, it is important to see beyond spatial dimension. Therefore, the role of designer/planner as proposing actor consequences necessity to have skill of negotiation and mediation to coordinate with other stakeholders.

In the end, a designer/planner will not be the one which is expert of everything, yet there is a suggestion to explore the capability to invite capacity of each stakeholder into the forum which can produce more fruitful intervention.

## Relation to recent-developing framework

This project generally relates to the **framework of sustainability** which compiles understanding of three sectors, public, private, and society. In the relation to this framework, this project has tried to provide access to each of those sectors to involve into the process. By knowing each interest and property, there is a bigger picture of this project which suggests collaborative interaction among those sectors. However, in the future research and design development, it is also important to understand the real-existing stakeholder which highly correlates to the project, especially from the private sector.

*Embracing further sustainability framework*



## Contributions to 9th, 11th, and 13th sustainable goals

*9th SDG - Industry, Innovation, and Infrastructure*

Provision of infrastructure as one of the highlights of the project has been introduced in the design framework and design pattern in the project. In general, the objective of infrastructure support is trying to connect the marginalized community to the bigger scheme of city development. By introducing this connection, it will suggest not only technical performance of infrastructure but also an establishment of resilient-to-flooding neighborhood.

*11th SDG - Sustainable Cities and Communities*

Bukit Duri as a community has a long history of living in inadequate livelihood which vulnerable to disaster. The impacts of disaster on their economic, social and spatial properties have been tried to be tackled in this project by introducing more resilient economic system and spatial organization. Furthermore, more sustainable social network has also been reinforced by initiating more productive and interactive public space in several locations in the neighborhood.

*13th SDG - Sustainable Cities and Communities*

The issue of climate change considerably has brought many consequences to the city of Jakarta not particularly to Bukit Duri as one of the most problematic neighborhoods in the city. Considering the long-term impact of this issue, this project suggests more self-sustained system in the neighborhood, for instance, rainwater harvesting and its water treatment to avoid further exploitation of groundwater. Even though the intervention is very local, it proposes a pilot intervention to reduce the rate of land subsidence in the city.

# REFERENCES

Adger, N. W. (2000). Social and ecological resilience: are they related? *Progress in Human Geography, 24*(3), 347–364. doi:10.1191/030913200701540465

Berkes, F. (2007). Understandin uncertainty and reducing vulnerability: lessons from resilience thinking. *Natural Hazards, 41*(2), 283-295. doi:http://dx.doi.org/10.1007/s11069-006-9036-7

Brand, F. S., & Jax, K. (2007). Focusing the Meaning(s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society, 12*(1), 23.

Cisadane, B. C. (2018). Vision and mission. Retrieved from http://bbwsciliwungcisadane.com/profil/visi-misi

Dahrendorf, R. (1979). *Life Chances: Approaches to Social and Political Theory*: Books on Demand.

Davis, M. (2006). *Planet of Slums*. London: Verso.

Ford, L. R. (1993). A Model of Indonesian City Structure. *Geographical Review, 83*(4), 374-396. doi:10.2307/215821

Gariépy, M. (2009). DUPUY, Gabriel (2008) Urban Networks – Network Urbanism. Amsterdam, Techne Press, 296 p. (ISBN 978-90-8594-019-7). *Cahiers de géographie du Québec, 53*(150), 472-474.

Hegger, D. L. T., Driessen, P. P. J., Dieperink, C., Wiering, M., Raadgever, G. T. T., & van Rijswick, H. F. M. W. (2014). Assessing Stability and Dynamics in Flood Risk Governance. *Water Resources Management, 28*(12), 4127-4142. doi:https://doi.org/10.1007/s11269-014-0732-x

Holling, C. S. (1996). Engineering resilience versus ecological resilience. In *Engineering within ecological constraints* (pp. Pages 31-44 in P. Schulze). Washington, D.C., USA: National Academy.

Jarvie, J., Sutarto, R., & Asmara, I. (2013). Resilience in Jakarta. Retrieved from http://www.100resil-ientcities.org/ website: http://www.100resil-ientcities.org/resilience-in-jakarta/

Jegho, L. (2016). Indonesia has the Fastest Urbanization Growth in Asia. Retrieved from http://www.globalindonesianvoices.com website: http://www.globalindonesianvoices.com/27678/indonesia-has-the-fastest-urbanization-growth-in-asia/

Juliman, D. (2006). The World's First Slum Upgrading Programme. *World Urban Forum III, Feature4*.

keck, M., & Sakdapolrak, P. (2013). WHAT IS SOCIAL RESILIENCE? LESSONS LEARNED and WAYS FORWARD. *Erdkunde, 67*(1), 5-19.

Klein, R. J. T., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Environmental Hazards, 5*(1), 35-45. doi:http://dx.doi.org/10.1016/j.hazards.2004.02.001

Liao, K.-H. (2012). A Theory on Urban Resilience to Floods: A Basis for Alternative Planning Practices. *Ecology and Society, 17*(4), 48. doi:http://dx.doi.org/10.5751/ES-05231-170448

Meerow, S., Newell, J. P., & Stults, M. (2015). Defining urban resilience: A review.

Sherwell, P. (2016). $40bn to save Jakarta: the story of the Great Garuda. Retrieved from www.theguardian.com website: https://www.theguardian.com/cities/2016/nov/22/jakarta-great-garuda-seawall-sinking

Suryani, S. (2016). Membangun Bukit Duri, membangun kota: Reposisi Kampung Dalam Konteks Urban. Retrieved from medium.com website: https://medium.com/forumkampungkota/membangun-bukit-duri-dc5567a6b625

Tempo.co. (2015). Apa Beda Banjir Jakarta 2007, 2013, 2014, dan 2015. Retrieved from https://metro.tempo.co/read/641933/apa-beda-banjir-jakarta-2007-2013-2014-dan-2015

Tunas, D. (2008). *The Spatial Economy in the Urban In-
formal Settlement*: Papiroz Edu.

Tunas, D., & Peresthu, A. (2010). The self-help housing
in Indonesia: The only option for the poor? *Hab-
itat International, 34*(3), 315-322. doi:https://
doi.org/10.1016/j.habitatint.2009.11.007

Vanessa, W. (2009). Seeing from the South: Refocusing
Urban Planning on the Globe's Central Urban
Issues. *Urban Studies, 46*(11), 2259-2275.
doi:10.1177/0042098009342598

Wang, C.-H., & Blackmore, J. M. (2009). Resilience
Concepts for Water Resource Systems. *Journal
of Water Resources Planning and Manage-
ment, 135*(6). doi:https://doi.org/10.1061/
(ASCE)0733-9496(2009)135:6(528)

# Appendix

# A-1. Ciliwung-Cisadane Territorial Flood Management in Regional



Jakarta Bay

Bukit Duri

0  2    10    20 km

Segment 6

Bukit Duri — Jakarta Provincial territory

Segment 5

Municipality of Depok

Segment 4

Bogor Regency

Segment 3

Municipality of Bogor

Segment 2

Bogor Regency

Segment 1



Segment 6

Segment 5

Segment 4

Segment 3

Segment 2

Segment 1

Bukit Duri

Jakarta Provincial territory

Municipality of Depok

Bogor Regency

Municipality of Bogor

Bogor Regency

sea dike improvement

artificial conduit

construction of retention basins

revitalization of reservoir

channel reservoir

river normalization

micro drainage

reforestation

0  2    10    20 km

# A-2. Field Observation Inventory
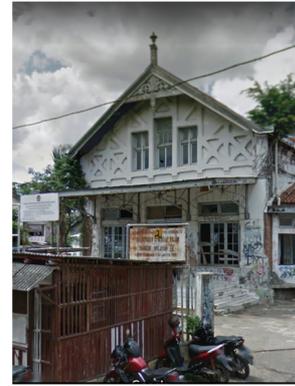
| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |



| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |



housing building which are threatened by frequent flooding

| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |



local economy threatened by flooding

| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | **bad habit - unmanaged waste disposal** | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |



| decayed building | **hardscape domination** | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |



| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | **low relation to the river** | infrastructure boundary |

| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |





improper sewage and water network in within the neighborhood

disconnection between iflood infrastructure and neighborhood
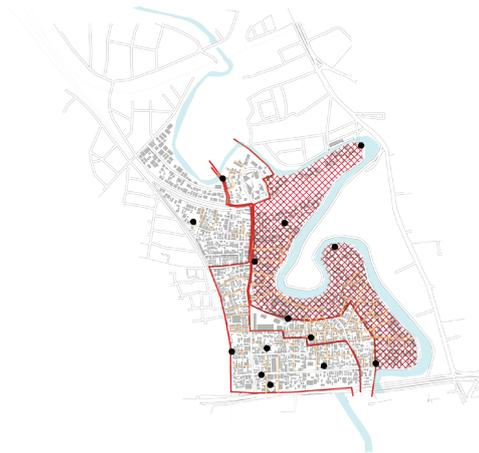
| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |





| decayed building | hardscape domination | infrastructure disconnection |
|---|---|---|
| individual flood adaptation living space | bad habit - unmanaged waste disposal | lacking of basic infrastructure |
| threatened local economic | low relation to the river | infrastructure boundary |

# A-3. Map of Anchor Activity
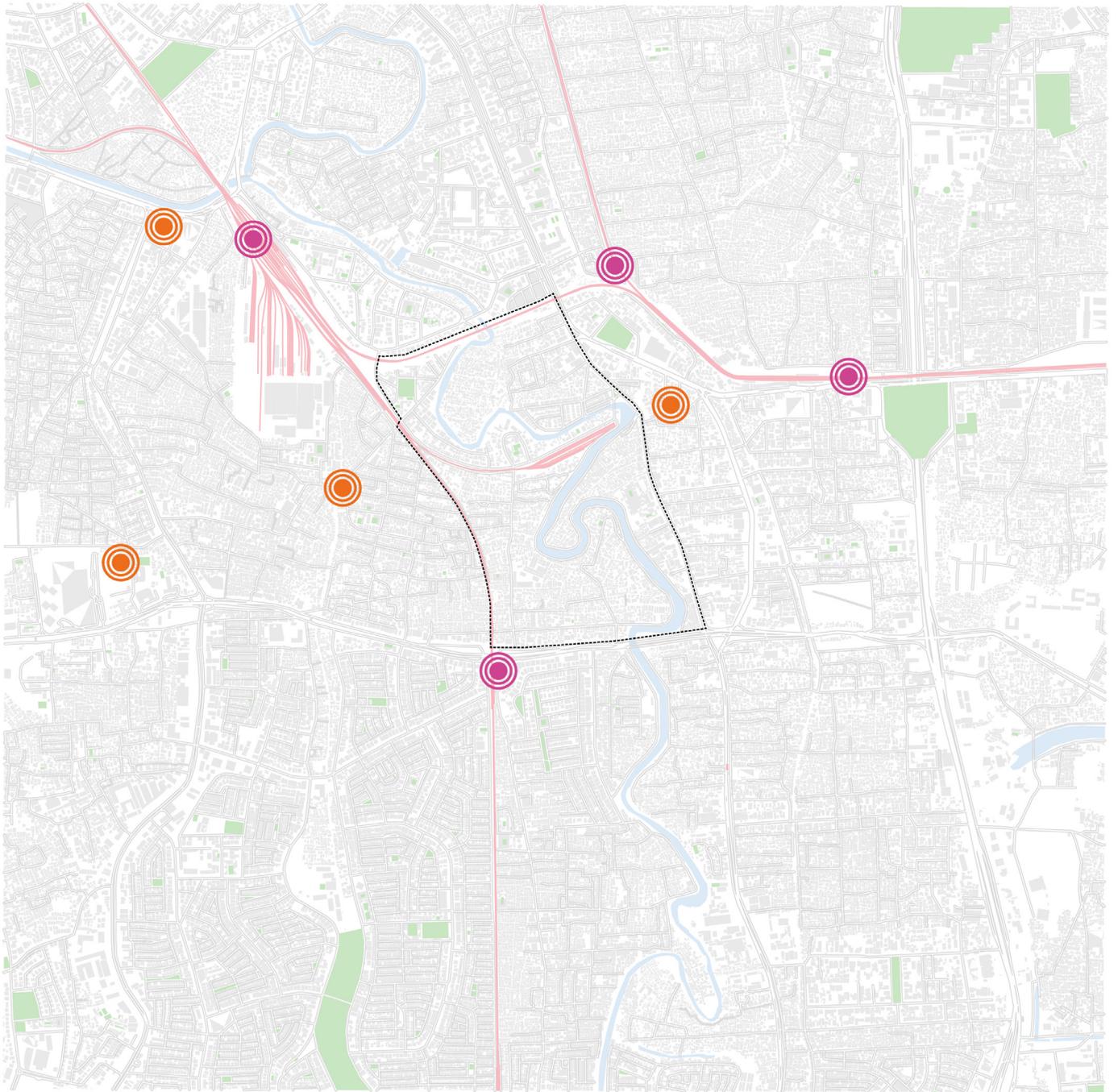


◉ transport hub / train station

◉ market

0   100                          500m

# A-4. Land Use map
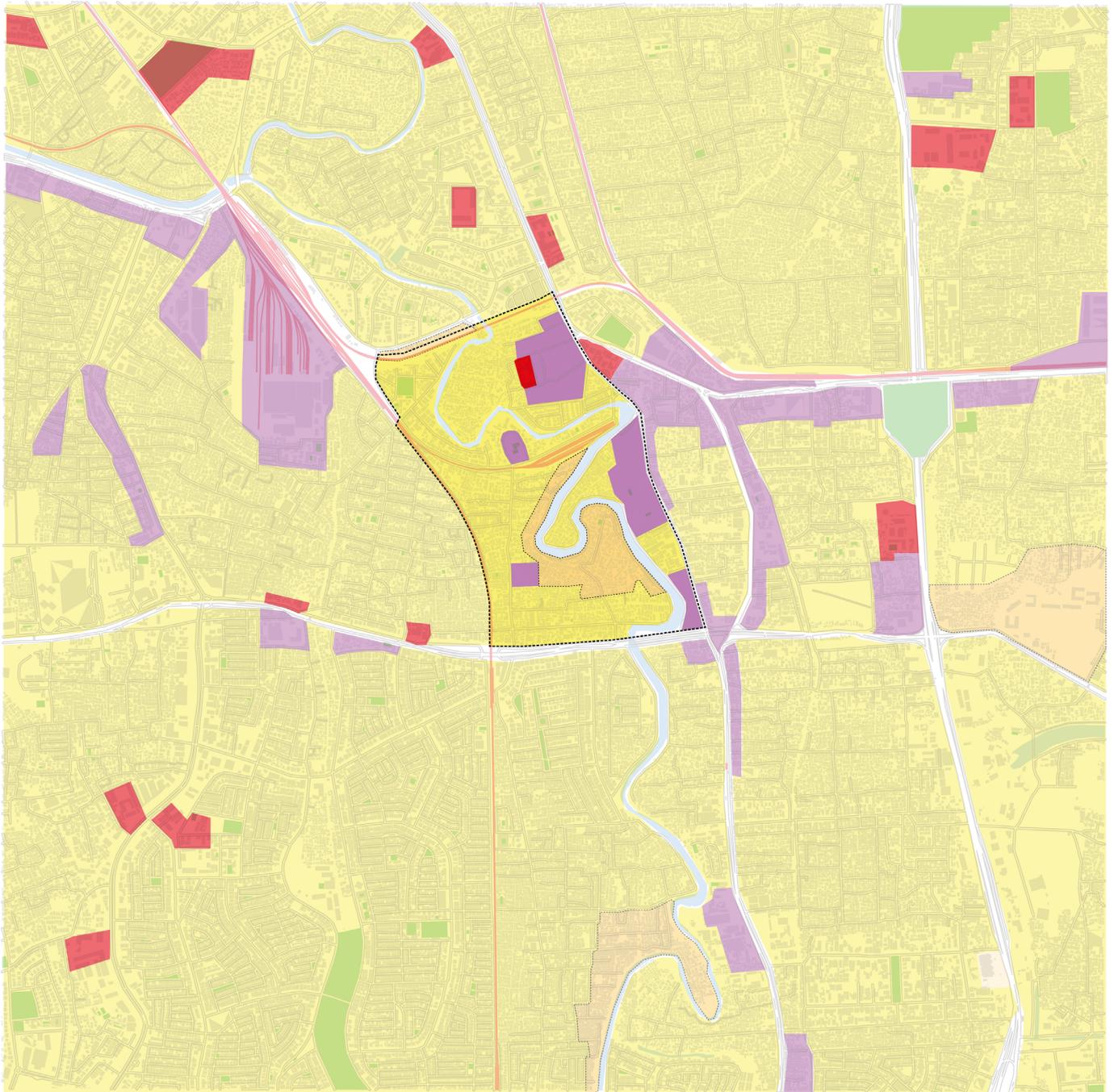


mangrove forest/ forest preservation
open space/park/cemetery
government
regular settlements
irregular settlements
office/trade/services
farms
industri/storage
reservoir/swamp/ponds
social facilities
transportation infrastructure
vacant land

0    100                    500m

# A-5. Policy Projection Map



East Jakarta
South Jakarta

Manggarai

5. District Manggarai

7. District Jatinegara

16. Ciliwung River Corridor
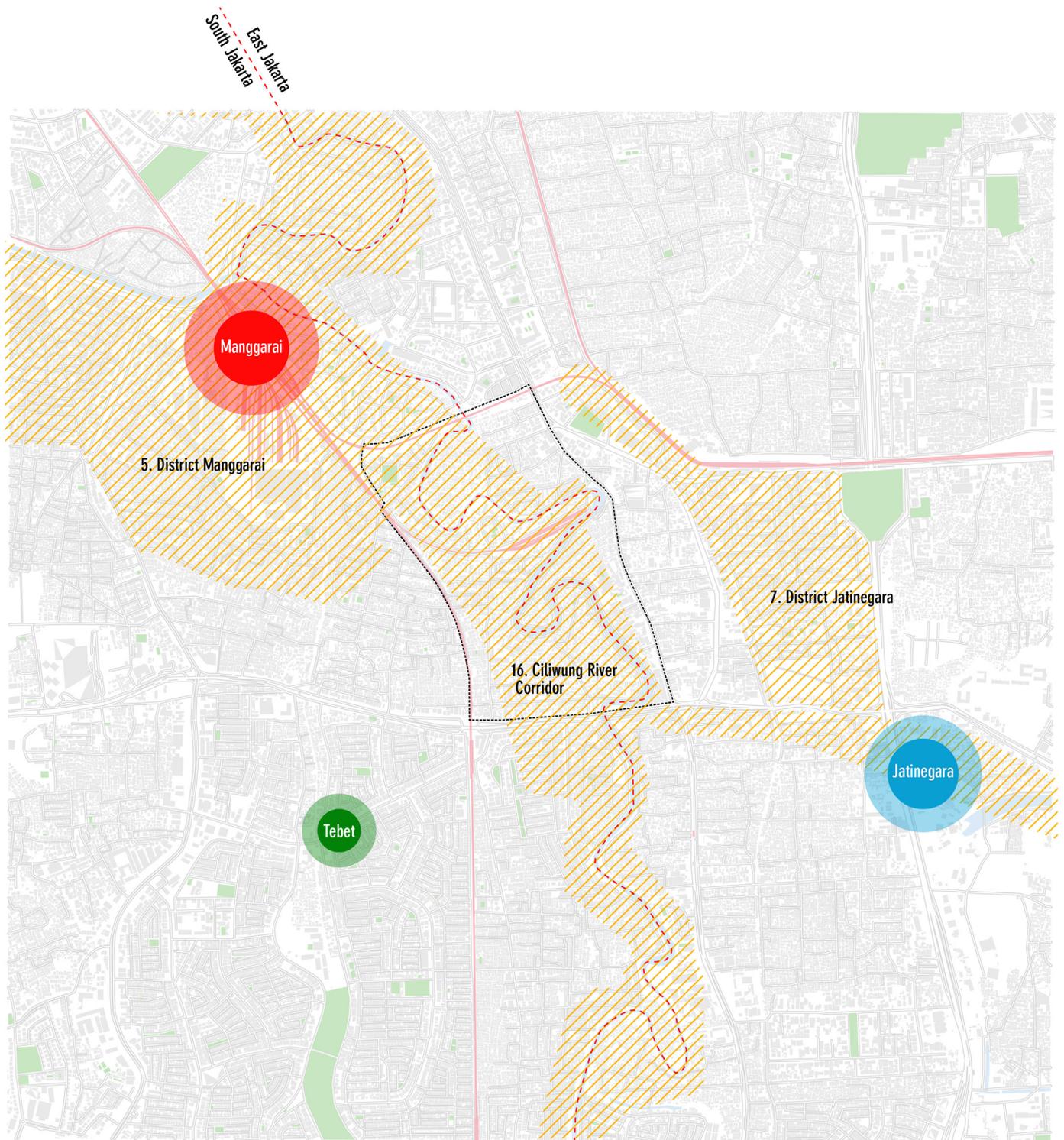
Jatinegara

Tebet

- - - - - municipal border

///// provincial strategic areas

● primary activity center

● secondary activity center

● tertiary actvity center

0   100        500m

# A-6. Zoning Map ( District Tebet - District Jatinegara)
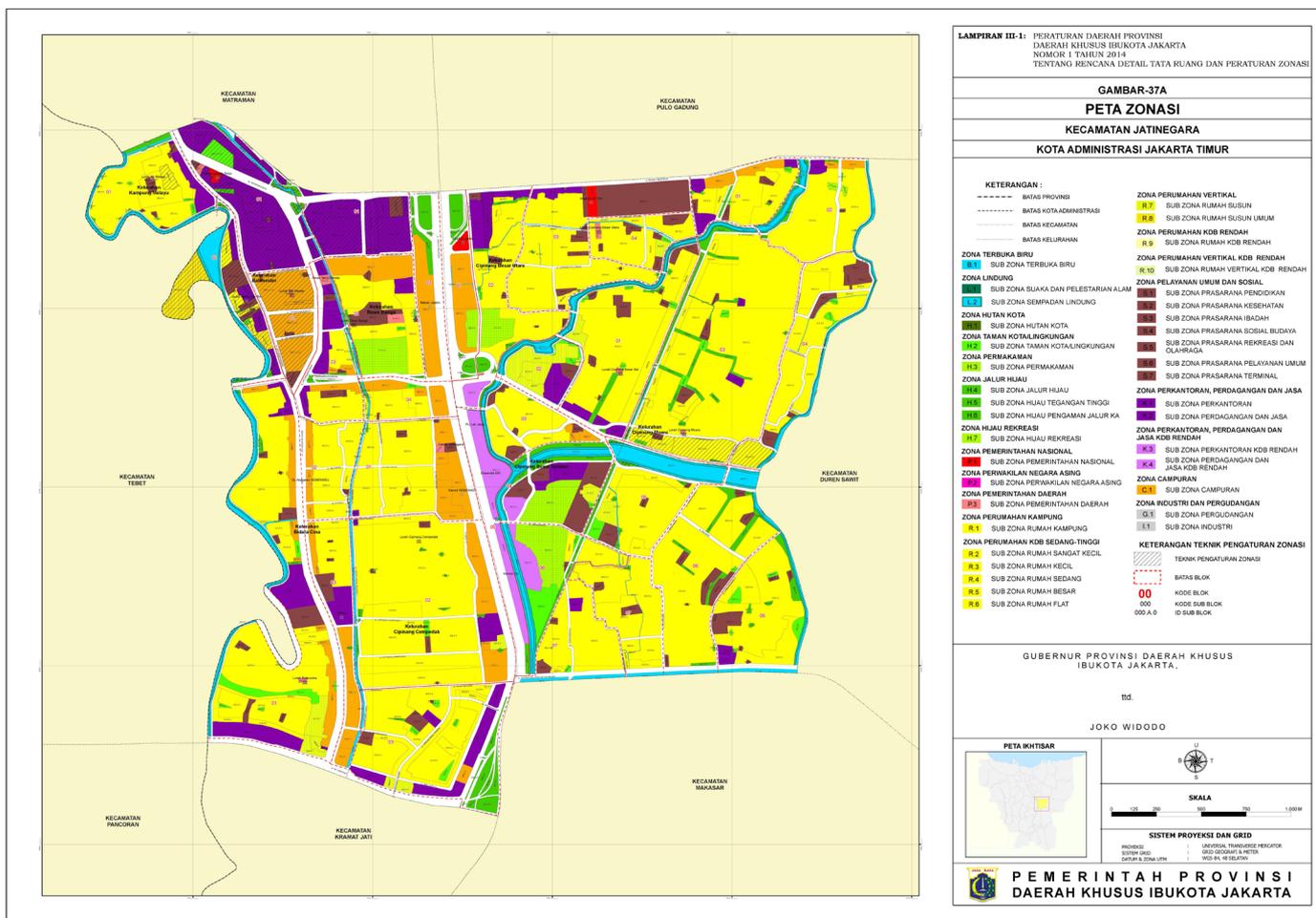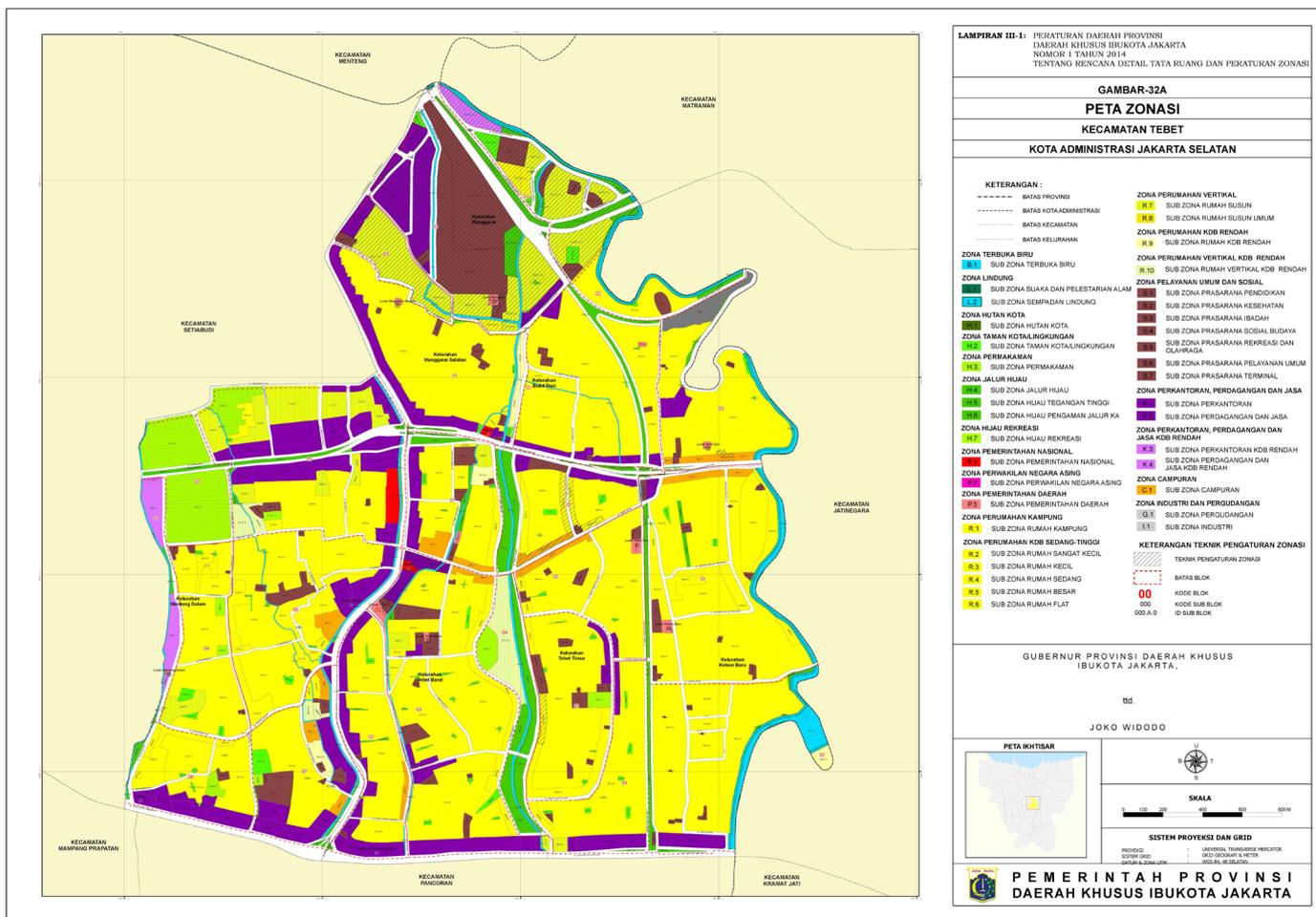
# A-7. Diversification of Policy and Action from Regional to Local Scale



BBWSCC Central Government Task Force

*MAP of Policy*

Policy in
**Provincial level**

Policy in
**Provincial + Municipal level**

Action in
**Neigborhood level**

Jakarta Bay
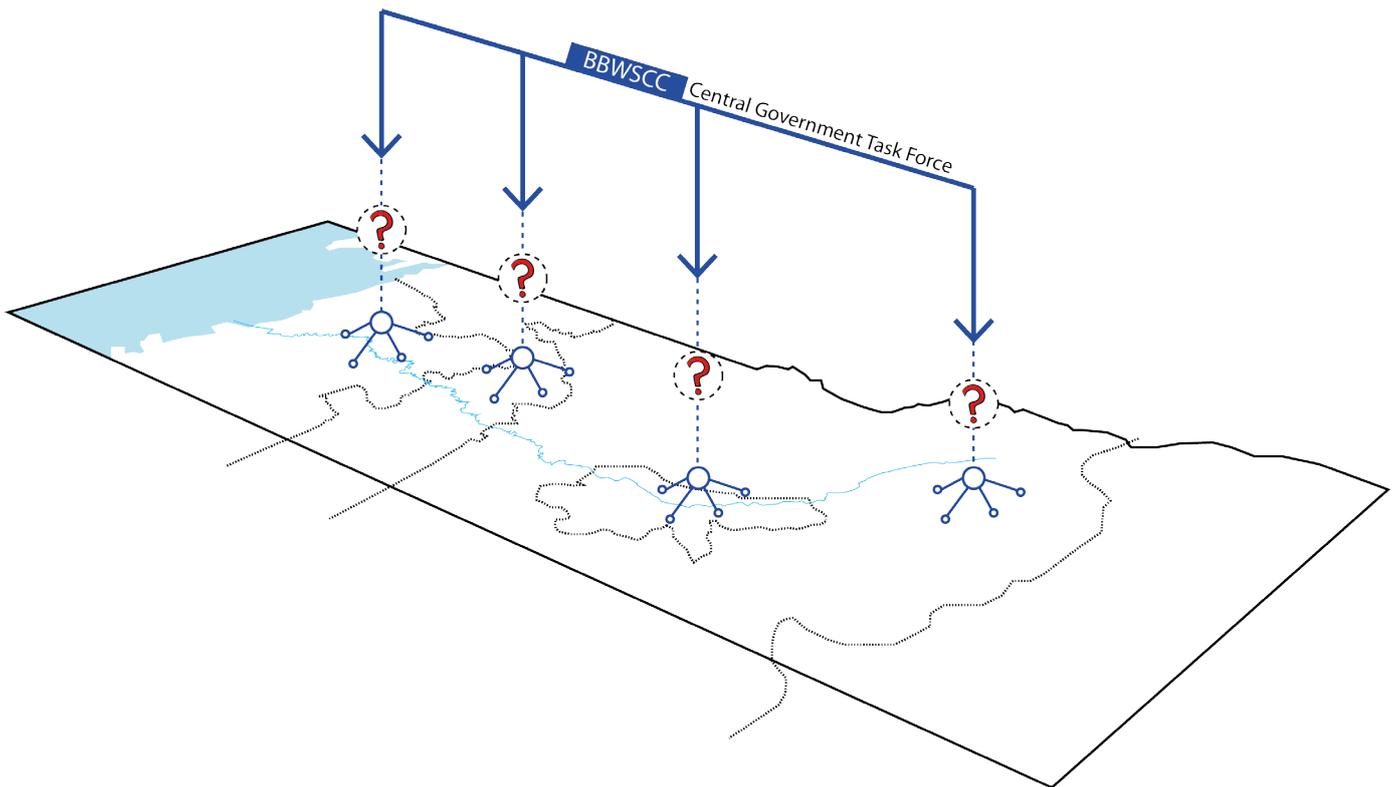
Jakarta Bay
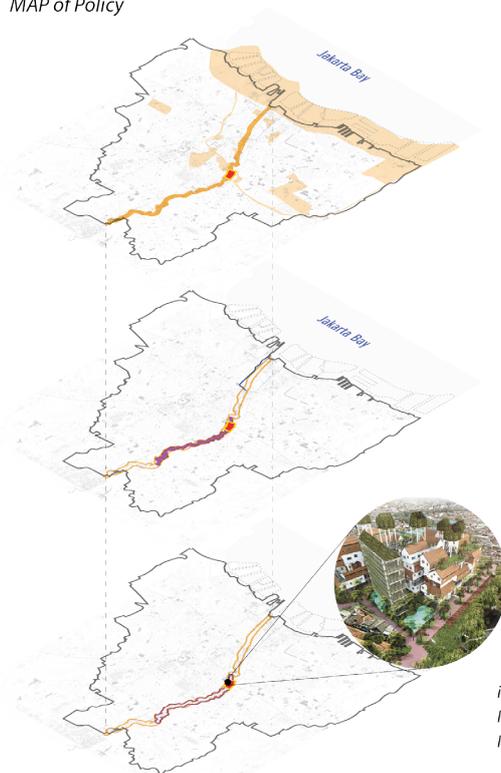
**Jakarta Spatial Plan 2030 –
Strategic Areas for Environment**
remarks:
d. Improvement of the river border as **green spaces and flooding retention**.

**Ciliwung River Normalization**
remarks:
widening the river and providing inspection roads.



**Proposal of** *Bukit Duri Elevated Kampung*
remarks:
- flood-responsive building
- rearrangement of green areas and water catchment areas
- mixed-culture housing which provides economic and social space

*in different level of action, diverse interest determine the process of intervention.
In a large scale the intervention is trying to* ***improve resistance***
*In more local scale, the intervention is working towards* ***transformation of space***.

# A-8. Space Syntax Analysis: spatial tools to determine integrated segment in the network
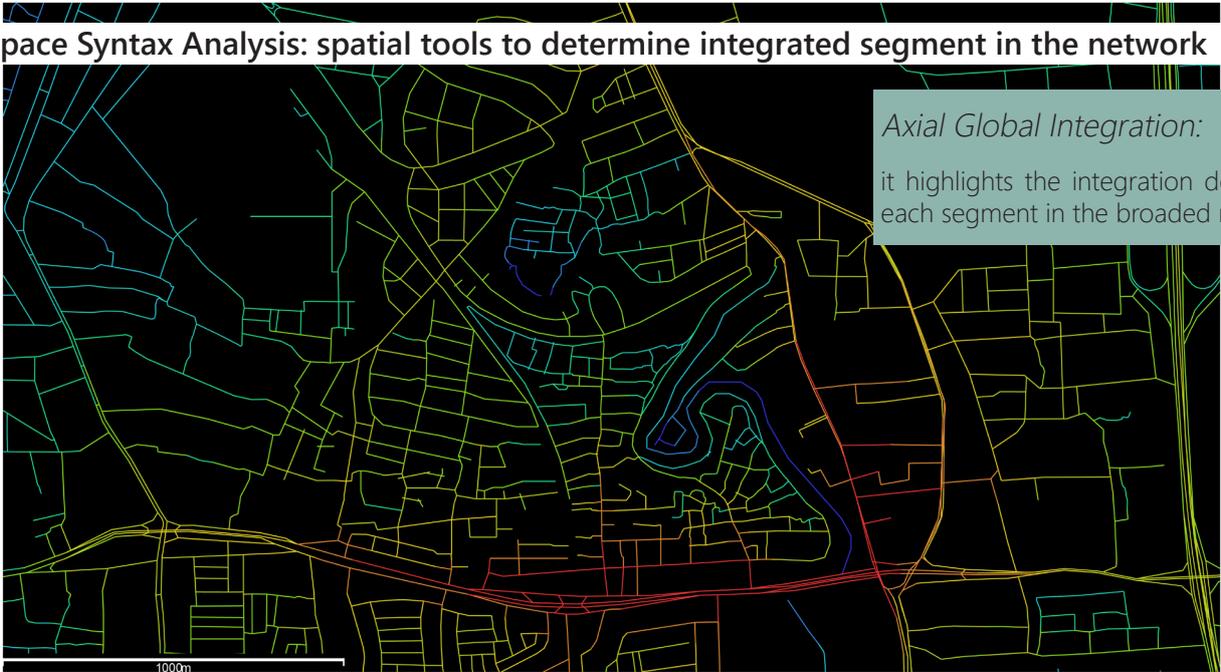


*Axial Global Integration:*

it highlights the integration degree of each segment in the broaded network
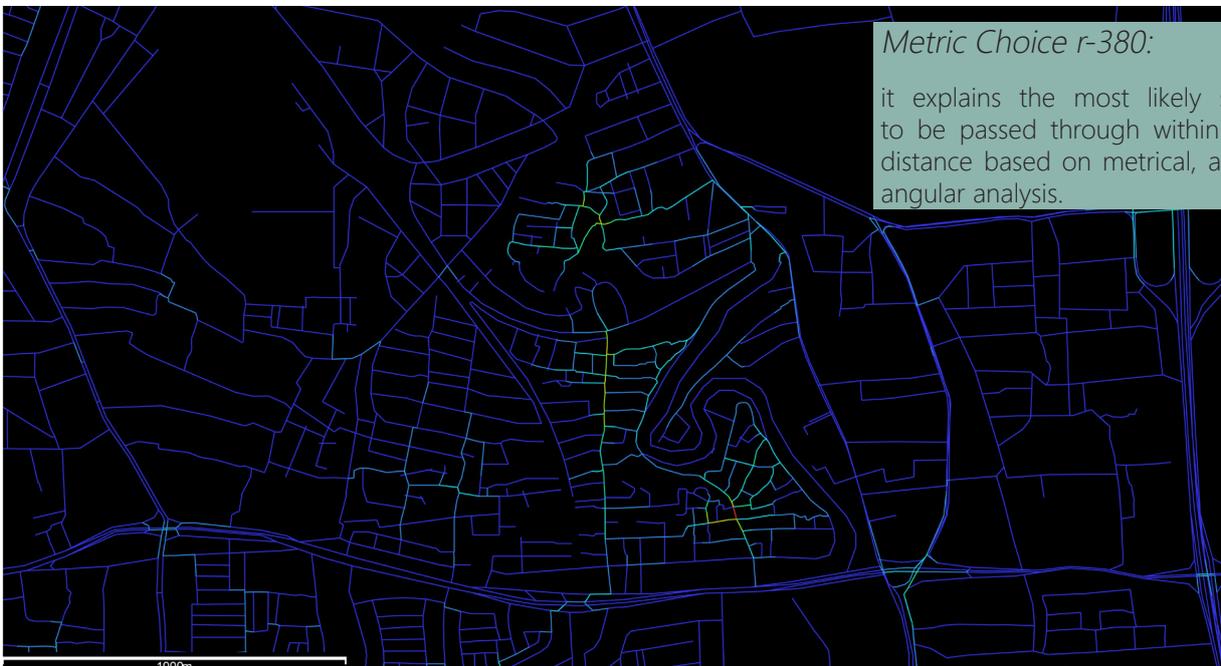


*Metric Choice r-380:*

it explains the most likely segment to be passed through within walking distance based on metrical, axial, and angular analysis.



*Metric Choice r-3800:*

it explains the most likely segment to be passed through by using vehicle based on metrical, axial, and angular analysis.