Breathe

Redefining a zone of informal settlments
for Ho Chi Minh City

Rapa Surajaras
Landscape Architecture MSC 2019

Breathe
redefine a zone of informal settlments
as an opportunity to the city and
the environment for Ho Chi Minh City
through landscape architectonic interventions

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This thesis is the reflection of my fascination in landscape architecture which has been strengthened by the Master study in Landscape Architecture track in the Faculty of Architecture and the Built Environment at Delft University of Technology.

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ABSTRACT

The project has been created from a strong fascination of the author who came from the developing country in South East Asia. A rapid change of a city from urbanization and over-growing population have somehow eradicated the traditional way of living. One of the best examples is in Ho Chi Minh City, in the South of Vietnam. The city is located in the prime location of the Saigon Delta, and it is the biggest city in Vietnam. Within the last 30 years, the population rose from 4 million people to 10 million people. This led to severe environmental problems and housing shortage. Consequently, local people began to settle their houses illegally along the canal to live with the water as their traditional way of living. This so-called informal settlement has expanded all over the water structure of the city, and they are continuing to grow. The current situation has triggered me to explore the potential of landscape architecture to create design interventions to redefine the zone of informal settlement as an opportunity for Ho Chi Minh City and the environment to 'breathe.'

The test site has been chosen in the area with the highest density of informal houses in Doi-Te Canal. The design strategies are composed of four layers which are Collect, Purify, Connect and Adapt. The first two layers are contributed to waste management and water purification. The floating waste on canal surface is captured and separated before transferred to the Biogas station which will be transformed into biogas for community cooking purposes. All of these procedures involved the design intervention which is operated by the community. At the same time, the polluted water is diverted to the purification park, it is directly delivered to 10 different biological ponds before released back to the canal. The third layer referred to the social aspect; the two sides of the canal are linked by the proposed pedestrian routes. The different experiences along the routes together with design interventions created interaction between a diverse group of people and brought the social space back to the Canalside. Lastly, the design also concerned about the adaptable ability to tackle with the unexpected future in the "Adapt" layer. The entire area has been studied to find the possible sponge surfaces to hold the water in case of excessive water. Furthermore, the zone of informal settlements also proposed to function as a low dike to protect the urban district come flooded.

Through the process of research by design, the zone of informal settlement is being redefined and integrated into the city. The project has revived the existing landscape and enhance the entire area into a living system which is not only created a better environment but also offered a better quality of life to community and Ho Chi Minh City inhabitants. Most importantly, the intangible quality as the culture of "life with water" is being represented and preserved for the future generation.

0 INTRODUC-TION

0-1

PREFACE

The beginning of the project derived from my own experiences from growing up in Thailand. By examining through my own photo collection from the past decade, it became evident that my personal interest is laid in the everyday life of people on the street and their creativity to deal with the given circumstances. Inspiring scenes of traditional living can easily be found in the rural area. For instance, I pictured kids having fun by jumping into the river and a family using fresh water from the water stream. It is intriguing how people adjust their living condition to the landscape and how they used to live with water. Without any awareness, this type of quality has taken root in my memory. To my regret, those images are turning into history since the urbanization came across and people tend to forget about their traditional way of living.

The question came to mind, how landscape architects can enhance this subtle topic that is of important cultural value? Moreover, how can the design deliver those qualities back to the landscape?

Figure 0-1,0-2,0-3 Traditional way of living of Thai people in the rural area (Damar,2015)
Figure 0-4 Thai kids jumping into the river in their leisure time (Life with water-วิถีชีวิตริมน้ำ, n.d.)

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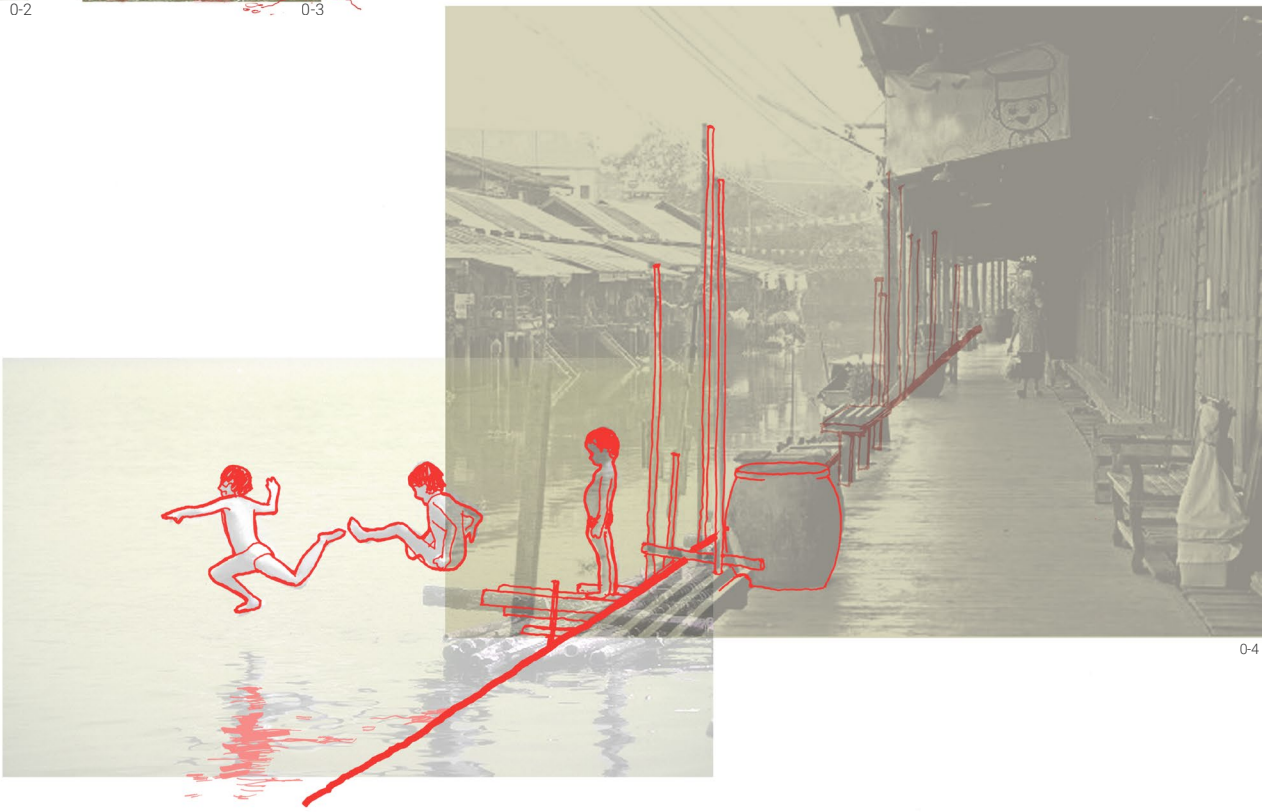
0-3



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It is not hard to argue that landscape shapes culture (Sumner & Williams). For centuries, people managed to settle in the fertile delta's land where it is resourceful, and water is accessible. The remarkable ability of human can be seen by the adaptability to the natural landscape. Start from one wisdom to social behavior that was when the culture and civilization had been initiated. As times went by, the emergence of technology and rapid urbanization offered alternative ways of living. Settlements are tended to appear where infrastructures and public utilities are provided. Skytrain, highway and skyscrapers became the common perspective of a city while an image of the traditional way of living turned into a memory. A familiar situation of the big cities represented by the rapid growth of urbanization which attracted more people than it can handle. The overflow of immigrants and the housing shortage in the metropolis led to the occurrence of the informal settlement.

The growth of informal settlements is a global phenomenon. From the last 30 years, more than 213 million people lived in the informal settlement which is equal to an estimated 25% of the world's urban population (Avis, 2016). The informal settlers tend to locate next to the water structure of the city and having their own cultural way of living. Most often, the image of informal settlement has been perceived as eyesores or the visual and social pollution. The informal part of the city became an isolated zone of the formal city (Dovey&King, 2012). This situation has led to the exploration of the project which intended to investigate the potential of landscape architecture to create a design intervention to redefine the zone of informal settlement as an opportunity for the city. The aim is to integrate the city to the dynamic of the natural landscape and enhance the long lost cultural value back to the city by using the informal settlement as a middle ground.

The study site is situated in Ho Chi Minh City, Vietnam where the city experienced the accelerated population growth in the last ten years. More than 15% of the registered housing units are the informal settlements and they are continuing to grow (Harley, Toan & Habitat for Humanity, 2008). The current situation shows the never-ending battle between a slum-clearance plan and a new zone of informal settlements. Therefore, the city requires an alternative solution to the tackle with the mentioned challenge. The research scope of this thesis will be focused on the informal settlement along the water structure in the urban districts and its relationship to the surrounding landscape as the main investigation. Besides, the focusing area is in the most accumulated area of informal settlers which is Kenh Te canal and Kenh Doi canal.

In order to intervene in the complex system of the big city as Ho Chi Minh City, the discourse of landscape as urban acupuncture will be used to structure the design intervention and to emphasize the integration of the built environment, the natural landscape and people. Besides, the theory of Social-Ecological Resilience will be used as the body of knowledge to analyze and evaluate the design interventions to be able to endure through the dynamic of the landscape and unpredictable extreme climate. The combination of the two approaches seeks to initiate the landscape architectonic interventions that can withstand in the existing conditions of HCMC and the unexpected events in the mere future. This design intervention is expected to be a set of design toolkits which can be used as a guideline for other cities with similar situations to create a network of informal urban acupuncture and to reflect the different cultural value of each city.

Figure 0-5. Boat as main transportation in Mekong river, Vietnam (Boat Channel in Mekong Delta,n.d.)
Figure 0-6, 0-7, 0-8. Everyday life onwater surface of Vietnamese people

1 CONTEXT INTRODUCTION

HO CHI MINH CITY, SOUTH VIETNAM

One of the distinctive examples of "a life with water" city is Ho Chi Minh City (HCMC), Vietnam. With the geographical location of Vietnam, most parts of the country are surrounded by the sea (figure 1-4). In the south part of the country, there is a prime location where the Saigon river and the Dongnai river merged before reached the Eastern sea, and it is where HCMC located. In the past, this delta city has been called as Saigon, it used to be the capital city of Vietnam. Currently, HCMC covered the area of 2,095.5 kilometers which is the biggest city in Vietnam ("Ho Chi Minh city",2015). HCMC is considered as a vibrant metropolis ("Climate Adaptation Strategies, HCMC", 2013). The city has rapid urbanization in the past decades. Now a day, it became the fast-growing economy city, the nation's financial capital, the highest GDP and center of various institutions. Most of the industry and harbors in the south of Vietnam are located in this area. Moreover, HCMC is used as an international trade hub due to its location at the intersection of strategic international maritime routes ("Climate Adaptation Strategies, HCMC", 2013). As a consequence, the city attracted people from all across the country, more than eight million people are now living in the city and it is continuing to grow (Nguyen, Samsura, Krabben & Le, 2016).

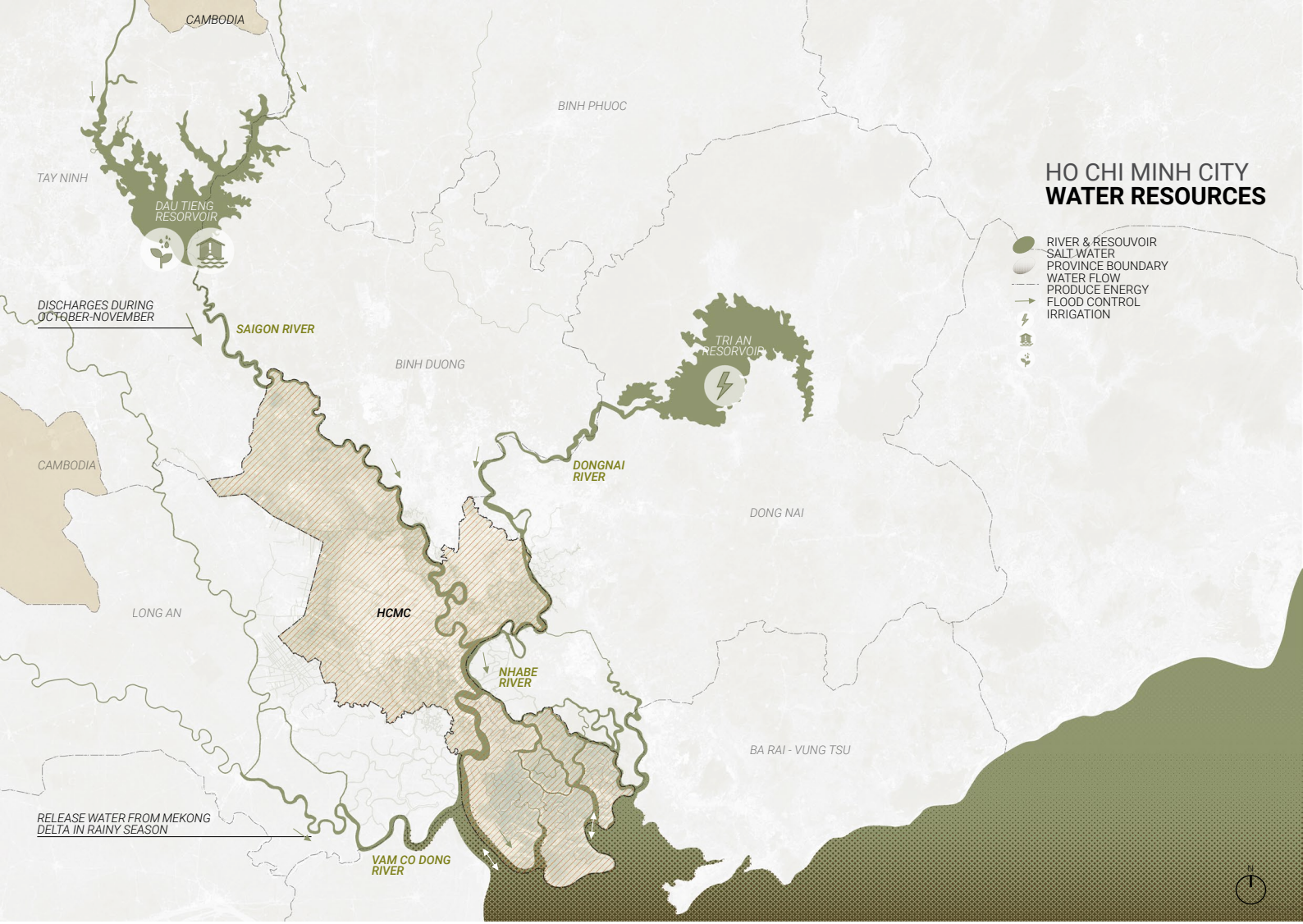
Figure 1-1. Saigon river as a backbone of Ho Chi Minh City (Ho Chi Minh City Guide, n.d.)
Figure 1-2. City as one of the main port of Vietnam (Nguyen, 2015)
Figure 1-3. French Colonization Period influenced in urban planning (Nagy,2017)
Figure 1-4. South East Asai map (Southeast asia map vector 73163776, n.d.), Redrawn by author

1-1

1-2

1-3


China
Vietnam
Laos
Thailand
Cambodia
The
Eastern Sea
Andaman Sea
Golf of
Thailand
Malaysia
Indonesia



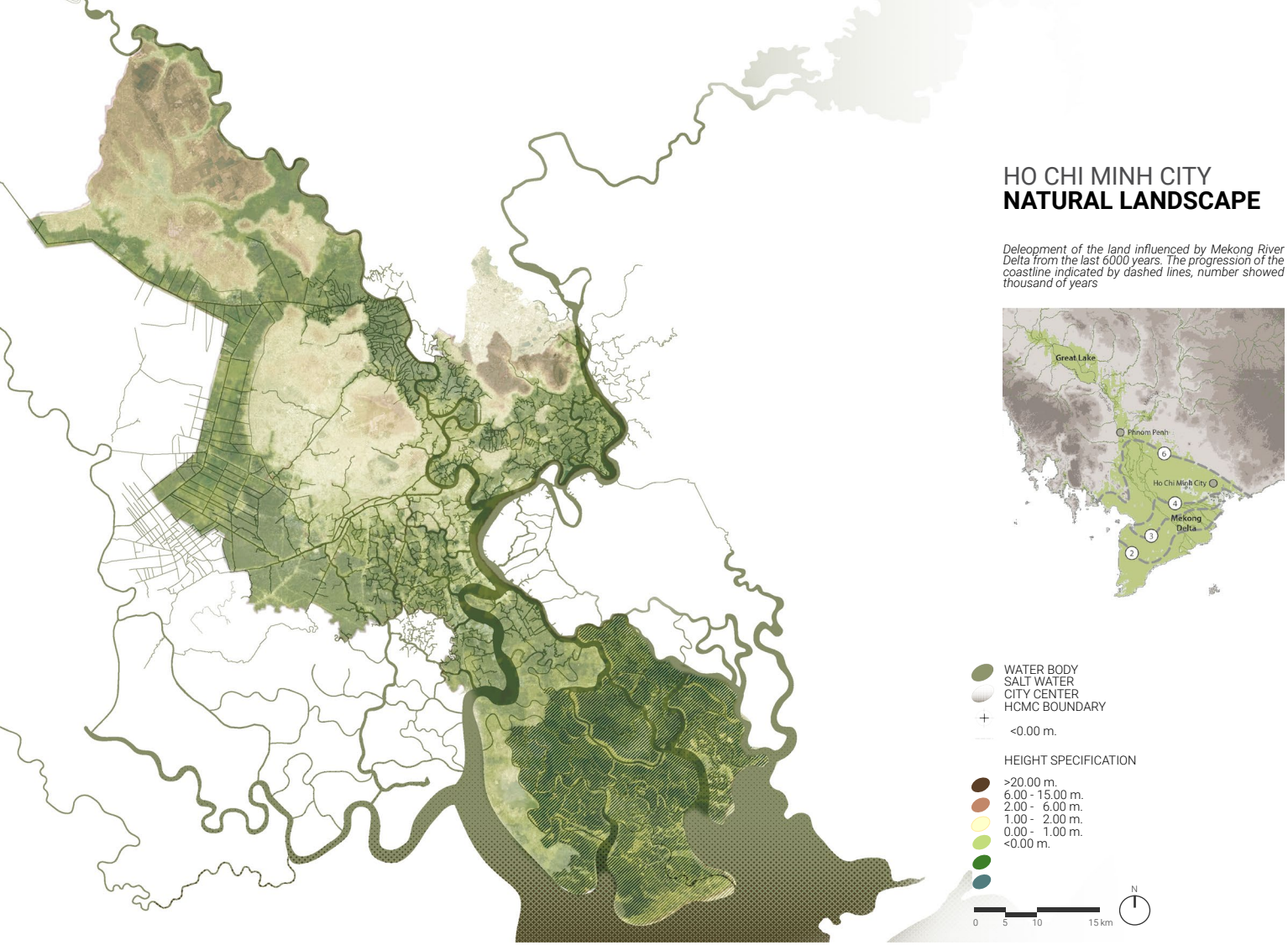
One of the main characteristics of HCMC is represented by complex hydrological system included a strong semi-diurnal tidal influence, interconnected water structure of canals and rivers, relatively high amount of rainfall and extensive amount of wet and low lands (Nguyen, 2013). The main river system consists of the Nhabe river, Vam Co Dong river, Vam Co Tay river and the most influential rivers as Dongnai river and Saigon river. The Saigon river is significantly associated with the development of the city, the river itself functioned as drainage system for rain water and waste water in the north and center of the city. The beginning of the river started from the border of Vietnam and Cambodia then flows downstream to the edge of HCMC. In Dau Tieng District, the river has been dammed to create Dau Tieng Reservoir which is used for irrigation and flood protection ("Climate Adaptation Strategies, HCMC", 2013). Water discharge from Saigon river is controlled by the amount of water released from Dau Tieng reservoir which is usually released only in October and November. Most of the time water level in Saigon river is influenced by semi-diurnal tidal which change four times a day (Truong, 2008). On the other hand, the discharge of the Dongnai river is depended on the upper river (Be river) and the amount of water released from Tri An Reservoir. This reservoir is built to produce energy which make the water level in the reservoir constantly high throughout the year. The Dongnai river plays an important role in the drainage system in the south of the city. Nevertheless, due to the interconnection of the two rivers, the water elevation of the Saigon River is substantially influenced by the flows volume of the Dongnai river and tidal of the sea (Ho, 2010).

Figure 1-5. HCMC Water Resource map (Vachaud et al., 2018), Redrawn by author

HCMC Source of Water Supply

Rivers (92%)
Groundwater (7%)
Rainwater (<1%)

Water demand	1.6 m^3/day
Current water supply	1.2 m^3/day



The geology of the city has formed by the influenced of the Mekong Delta (figure 1-x) which is located on the central core of the Indosinian Continent. The geological conditions are mainly sedimentary deposits (Cenozoic Quaternary Deposit, uncemented clay, silt, sand and gravel), siltstone and mudstone. Most of the area is relatively flat which the range of 0 – 10 meters. The topographical condition can be divided into three different zones. The high terrain zone is defined as the land with the average height of 10-25 meters to the highest point at 32 meters in district 9. This condition can be seen in the north-northeast of the city and part of the northwestern area. The second zone is the medium-height terrain in the middle of the city with the average height at 5-10 meters. The low ground lies in the south of the city with the average height of 0.50-2.00 meters ("Atlas Ho Chi Minh City", 2013). Hence, the terrain of HCMC becomes lower from north to south and from east to west.

Not only the hydrological system and geographical conditions influence the landscape of HCMC, but the different administration also plays a crucial role in the development of the city. The historical timeline of HCMC in this report (figure 1-8) will mainly focus on the physical change of the city and its landscape which can be divided into 4 periods from 1698 to a present day.

Figure 1-6. HCMC Elevation map ("Atlas Ho Chi Minh City", 2013), Redrawn by author
Figure 1-7. (Top right) Mekong Delta Development ("Atlas Ho Chi Minh City", 2013), Redrawn by author

SIGNIFICANT EVENTS

POPULATION

LANDSCAPE

TIMELINE

HYDROLOGY

FLOOD EVENTS

URBAN GROWTH

16 98

18 59

19 54

Small Fishing Village called "Prey Nokor"

Khmer people domination

Nguyen Dynasty order vietnamese to settle the town

Vietnamese became majority

NGUYEN DYNASTY

City developed along Saigon river

Became a significant port city

FRENCH COLONIAL

Naming the city as ***"Saigon"***

Influenced by the modern city

CAPITAL OF SOUTH VIETNAM

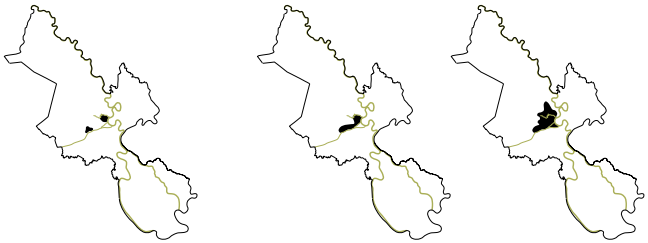
Divided Vietnam *into North Vietnam and South Vietnam*

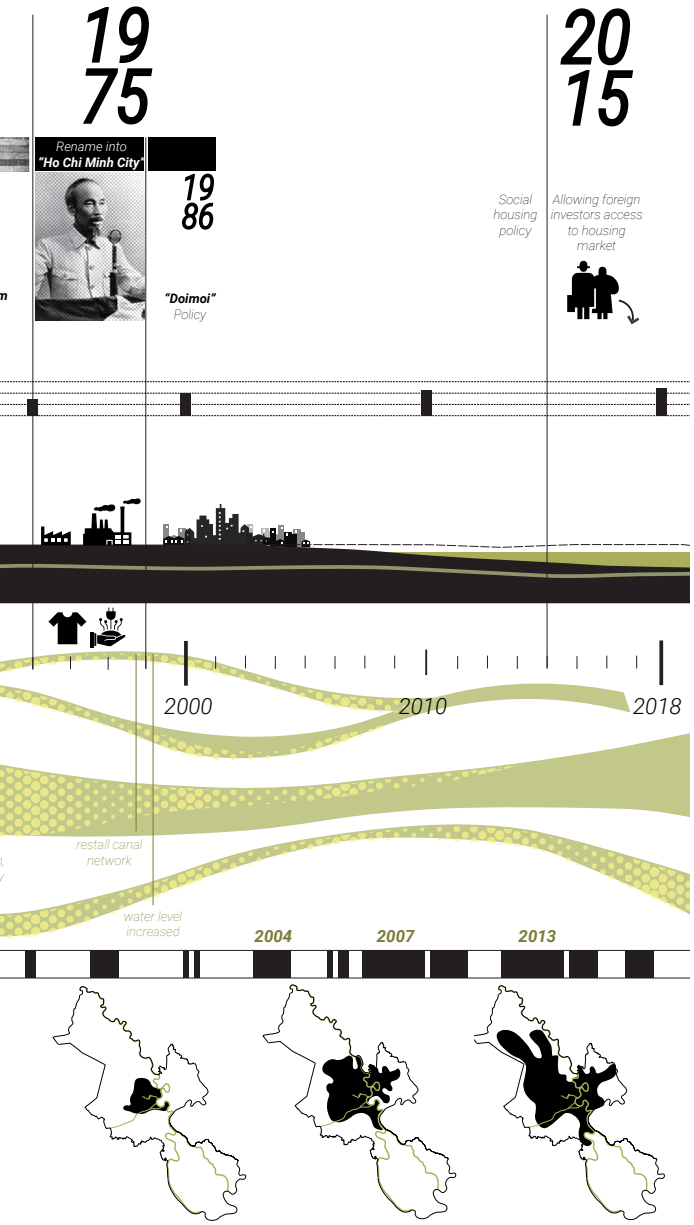
1600 1700 1800 1900

deepen and widen the river

created more canal system

maintain by public ownership low water quality





1698-1859 The city began as a small fishing village called "Prey Nokor" (Forest City), and it was mainly occupied by Khmer people. Until Nguyen Dynasty ordered the Vietnamese to establish their town and organize new administration system. During this period the settlement has widely been built due to the flexibility of the law. The city has been developed mainly along the Saigon river by using the port area as a nucleus of the city (Tranngoc, Perset, Strady, Phan, Vachuad, Quertamp&Gratiot, 2016). A canal network are improved to provide better waterway for transportation and facilitate the commercial activities (Vachaud, Quertamp, Phan, Ngoc, Nguyen, Luu & Gratiot, 2018).

1859-1975 The coming of the French occupation created a dramatic changed to the forest city, and it is adopted "Saigon" as the name of the city. With an attempt to transform the small town into a modern city, several masterplans were made during this period. The canals intersecting at the city center have been filled to give a way for Palm tree-lined boulevards (Vachaud et al., 2018), the remaining canal network became an open-sewage system (Givental, 2014). Moreover, the Western architecture such as church and the idea of a city park have been introduced to the city. The existing swamp area was filled to create a new residential area and concomitantly (Vachaud et al., 2018). Consequently, this transformation created a gigantic change to Saigon, the city has been recognized from the wider group of people, and it was called "Pearl of the Far East" (Hon Ngoc Vien Dong) for its elegance and prosperity.

After a century of French ruled in Saigon, in 1954 after the Geneva Agreements, US came to replace. This is when the war period began, Vietnam has been divided into two parts: the Democratic Republic of Vietnam in the North with Hanoi as a capital, it is influenced by socialist ideology from the former Soviet Union and China, and the Republic of Vietnam in the South affected by capitalism from the US – with Saigon as the capital.

From 1970 to 1975, more than millions of immigrants poured into the city to avoid the war (Goodman, 1975). The rapid population growth created the problem of the housing shortage and low quality of life for the citizens. Besides, the informal settlement began to appear along the water structure. However, due to the intensity of the war situation, several masterplans have been produced without any execution (Nguyen et al.,2016).

1975-1985 The war came to an ended, after 1975, the two parts of Vietnam has been reunited again, and Hanoi was appointed to become the capital city. In 1976 Saigon was renamed as Ho Chi Minh City to honor the late president of the Vietnamese Revolution. The new government abandoned the idea of private ownership and established the arrangement for agricultural land. However, during the post-war period, there were only a few developments around the city center while the problem of housing shortage was still growing. The mindset of people began to change from private housing to "share" house due to the housing shortage situation (Nguyen et al.,2016).

Figure 1-7. HCMC Historical Timeline, drawn by author

PROBLEM FIELD

1986-Present In 1986, there was the introduction of the open-door policy or Doi Moi policy which aims to stabilize the political and social situation. The application created change to the development of the city, the private sector was encouraged, and the farmers received more freedom. After that HCMC has experienced several changes in law and regulation, one of the significant changes was in 2003. The state enacted a new land law with an objective to provide equality to land users whether they are Vietnamese or foreigners. The impact of the laws has widening the market of HCMC, there were more large-scale project developments, the creation of new industrial zones, the construction of new high ways. Moreover, the morphology of the city has also changed towards a capitalist urban model. The land use has largely been mixed between residential and commercial zones (Nguyen et al.,2016). However, the water management still requires an improvement. Currently, water became one of the primary issues of all global climate-related issues. HCMC as one of the Delta city has been considered on the top-ten list of the greatest danger of coastal flooding (Small & Nichols, 2003).

The rise of job opportunities has attracted a large number of people, the population of HCMC approximately doubled from 3.78 million in 1986 to 8.445 million in 2017. This statistic does not include the additional 2 million unregistered migrants in the city. The government has to expand the urban district to support the growth of the city by established six new urban districts. This extension of the built area has replaced the gigantic parameter of rural agricultural land.

As a result, the accelerated growth of urbanization has created the unseen consequences such as the inadequate infrastructure, an increasing rate of rural-urban migration, increasing land prices, the lack of green area and permeable space, housing shortage and increasing of socio-economic disparities. This thesis will explore five major problems of the city which are Rapid Urbanization, Flood, Water Pollution, Vulnerability to climate change and Housing Shortage and Informal Settlements.

HO CHI MINH CITY MAJOR CHALLENGES
I. RAPID URBANIZATION

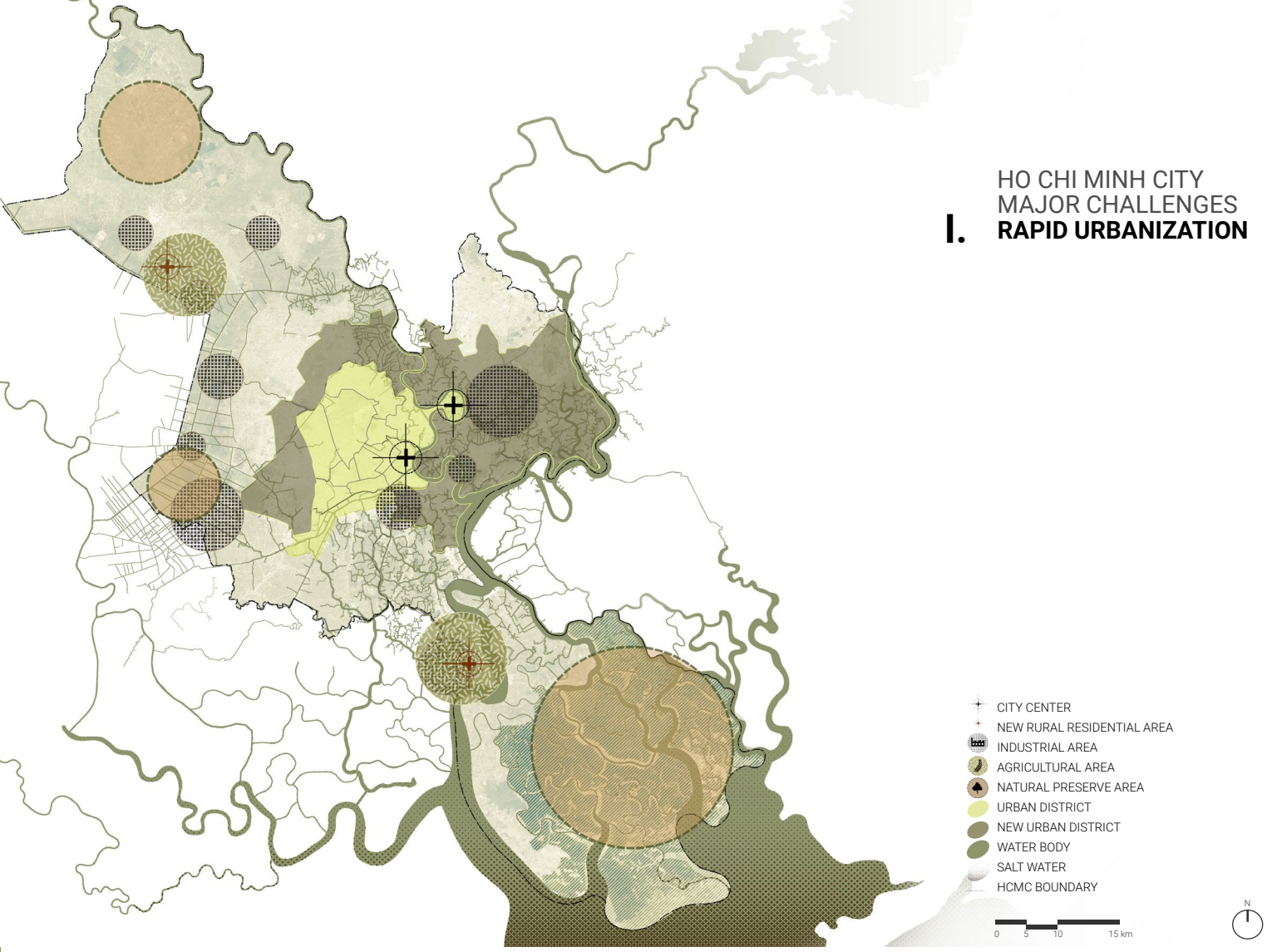


Figure 1-8. HCMC Urban Development plan ("Atlas Ho Chi Minh City", 2013), Redrawn by author

The city consists of 24 districts which can be divided into 19 urban districts (13 central urban districts and 6 newly established urban districts) and 5 suburban districts. The industrial zones are distributed in the new urban districts and surrounding area. The dominant of the agricultural area has only found to be integrated with the ecological belt in Cu Chi, Hoc Mon, Binh Chanh and Can Gio districts. The edges of the city have been maintained as the natural preservation zones as presented in the north and Can Gio mangrove forest in the south ("Atlas Ho Chi Minh City", 2013).

The map illustrated rapid urbanization, the expansion of the urban districts has doubled the size of the inner area of the city. The growth of the industrial area also scattered from northern side to the south eastern side, it took over most of the existing agricultural land. This led to the higher demand of transportation system and the greater number of cars in the city. The water structure is continuously filled to give way for cars. Water structure of HCMC used to be a significant cultural asset that identify the city (hang, 2006) has gradually changed as well as the traditional way of living.

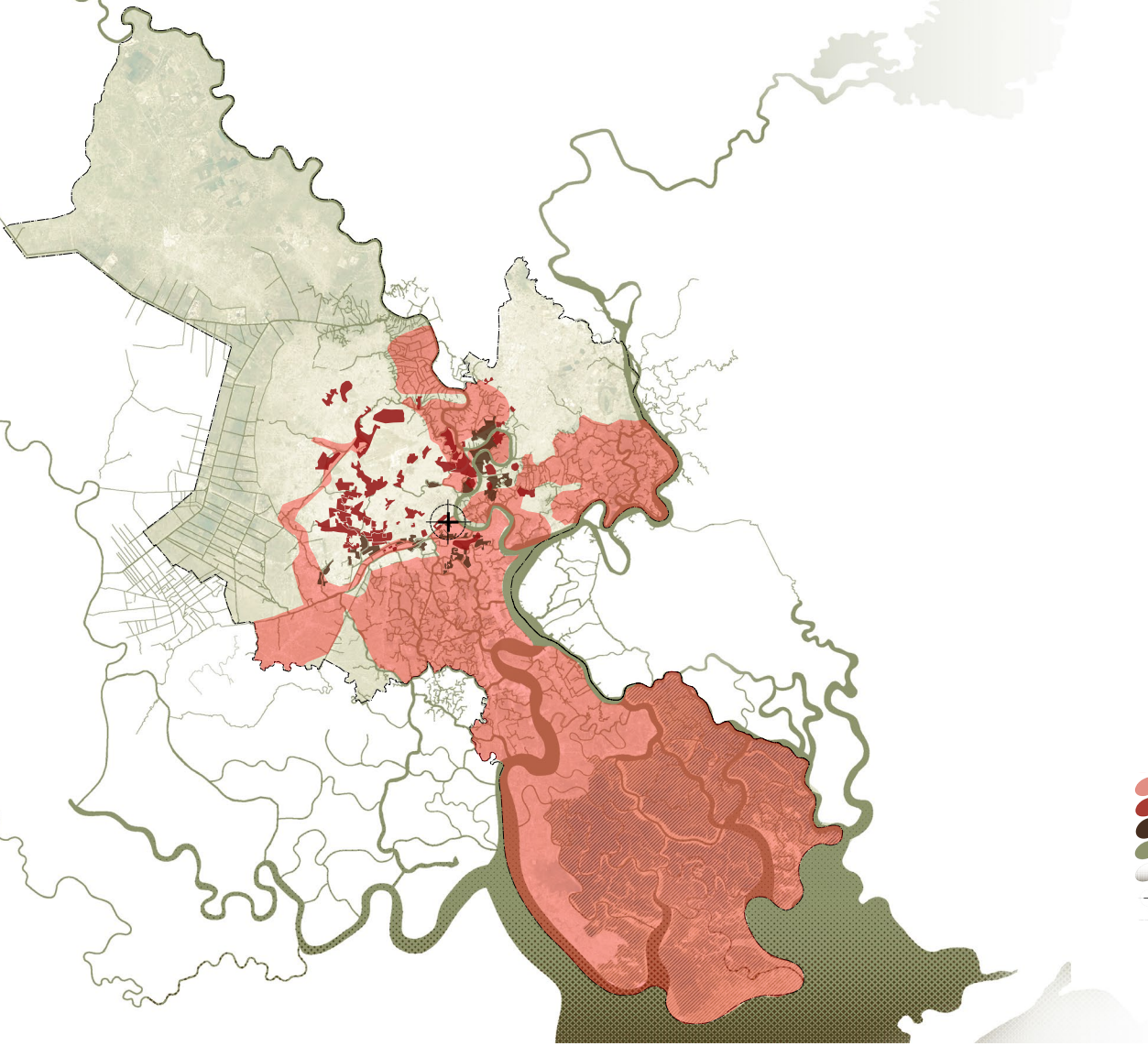
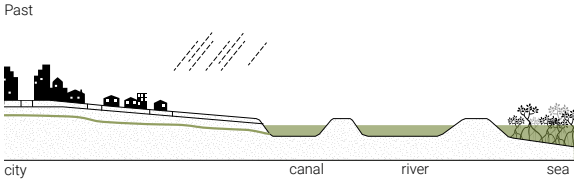


Figure 1-9. HCMC Flood map ("Climate Adaptation Strategies, HCMC", 2013), Redrawn by author



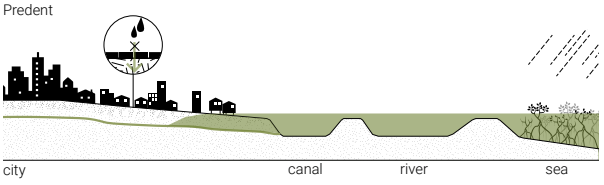
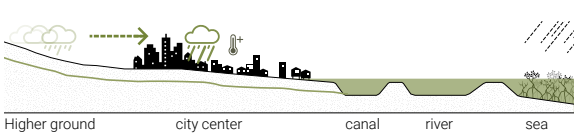


Figure 1-10. HCMC tidal flood section, drawn by author



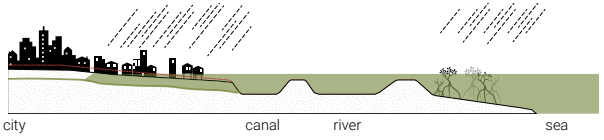


Figure 1-11. (left) HCMC section showed goegraphical condition that caused more precipitation to the center of the city, (right) HCMC rain floow section , drawn by author

II. FLOOD

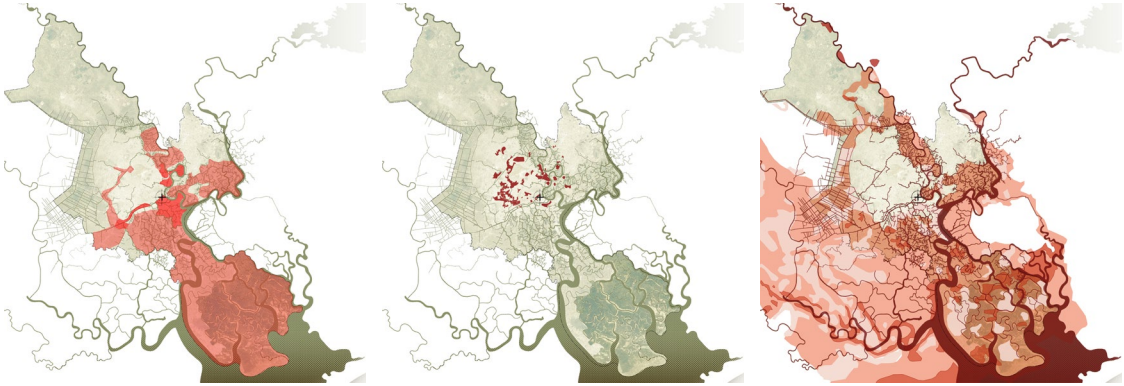


Figure 1-12. Tidal flood map (left)
Figure 1-13. Rain flood map (middle)
Figure 1-14. 2050 prediction flood map (right)
("Atlas Ho Chi Minh City", 2013),
Redrawn by author

Urban flooding became a typical problem of HCMC. After the mid of the 1990s, the degree of the flood, flood frequency, and flood duration have continuously increased. Flooding in HCMC can be divided into 3 types which are a tidal flood, rain flood and tidal and rain flood (figure 1-9). HCMC is very prone to tidal flood, as a result of the water levels at the sea are dominated by the astronomical tide and the impact of monsoon winds ("Atlas Ho Chi Minh City", 2013). The Tide in HCMC is usually mixed and demi-diurnal type. Figure 1-12 showed that the inner urban districts as district 4,6,7,8 and Binh Thanh have a dramatic impact from the extreme high tides. While figure 1-13 illustrated that the center area of HCMC experienced a high degree of rain flood. The average rainfall of HCMC is 1667 mm/year while in the city center the average rainfall rises to 1850 mm/year. This phenomenon may cause by the topographical elevation of the area and the over-used of a paved area which created high temperature at the city center. The high-temperature surface contributed to a wind convergence in the urban area which could strengthen the vertical movement of the air and contributed to the heavier rainfall ("Atlas Ho Chi Minh City", 2013).

Moreover, sometimes, both of the cases occurred at the same time created the tidal and rain flood. However, even if the flood problems in HCMC has happened for a century, yet the flood risk is expected to increase further which is more than HCMC citizen can handle (figure 1-14). The impact of the flood continues to cause substantial economic losses, intervening social activities, damage to infrastructure, building, water pollution and the environment of the city.

III. WATER POLLUTION

Not only exceeded water is the problem of the city, but water quality is also a major concerned. HCMC is the city formed by the rivers and more than hundreds of canals network, the water quality is considered to be an essential issue for human health and a good condition of the environment. The research from Triet et al. (2005) stated that there are 44 industries discharged 111,065 cubic meters of wastewater to Saigon and Dongnai rivers daily. The water is contaminated by TSS, COD, BOD5, nitrogen and also phosphorus. The domestic wastewater from urban and housing area, runoff water from the agricultural area and landfills are also contributed to the degrading of water quality. Furthermore, the daily wastewater discharged to the canals has been reported in 2000 to be as high as 710,000 cubic meters. This number is predicted to reach 2,100,000 cubic meters per day in 2020 ("Atlas Ho Chi Minh City", 2013).

HO CHI MINH CITY
MAJOR CHALLENGES

IV. VULNERABILITY TO CLIMATE CHANGE

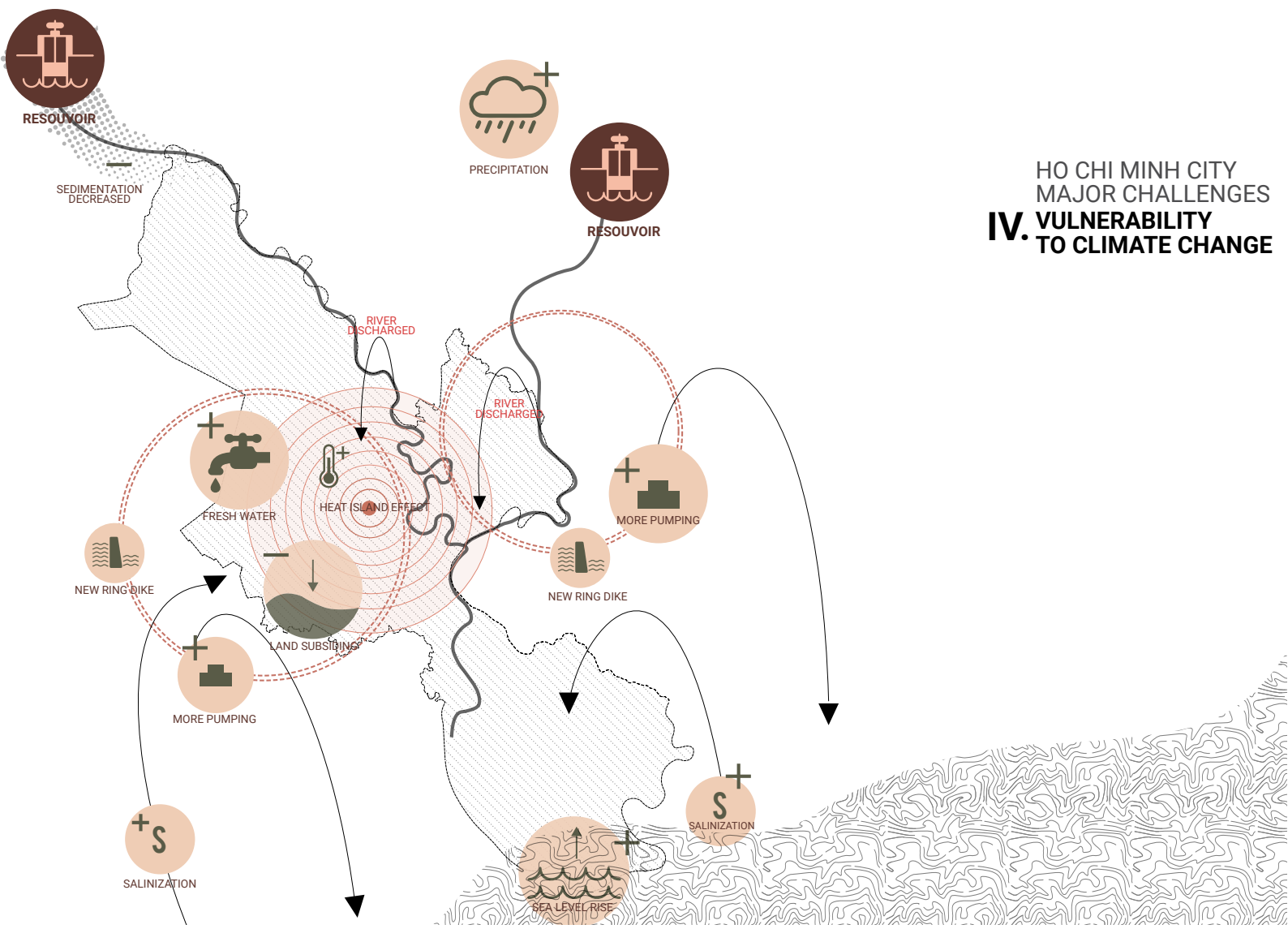


Figure 1-15. HCMC Vulnerability to climate change ("Climate Adaptation Strategies, HCMC", 2013), Redrawn by author

The imminent problem of a Delta city is the higher chance to experience the effect of climate change. The main predicted results can be described as follows ("Atlas Ho Chi Minh City", 2013).

Sea level rise – which is leading to increases in flood risk. HCMC is located in the low land where parts of the city are normally flooded by the tidal influence. The higher level of the sea will support the flooding depth to increase up to 30 centimeters height. Furthermore, the rising sea levels will affect the intrusion of salt further upstream. The saltier water will create a further problem in drinking water supply and the growth of agricultural production.

Changes in precipitation and river runoff – It is predicted that the precipitation will rise to 16.5 percent during the rainy season.

Land Subsidence – This topic is not considered as a climate-related factor, yet it is an essential factor in supporting an increase in flooding frequency. The groundwater extraction that caused by human activity is continuously lowering the land, this will lead to higherwater levels in case of flood.

The rise in temperature – The higher temperatures will lead to deterioration of air quality and surface water quality. These sorts of negative conditions are one of the causes to reduce human productivity and create discomfort situation to the citizens.

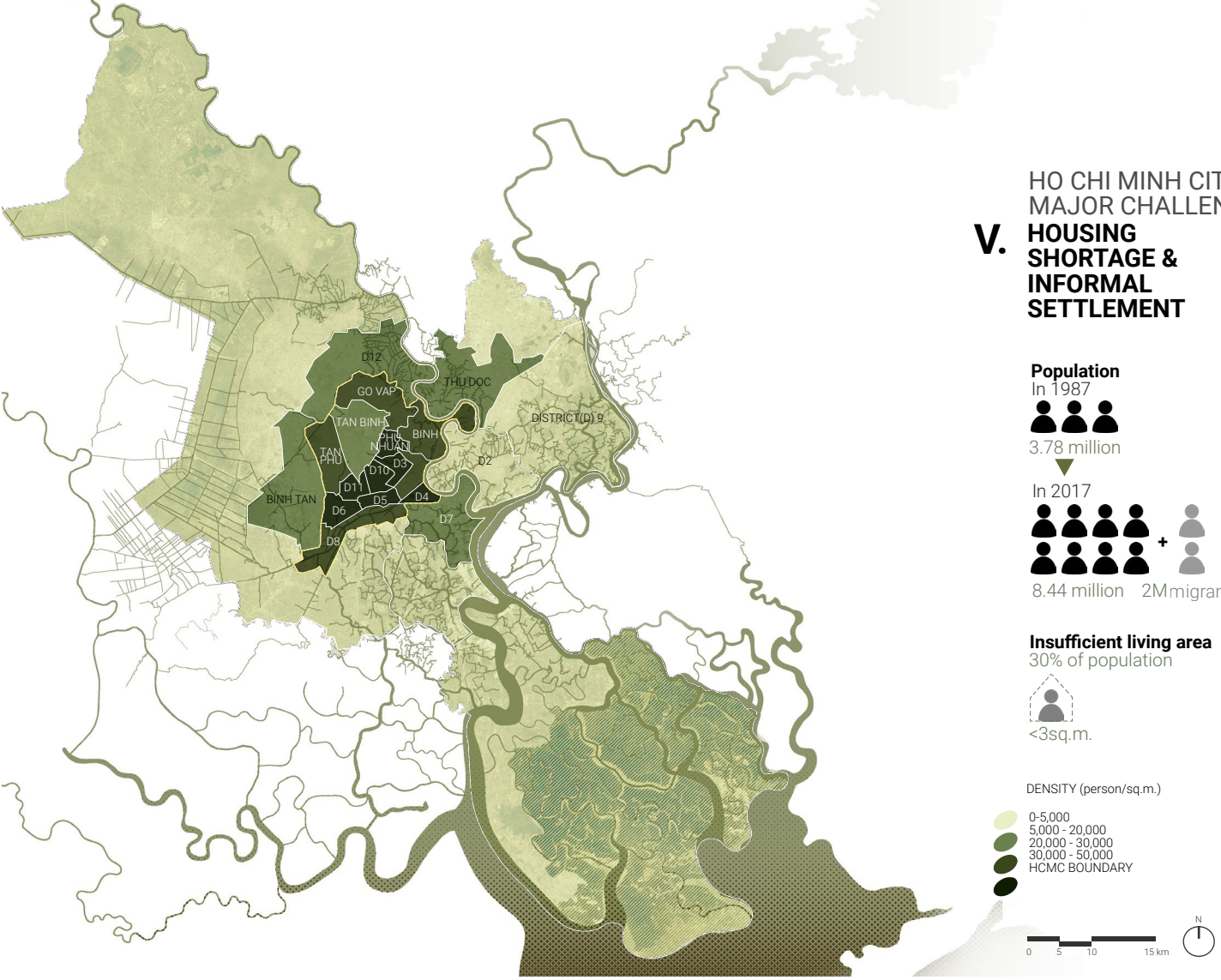


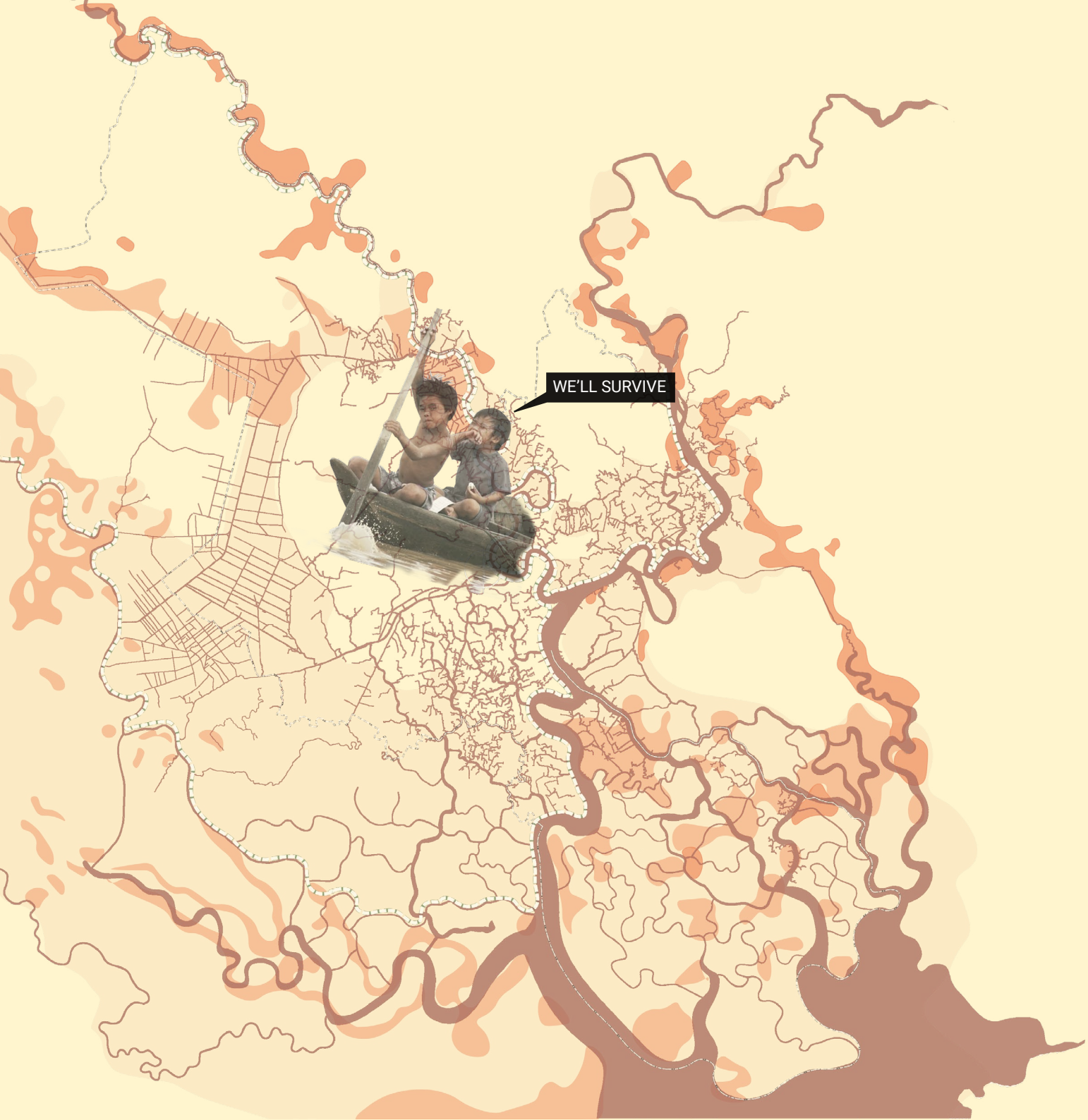
Figure 1-16. HCMC dencity map ("Atlas Ho Chi Minh City", 2013), Redrawn by author

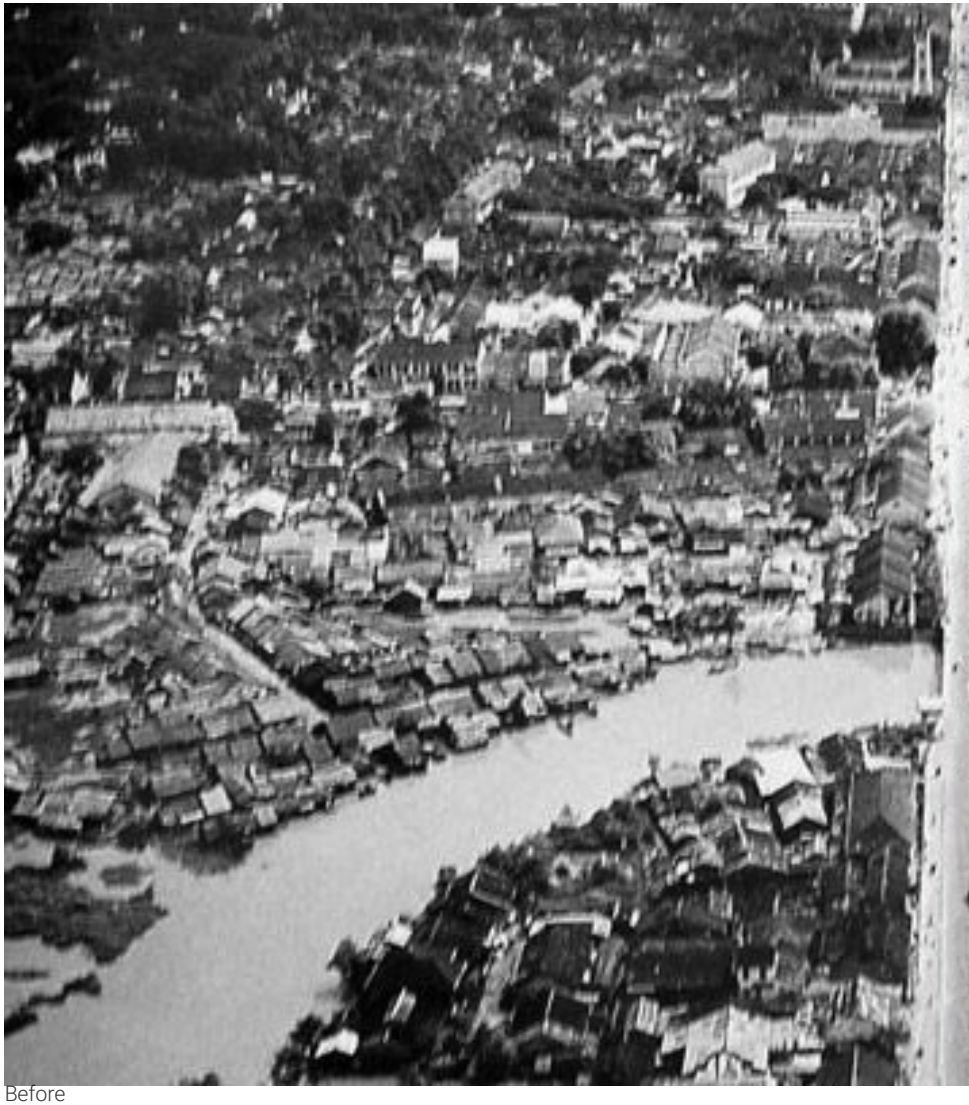
After 1986, the application of Doi Moi policy opened HCMC to the global market. The change has improved people's quality of life, the urbanization is growing, soaring land prices and the influx of migrants occured. The city has attracted more people than it can handle, HCMC experienced dramatic urban growth in the past 20 years. The settlements area has more than doubled from 2000 to 2018. Its density is as dense as 30,000-50,000 person/sq.m in the inner urban districts (figure 1-xx), the highest population density is in district 11("Atlas Ho Chi Minh City", 2013). HCMC's population has grown faster than the development of infrastructure and the availability of living area. The research revealed that more than 30 percent of HCMC population having an insufficient living area and the average living area is only 3 sq.m per person ("Mapping Urban Poverty in Ho Chi Minh City",2008). This led to the occurrence of the informal settlement throughout the city. In urban districts, the informal settlements appeared on water structures and floodplains. In semi-urban districts and rural area, they are located around the new industrial zones, construction sites and existing infrastructures (Wailbel, 2006). The informal settlement has created a significant impact on the city and the environment. The next chapter of the report will be elaborated more in this issue.

2 PROJECT IMPLE-MENTATION

Therefore, the urban development of HCMC will continue to grow as well as the scale of the city. The Vietnam government already came up with several plans and strategies to overcome the immediate problems. Most of the plan attempted to apply the engineering method to overcome the flooding problem and the future impact of climate change. A large infrastructure such as ring dike, 2 meters high- concrete barrier, gigantic Watergate has been proposed to control the water entirely. It is hard to argue that **Ho Chi Minh City is strongly in need of strong action to tackle with the problems but is this the only way to approach the problems?** The top-down solution somehow neglected the cultural perspective of the city and overlooked the life of people who live next to the water. **What could be the alternative solution for Ho Chi Minh City?**

Figure 2-1. Proposed ring dike system plan ("Atlas Ho Chi Minh City", 2013), Redrawn by author


WE'LL SURVIVE



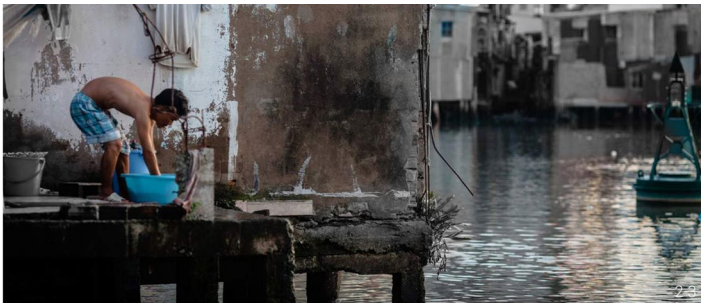
Before

After

The comparison pictures showed the urban development of the Saigon river which has been wiped the informal community out of the river and replaced by gigantic highway. The top down solution has created new image of the city, however it also eliminated the history and connectivity with the water.

Figure 2-2
Aerial view of saigon river before (left) the slum clearance strategy and after (right)
(Saigon Cholon, 2018)


2-2


2-3


2-4


2-5

PROBLEM STATEMENT

It is hard to argue that canal systems of HCMC have been recognized as a significant cultural characteristic identifying the city since 1698 (Hanh, 2006). What are the tangible qualities that distinguished HCMC from other waterfronts, Hanh (2006) has described those essential elements as (1) canal informal settlement (2) canal house way of construction (3) daily life occurring within canal-regions. The water structures of HCMC have been occupied by the informal housing for more than centuries, and it created the social values to the canal. It became the place where people gather with a variety of water-related activities as well as boat-port activities. Nevertheless, due to the impact of western culture and rapid urbanization as mentioned in the last chapter, the canals turned into a drainage system with poor water quality while the informal settlement became a flaw to the city. From time to time, many canals have been filled and the informal settlement has been cleared up. HCMC has gradually lost one of its essential character and its historic-cultural quality. As it has been stated that **"When we lost a cultural history, we lost a part of who we are"** (History is in our hands, n.d.)

This project aims to propose another perspective to approach Ho Chi Minh City. By looking from the existing structure as informal settlement as a design platform. The informal settlement showed a strong potential due to its cultural value that is reflected to the personal fascination of the author and more importantly its prime location along the water structure of the city. It acted as a thick boundary between the city and the water bodies. Informal Settlement has already occurred and it is part of the city, it is time to revalue and upgrade this traditional element. This led to problem statement of this thesis as follow:

" Informal settlement is not just an isolated zone of poverty, this matter need to be redefine. It is part of the landscape and part of the city that need to breath together within their larger context. "

Figure 2-3, 2-5, 2-6.
Everyday life of people in the informal settlement
(Sciosia, n.d.)
Figure 2-4
Access to fresh water of informal settler
(Slum tour by motorbikje, n.d.)

How to redefine a zone of informal settlments as an opportunity to the city and the environment for Ho Chi Minh City through landscape architectonic interventions ?

MAIN RESEARCH QUESTION/
PROJECT AIMS

How to redefine a zone of informal settlement

as an opportunity to the city

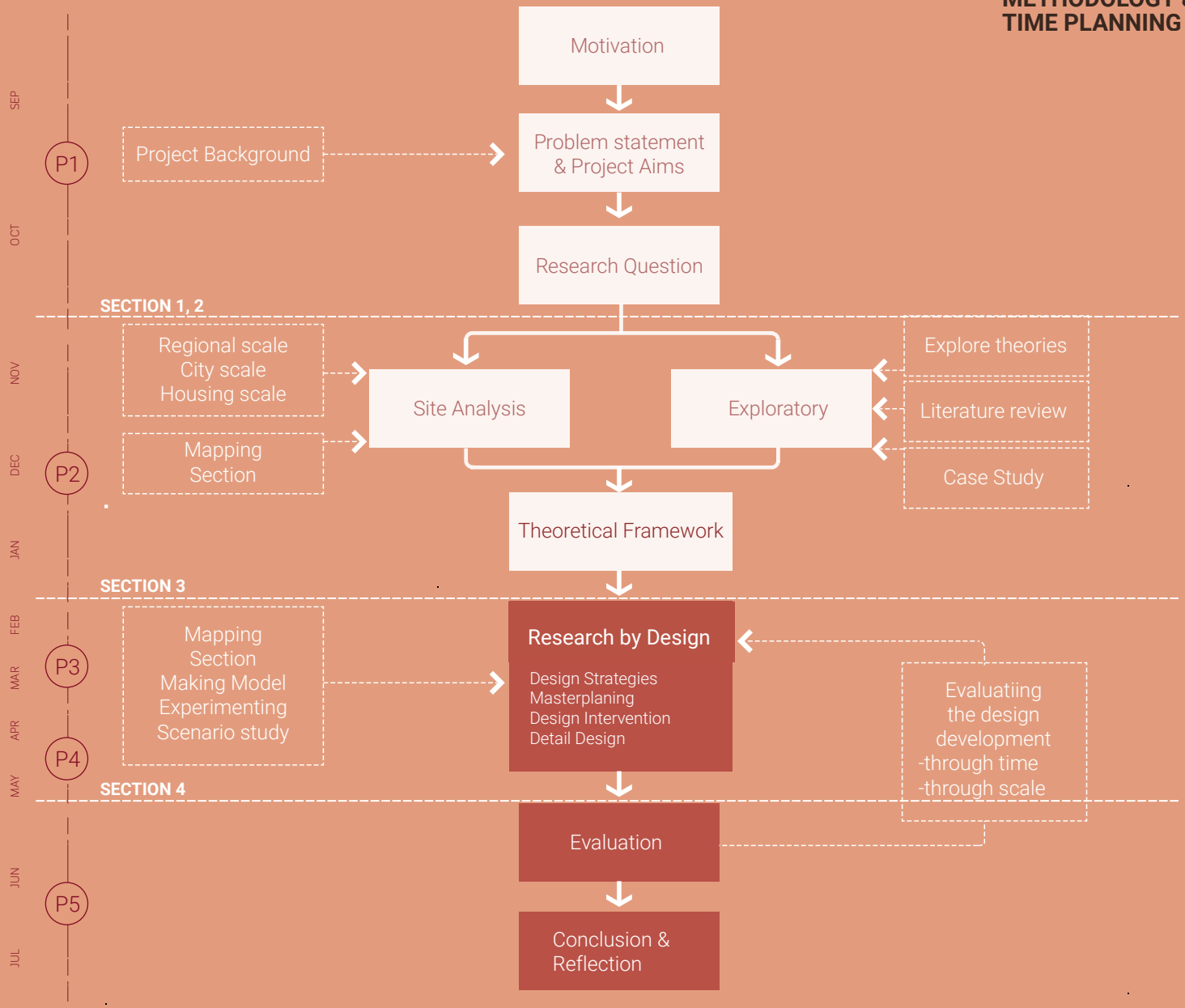
and the environment for Ho Chi Minh City

through landscape architectonic interventions

RESEARCH QUESTION

SUB RESEARCH QUESTION	METHOD	THEORETICAL APPROACH
What row can the informal settlement be integrated into the city?	Analysis *Literature review, Interview,* Positioning & Visioning *Comparative, Masterplan Analysis, Site visit*	Case Study - Makoko
How is the design strategy enhancing the cultural value of "life with water "	Analysis *Literature review, Interview* Positioning & Visioning *Comparative, Masterplan Analysis, Site visit*	Case Study - Houtan Park
How can the design constitute an ecological resilience condition to the environment of Ho Chi Minh City?	Process Analysis *Theoretical paper, Case Study* Research by Design *Scenario Design, Design through scales, model experimentation*	Urban River Corridor
How is the architectonic design functioned as part of the landscape architectural system?	Research by Design *Scenario Design, Design through scales, model experimentation*	Urban Acupuncture

METHODOLOGY & TIME PLANNING



After arrived with the research question, the methodology can be described in four main sections as elaborated on the diagram. The description of the overall conditions of HCMC will be discussed in the earlier part of the first section. Then it is following by the analysis of the informal settlement in HCMC in order to elaborate further to the specific area in the Doi canal and the Te canal. The first section will be investigated through the literature review, site visit, interview and comparative study of the differences between informal settlement in HCMC and informal settlement in other contexts.

In parallel with the first section, the next section will be focusing on the theory and case studies. This second section has done through the process of analysis, literature review, and case studies. The two theories which are the "Urban Acupuncture" and "Socio-ecological resilience" will be studied and discussed further to be applied as design principles in a further stage. As a consequence, after analyzing and synthesizing through the first and the second section, a framework is initiated. It will be used as a design guideline and a critical design assessment for the project outcome.

The third section will be focusing on the experiment and the design. This process will be done by different design tools, such as sketches, 3D model and physical study model through a variety of scales included small intervention or housing scale, neighborhood scale (set of interventions), district scale and city scale. The design section will be a back and forth, trial and error as well as scenario-based design. Besides, the design will be developed not only from the experiment but also from the feedbacks of the critics until the design will ultimately answer the research question. Until the last section, the final design will be evaluating and assessing by the framework from the earlier stage. The outcome of the fourth section is the final report that has been included the entire mentioned information from the beginning of the research, the final design and the reflection from the author.

PROJECT RELEVANCE

The outcome of the project represents the bottom-up approach to tackle the issues of social segregation and degraded environment. The design strategies show the potential for people in every community to be involved in the improvement of the city. At the present day, the idea of slum relocation has been used widely; this left the less fortunate inhabitants with no option. The project offers awareness and discussion to the government and stakeholders to consider a more resilient solution to manage the zone of informal settlement. On the other hand, the project also provides an alternative way of living to the informal settler with job opportunities and a chance to contribute to the city.

In a broader context, the project is attentively concerned with the impact of the environment and the issue of climate change. The project has explored the potential of landscape architectural design as a tool to enhance the ecosystem by researching and analyzing the dynamics of the delta city. The forgotten canal structure can be revived and became the essential structure for human and nature to interact. Furthermore, the project is intended to investigate the boundary between landscape architecture design and architecture design. The outcome reflected the collective function of the two design instruments which could not work in separation. It showed an integration between the man-made structure and flow of nature through the design strategies.

3 THEORETICAL FRAMEWORK

The challenges have been pointed out in the previous sections, Ho Chi Minh City requires an alternative approach to confront with the existing problems and the forthcoming challenges. Therefore, the design strategy is expected a proper understanding of the context and a resilience approach to sustainably extricate the situation. As a consequence, this thesis applied two theories and two case studies as a foundation. (1) **The Urban Acupuncture** provides the framework guideline and assessment tools while the theories of (2) **Social-Ecological Resilience** presented the theoretical frame and design principles. On the other hand, the design part has considered spatial design strategies to undertake some specific issues. The case study of (3) **Houtan Park** offered a guideline for natural purification system while the case of (4) **Makoko** showed the successful design participatory. The combination of the four approaches is expected to create a clear framework of this thesis.

By focusing on the small elements as informal settlement, the concept of Urban Acupuncture provided an essential guideline in approaching the project. The Urban Acupuncture aims to create better livability by using the small-scale intervention to stimulate the flows in a particular spot of the city in order to catalyze the more substantial effect to its surrounding and urban context. It adopted the traditional medical Chinese acupuncture to urban strategy in which the skin is the urban fabric and the cracks on the are the problematic locations. The pinpricks are replaced by urban design interventions, carried out in specifically chosen locations in the city (Sola-Morales, Framption & Ibelings, 2008, Lerner, 2014 & Casagrande, 2008)

However, the theory of Urban Acupuncture has been described differently by different specialists; the definite rules or solid structure have not been indicated. By analyzing through the concept of Urban Acupuncture from the pioneer theorists, the critical points of the theory share some similarities (Hoogduyn, 2014). The principle that is considered to apply to landscape design can be described in 6 principles.

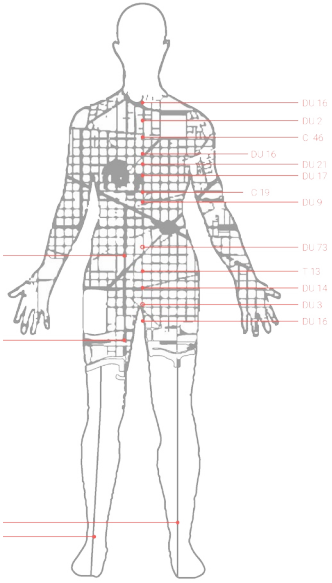
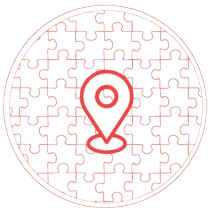


Figure 3-1 Urban Acupuncture Conceptual Digram (Zhange,2015), Redrawn by Author

Figure 3-2 Principles of Urban Acupuncture, Drawn by Author (left)

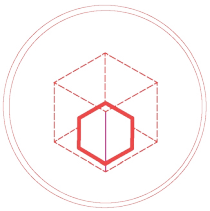
1 Sensitive Point

The first principle is the first steps in the application of urban acupuncture. Determining a specific location where there is little energy, lack of energy or faced with a blockage in the energy flow.



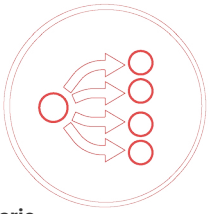
2 Creating Place

The design is expected to deliver awareness to the meaning of the place. Looking at the richness of places that before were none (Sola-Morales et al., 2008).



3 Small Scale

The scale in this agency refers to the proportion of the intervention in relation to the impact of the transformation that it has generated. h



4 Scenario

In designing the city, the plan or the strategy strongly requires an understanding of other stakeholders and the majority group of people. The scenario design should be proposed to envision the design in every possible direction in order to represent the possible scenario of the city.

5 Participation

It is relevant to understand the local context and local culture to initiate a successive intervention to a specific location. The participant is a significant guide to a local perspective and a great catalyze of the process.

6 Education

The successful plan could not be created to be maintained by itself, the well-educated community will sustain the design objective and sustainably pass the knowledge to the next generation.

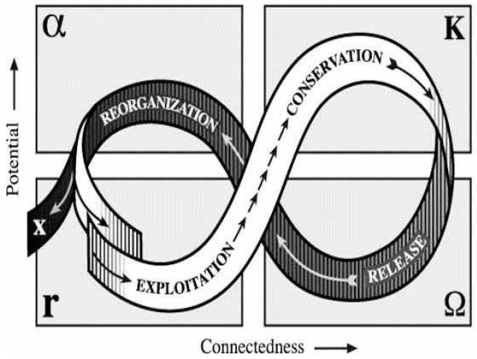


Figure 3-3 Adaptive Cycle diagram (Folke et al.,, 2010)

The idea of "Resilience" has been mentioned at the very beginning in 1973 by ecologist C.S. Holling. The definition is created as opposed to the term stability, the measure of a state of the system that ensures an ability to absorb changes while maintaining its original qualities through variable states (Holling, 1973). After that, the term "Resilience" has been widely used in various disciplines and it continuously been re-invented to be more specific to the curriculums. One of the terms that have been popularized recently is the term that extended from the term ecological resilience which recognizes the multiple equilibrium states and the ability of ecosystem that may change to a different state when some certain threshold is crossed (Forgaci, 2018). This extended term is known as "Social-ecological resilience" or "Evolutionary resilience." It is not only recognized the dynamic and complexity of ecosystems but also brings them to further stage which is defined as "the ability of a complex socio-ecological system to change, adapt, and, crucially, transform in response to stresses and strains" (Davoudi, 2012).

There are two attributes of resilient systems that appeared in the definition of Social-ecological resilience which is adaptability and transformability (Forgaci, 2018). As Folke has been mentioned that "Adaptability is the capacity of a social-ecological system to adjust its responses to changing external drivers and internal processes and thereby allow for development within the current stability domain, along with the current trajectory. Transformability is the capacity to create new stability domains for development, a new stability landscape, and cross thresholds into a new development trajectory. Deliberate transformation requires resilience thinking, first in assessing the relative merits of the current versus alternative, potentially more favorable stability domains, and second in fostering resilience of the new development trajectory" (Folke, Carpenter, Walker, Scheffer, Chapin & Rockström, 2010, para. 24).

Besides, Social-ecological resilience composed of three underlying assumptions (Forgaci, 2018) :

(1) Social-ecological resilience are linked
The social system is not external but coupled to the ecological system
(2) Social-ecological is a complex adaptive system
The systems are exhibiting non-linear dynamics of change which distinguished them from engineered resilience and others
(3) "Building adaptive capacity for resilience is the key objective of governing social-ecological resilience (Wilkinson, 2011, p. 151)".

The overall system can be illustrated as the adaptive cycle diagram which portray a different phase of social ecological systems and other complex adaptive (figure 3-3)

By adopting the theory of Social-ecological resilience into design practice, its complexity and conceptual value may create an insufficient clarity for the design guideline. In this case, the concept of "Urban River Corridors" will be applied in order to achieve the ability of Social-ecological resilience. As Forgaci has explored the design instrument in order to integrate social-ecological resilience in urban river corridors. The term Urban River Corridors is defined as "Space where the integration between the urban system (social) and the river system (ecological) is the most intense (Forgaci, 2018) ". This design instrument has been created to achieve the goal that cities could be more resilience, in which the cities not only can resist the flood related disturbances but also endure through general chronic stresses.

DesignPrinciples

The design principles of Urban river corridors are used for guiding the design towards social-ecological integration. The four design principles are described as follow:

Spatial element

Interconnectedness

Guiding the design for spatial elements in related to movement and network including water network, traffic network, pedestrian movement and ecological network. "These networks require a non-conflicting and interconnected spatial configuration in order to accommodate hydrological, social and ecological connectivity on longitudinal, lateral and vertical dimensions (Forgaci, 2018, p.263).

Absorptive Capacity

Addressing the ability of the design elements which is expected to have redundant and attractive composition while obtain the spatial capacity to absorb water. For example, the elements as water space, social space with high porosity and green space.

Social-Ecological Integration

It is defined as a relational principle in which reveal the synergies within and between the networks and spaces. This quality is evident by showing non-conflict in spatial network configurations and multifunctional spaces.

Interscalarity

The last principles creates relations across scales including catchment area scale, metropolitan corridor scale, corridor segment river scale. "Interscalarity reveals temporal constraints and path dependencies inherent in the networks and spaces of the urban river corridors (Forgaci, 2018, p.263)."

Design Instruments

After the design principles have been stated, the design instruments are strongly require to implement those principles in the design process. The four elements is described as follow:

1 The Connector

using a procedure that helps the designer to highlight and reconfigure the network elements of the URC and reassign them in a non-conflicting spatial configuration. The Connector is not comprehensive but strategic, as it selects network elements that are key to improving interconnectedness.

2 The Sponge

Making an inventory of all open spaces of the URC, classifying them into (existing and potential) elements of water space, public space, and green space, and critically identifying their qualities and attractiveness.

3 The Integrator

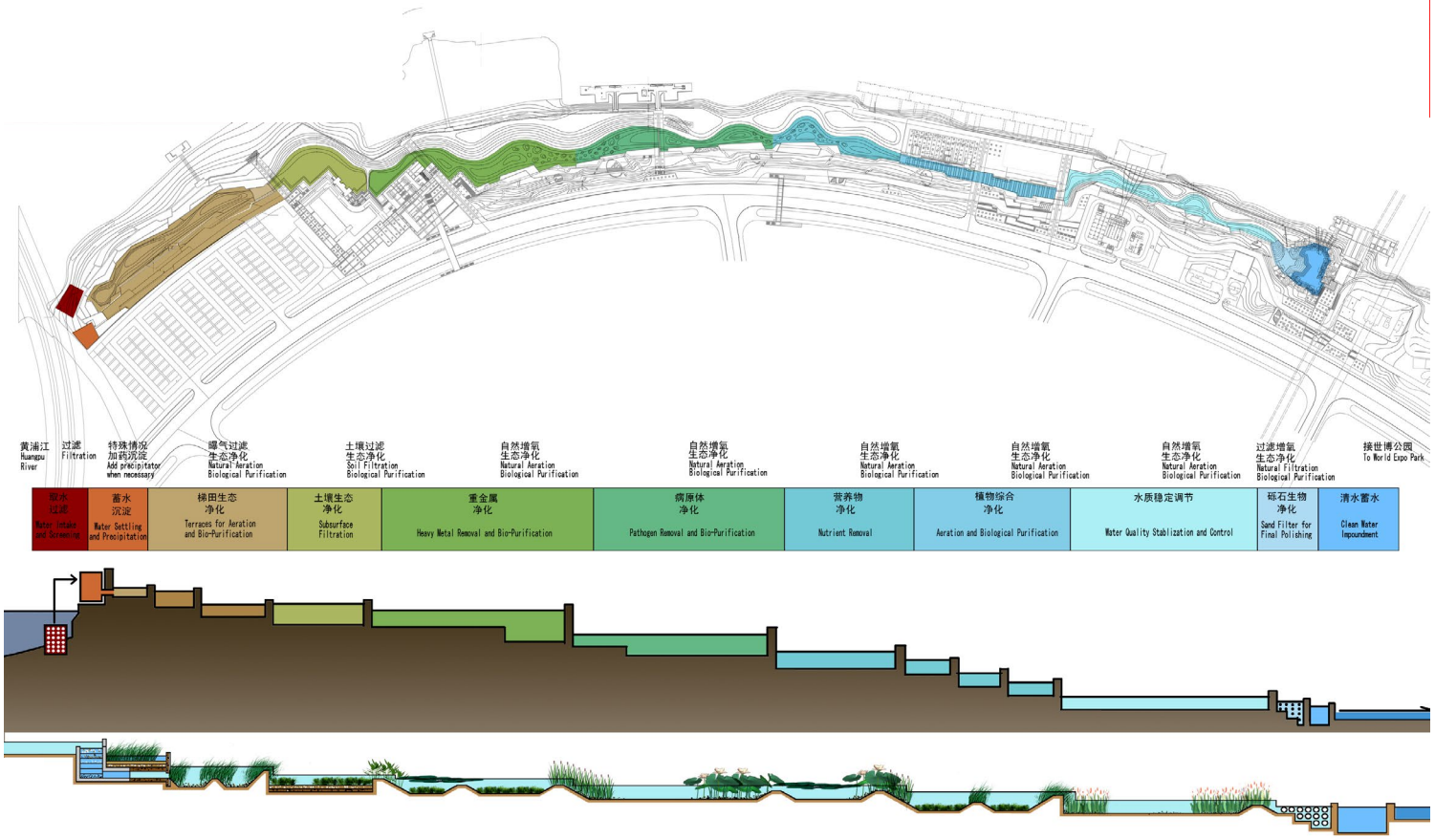
Identifying social-ecological conflicts and synergies on two levels. One is to examine the interaction between network elements and open space elements separately. Another one is to confront the networks and open spaces to reveal further synergies between their spatial configuration and spatial composition.

4 The Scaler

Revealing scalar interactions among the spatial elements identified by the Connector and the Sponge. As a reflexive instrument, the Scaler helps the designer identify the scales of context, focus and detail on the scalar spectrum of URCs and, in consequence, to make (potential) interdependencies, cascading effects and pathdependencies explicit.

Spatial term definition - (Forgaci, 2018, p.263).

III. Houtan Park



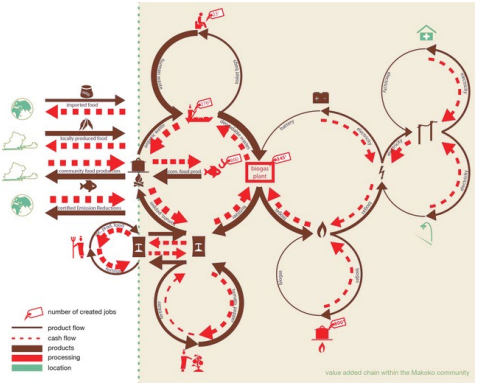
From the condition of Ho Chi Minh City, water quality is found to be one of the major problems of the city; therefore Houtan Park showed an alternative way to tackle this challenge. Houtan Park is located along the Huangpu River waterfront in Shanghai, China. The site is a brownfield of a former industrial area; as a result, the water of the river is highly polluted and considered as unsafe for recreation and unlivable for aquatic life. The design challenge is to transform the area into a public space and restore the environment of the waterfront. Furthermore, another problem is to improve flood control system from the existing rigid concrete wall to a more environmental-friendly design.

The design is created by Turenscape with the idea to create a living system in the park. The major strategy is the Constructed Wetland, as it has been stated (Shanghai Houtan Park: landscape as a living landscape 2010, para.5) that "...a linear constructed wetland, 1.7 kilometers long and 5–30 meters wide was designed to create a reinvigorated waterfront as a living machine to treat contaminated water from the Huangpu River. Cascades and terraces are used to oxygenate the nutrient-rich water, remove and retain nutrients and reduce suspended sediments while creating pleasant water features; Different species of wetland plants were selected and designed to absorb different pollutants from the water. Field testing indicates that 2,400 cubic meters per day of water can be treated from Lower Grade V to Grade III". Besides, the wetland also used as a flood protection buffer and the existing concrete flood wall is replaced by riprap which allows native species to restore. The design of the wetland not only represented an ecological way to purify polluted water but also offered a new public space for a variety of programs such as recreation, education and research.

Location: Shanghai, Chima
Landscape Architect: Turenscape
Year: 2010

Figure 3-4. The water mechanism of man-made wetlands (Yu, 2010)

IV. MAKOKO - URBAN DESIGN TOOL BOX



By considering the area of informal settlement, the issue of community is one of the essential keys. The design has strongly required participation from the residents. Makoko Urban Design Toolbox has shown a comprehensive design strategy to be incorporated with the communities. The design toolbox can be summarized in three main strategies which are New Decentralized Infrastructure, New Job Opportunity and Upgrade of the Neighborhood.

New Decentralized Infrastructure has been proposed through a new masterplan with flexible, low-cost, low-tech and flood resilient infrastructure. The scattered houses on the water have been clustered and organized with better boat circulation while the basic medical services, floating market and essential utilities are included in the community. At the center, the new Neighborhood Hotspot has proposed to provide renewable energy production for community and it is where the participatory design eventuated. Starting from waste from the entire community will be separated and delivered to the Neighborhood hotspot to be sold or transformed into biogas for future electricity. Apparently, there are various operations needed in the plan which can be the new job opportunities to the community such as recycle stations worker, cooking station, toilet organizer, floating farmland caretaker as well as a delivery man. Furthermore, the plans for Neighborhood upgrading are also suggested in order to adapt to flooding condition and climate change. As a result, the project exemplified a closed loop cycle that can bring community people in the development plan and it is a great model of a sustainable and flood-resilient plan for the informal community.

Location: Lagos State, Nigeria
Urban Designer: Fabulous Studio
Year: 2014

Figure 3-5. Urban Design Makoko (Aro, 2015), Redrawn by Author

4 INFORMAL SETTLEMENT

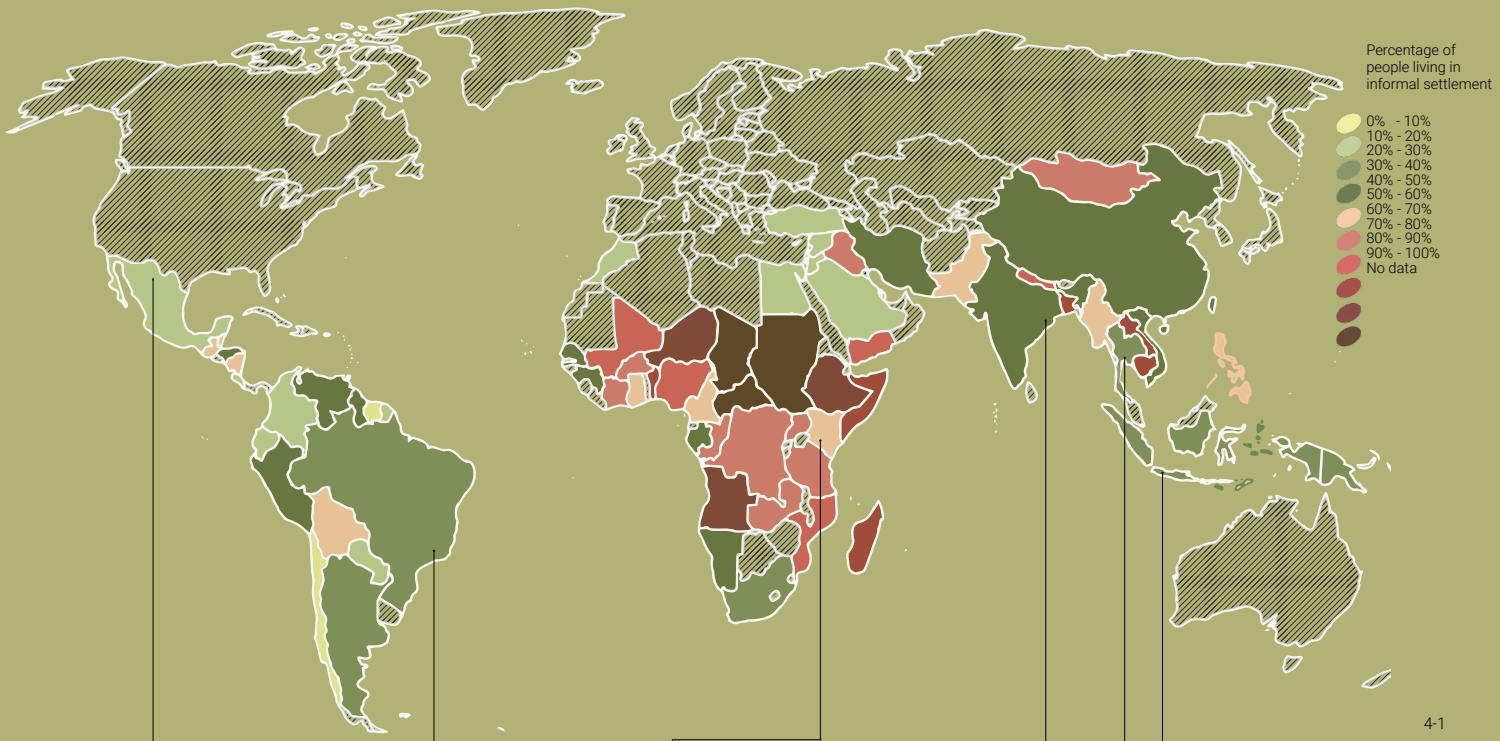
IN HO CHI MINH CITY

What is informal settlement?

Informal settlement is described as " Residential areas where 1) inhabitants have no security of tenure vis-à-vis the land or dwellings they inhabit, with modalities ranging from squatting to informal rental housing, 2) the neighbourhoods usually lack, or are cut off from, basic services and city infrastructure and 3) the housing may not comply with current planning and building regulations, and is often situated in geographically and environmentally hazardous areas (UN Habitat, 2015)"

The rapid growth of informal settler is not only occuring in Ho Chi Minh City but it is the world phenomenon. From the last 30 years, **more than 213 million people lived in the informal settlement** which is equal to 25% of the world's population (Robert Avis, 2016). From the global perspective, these settlements has percieved to be geographically, economically, socially and politically disengaged from the urban system (UN Habitat, 2015f). There existence intervened the urban plan as well as obstructed the growth of the city.

Figure 4-1. Percentage of informal settler on world map (UN habitat, 2005)
Figure 4-2. Informal settlement in Ciudad Juarez, Maxico (Mexico,2009)
Figure 4-3. Informal settlement in Rio De Janeiro, Brazil (Davis,2009)
Figure 4-4. Informal settlement in Nairobi, Kenya (One billion slum dwellers,2006)
Figure 4-5. Informal settlement in Kolkata, India (Celce,n.d.)
Figure 4-6. Informal settlement in Bangkok, Thailand (Slum, 2015)
Figure 4-7. Informal settlement in Jakarta, Indonesia (Nuraheni, n.d.)



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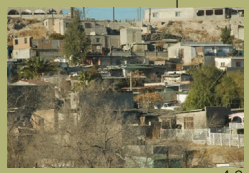

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4-7

INFORMAL SETTLEMENT **WORLD VIEW**

The global image of the informal settlement was recognized as a social problem and visual pollution. Due to the vulnerability and disorganized of their houses which created the unpleasing image to a certain area of a city. This led to a negative stereotype about the residence of the informal community; they have been judged as the negative community and perceived as the outsider of a city. As Kellett and Napier (1995) discussed that "...untested negative stereotypes and prejudices about the morals, abilities and values of the (informal) residents were reinforced by the images of inadequate, disorganized and improvised shelters. Such views became generalized". Besides, the idea of generalizations can be exemplified from the perspective of 21st people as well as the perspective of 20th people, as Harrison (1983) argued that "Every Third World city is a dual city - an island of wealth surrounded by a black belt of misery. Outside the bright, shining modern city of skyscrapers, flyovers and desirable residences, the poor are camped in squalor, disease and neglect, in shacks and hutments of plywood, cardboard, mud or straw ....". As a result, the idea of the informal settlement became a negative meaning even without seeing and experiencing the actual settlement, they are already seemed to be the remaining part of a city.

*" Most often, informal settlements are identified as places with **negative symbolic capital**: pitiful improvisations by the poor and undesirable."*
(Peattie,1992)

*" The informal city becomes **the "other" of the formal city** and hence essential to its identity "*
(Dovey and King,2012)

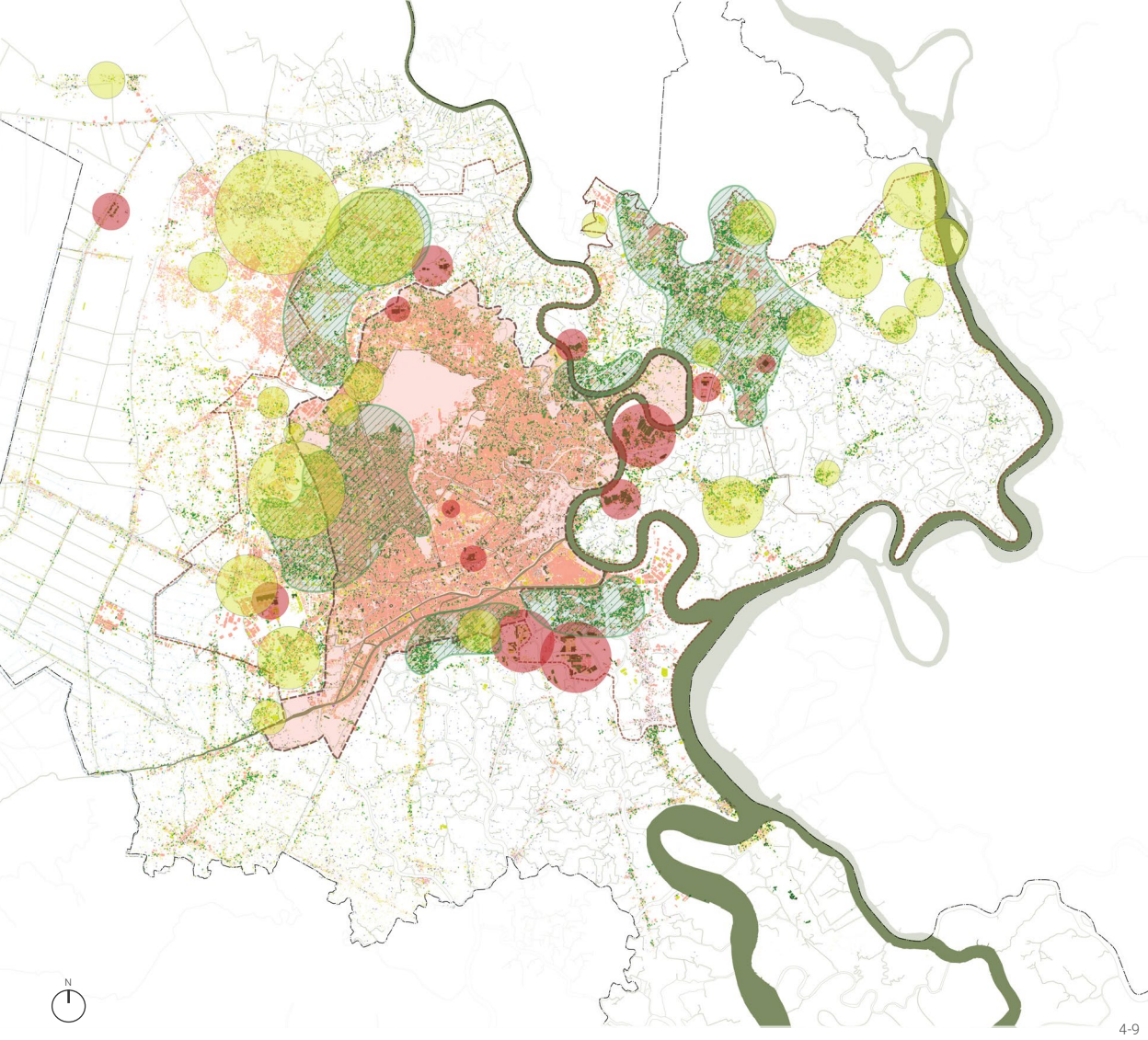
*For local middle classes, " **These are eyesores**; they equate to visual and social pollution"*
(Pojani & Buka, 2015)

*" Informality continues to **signify 'slum'** even after physical conditions are upgraded "*
(Kellet and Napier,1995)

In the case of HCMC, informal settlement has also been recognized as a problem. Due to the economic policy which intended to be opened to global capital, the number of urban poverties is expected to decrease to reflect the improvement of people's living condition (Tran, Bartosiak, Arthur, Linh, Phuong & Giang, 2008). Informal settlement is perceived as a community of poverties and it is a negative image which need to be eliminated from the city. For the purposes of this report poverty defined as those living below HCMC's 2008 poverty baseline of 500,000 VND/per capita/month .

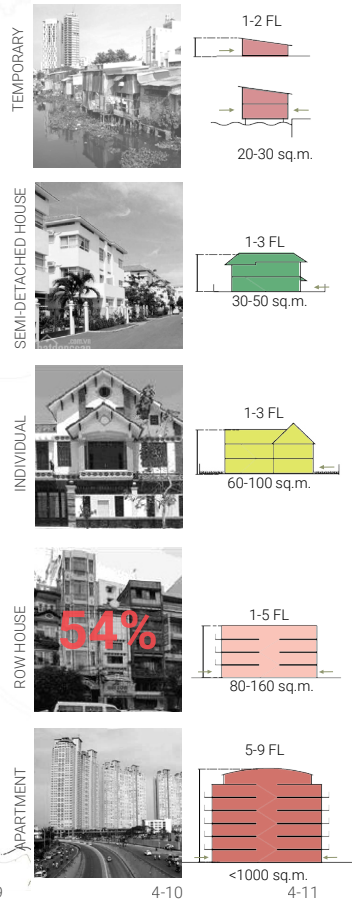
From my point of view, **the first-hand experience from site visit has totally changed my perspective regarding the perception of the informal settlement.** The informal settlement has visually differentiated HCMC from other waterfronts. The center of the city has been transformed into high-rise buildings and car-based city while the zone of informal settlement became the only place that revealed the traditional living of local people. The housing patterns, the use of material, construction methods and lifestyle of people in the community reflected the memory of the water-oriented city. The sound of the boat ride on the canal and people talking across the house from their balcony are the value that has been vanished from the contemporary society. The question rises to the mind that how can the mentioned quality will be perceived by wider group of people and how can the design enhance this value for the city? Therefore, the development of informal settlement and the relationship to the city will be explored for further understanding about the topic.

Figure 4-8 Personal perception of informal settlement in HCMC (Gratzer, 2016)



4-9

INFORMAL SETTLEMENT **&BUILDING TYPOLOGY**



4-10 4-11

The starting point of temporary housing or so-called informal settlement in HCMC has developed from a traditional Vietnamese house. The map illustrated the five residential building typologies, Hoa (2013) described the differences of the four-formal typologies as follow:

Apartment – High building for housing with 5 to 9 stories, each apartment has balcony, total area range from 1000 m^2 – 5000 m^2 of the ground floor

Row house – House built in rows of three or more units of which each has a common wall or walls adjoining with the next house. Each house is about 80 m^2 – 160 m^2 of ground floor with 1 to 5 stories.

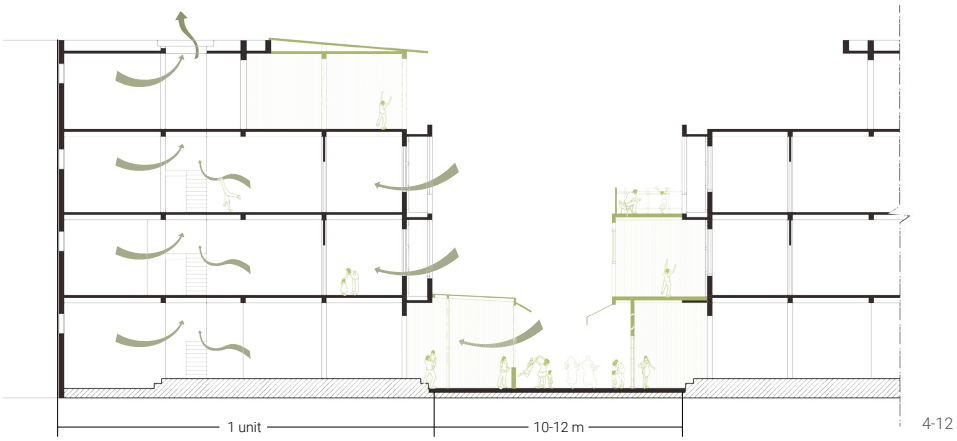
Individual – It is so-called Villa house, it is normally located where it has large land for building a house with surrounded garden. Each house is about 200 m^2 – 500 m^2 of the ground floor, depended on the detailed planning of each area

Semi-detached house – Single flat or house, less than 30 sq.m. of ground floor with 0 to 1 story and various designs

The map showed 1,085,265 housing units. The dominant building type is the Row house which mainly occupied in the inner area while the individual house and semi-detached house were spread in the new urban district and rural area. The new housing type as apartment was located as a cluster in a new urban district and rural area. The informal settlement has not been recognized as one of the residential type , however they ares cattering along water structures and it is approximately 15-25 percent of the total registered housing units (Tran et al., 2008).

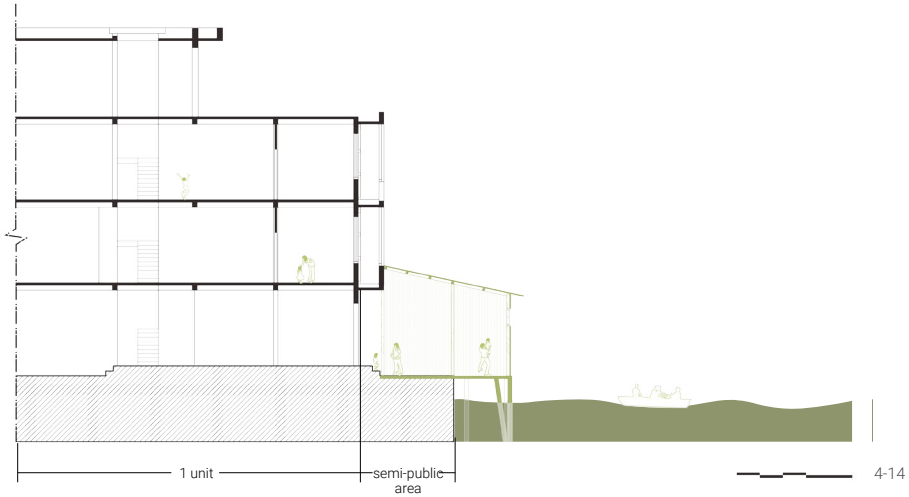
Figure 4-9 Map of Building Typologies in HCMC (Hoa, 2013, p.81)
Figure 4-10 Images of Building types (Moon, Downes & Rujner, 2009, p.4)
Figure 4-11 Graphic section of building types Drawn by Author

INFORMAL SETTLEMENT **DEVELOPMENT**



4-12

4-13

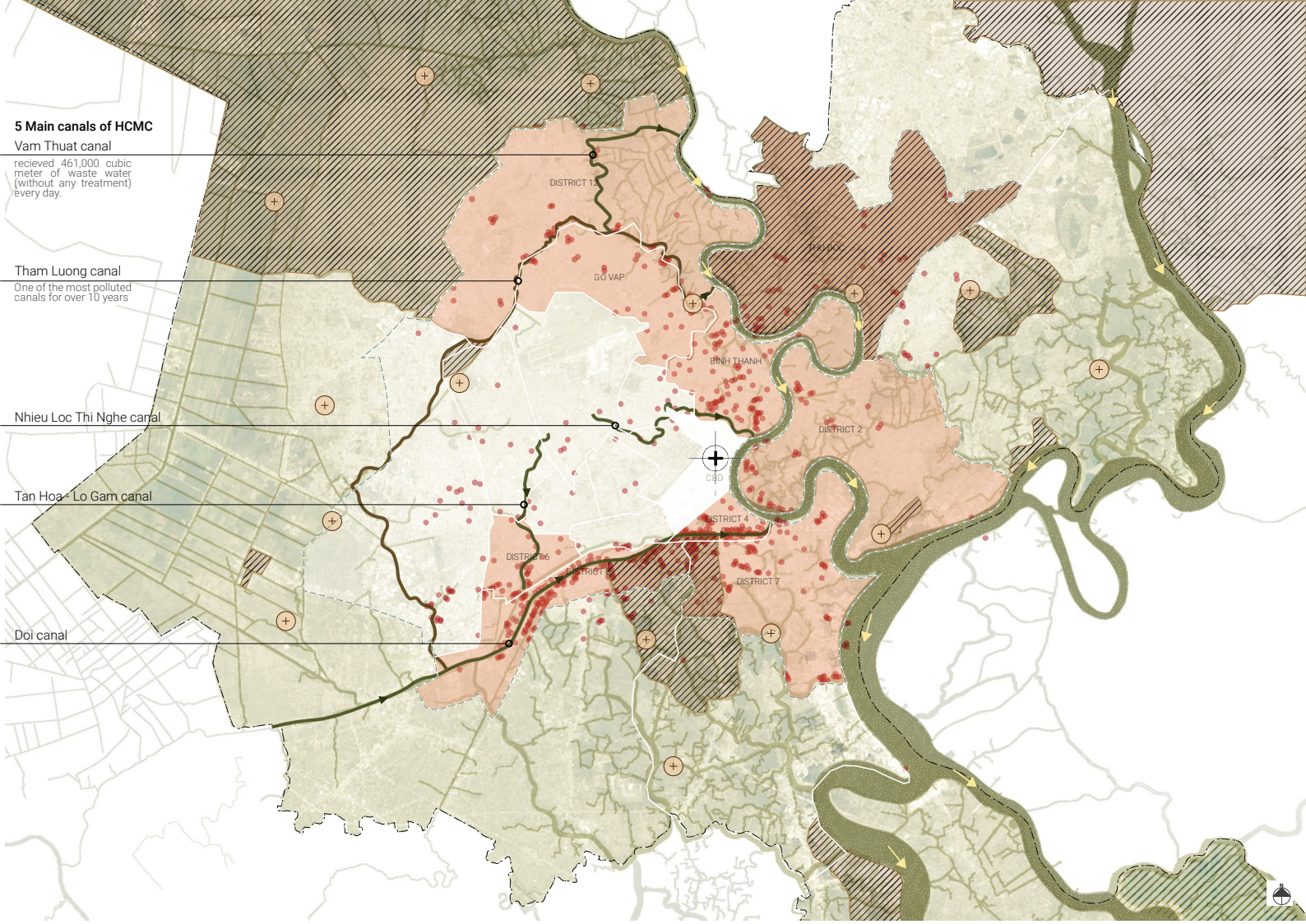


4-14

4-15

From the map of figure 4-9 illustrated that the cluster of informal settlements and group of row house are interrelated. This can be explained by the occurrence of the informal settlement. At the beginning Vietnamese typical rowhouse composed of long linear rowhouses with 10 – 12 meters wide road in between and another typical is a long linear rowhouse located a few meters away from a canal. Due to the rapid urbanization, the city has attracted larger group of people by the large amount of job opportunities. However, as mentioned in Chapter 1, there was inadequate space for new comers and immigrants. As a consequence, local people began to extend their territory into the public property in order to provide an extra living space for their relatives or companions. The 10 – 12 meters road which was accessible by cars has reduced into a narrow walking-street (Tran et al., 2008). Besides, the setback area next to canal has also been occupied by the temporary structure. The housing pattern of the typical row house has gradually changed into an extremely dense built area with narrow accessibility (Hanh, 2006).

Figure 4-12 Informal extension of row house section with road in between, Drawn by Author
Figure 4-13 Informal extension of row house plan with road in between, Drawn by Author
Figure 4-14 Informal extension of row house section with waterfront, Drawn by Author
Figure 4-15 Informal extension of row house plan with waterfront, Drawn by Author



As a result, the occurrence of informal settlement has rapidly grown, and it is now more than 300,000 unregistered residents. The map showed the location of the informal settlement in relation to major water structures and industrial area which can be categorized the informal settlement pattern into three types.

Type 01 appeared on the new industrial area of district 12, Go Vap and Binh Thanh. The pattern is fragmented with a low density of houses. As it is located in a rural area, the durability of houses is relatively low with lack of electricity and freshwater resources. Type 02 showed a higher density of houses along the water structure and infrastructure. The pattern is still fragmented, but it is appeared to be a discontinuous linear structure in the new urban district of district 2 and Thu Doc. Most of the houses have accessibility to electricity and water resources. Lastly, type 03 showed a similar pattern with higher density and thick linear community pattern. The most concentration area found in district 4, 6, 8 along water structures with relatively high durability of building structure and full accessibilty to electricity and water supply (Tran et al., 2008).

Figure 4-16 Informal Settlement location in relation to surrounding context ("Atlas Ho Chi Minh City", 2013) Redrawn by author

INFORMAL SETTLEMENT IN **HO CHI MINH CITY**

Figure 4-17 Informal Settlement in different district (Tran et al., 2008, p.44-58)

TYPE 01

Built Pattern — New industrial area, Scattered
Material — Recycle material ,Organic-material, Timber, Corrugated iron

Access to Water ○○○○○
Access ro Electricity ○○○●●
Sanitation ○○○○○

TYPE 02

Built Pattern — Developing district - Scattered along infrastucture
Material — Recycle material ,Organic-material, Timber

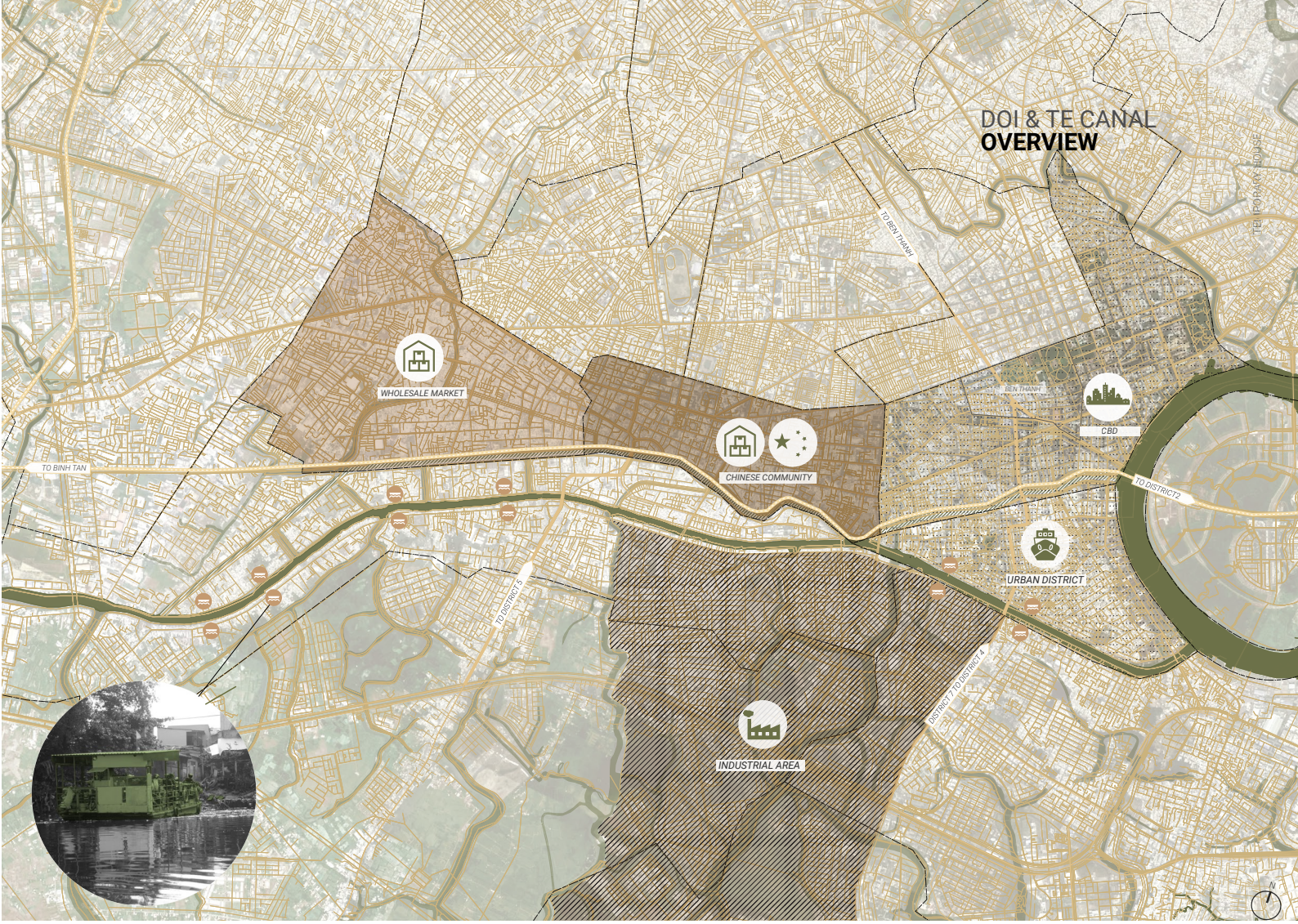
Access to Water ○○○●●
Access ro Electricity ○○●●●
Sanitation ○○○●●

TYPE 03

Built Pattern — Urban district-Linear settlement
Material — Corrugated iron, Timber, Brick, Concrete, Recycle material

Access to Water ○●●●●
Access ro Electricity ●●●●●
Sanitation ○○●●●

Figure 4-18 Old images of the area during 1965
(The Quới Đớớc creek, 1965)
Figure 4-19 Aerial view of canal at a present day
(District 8 and its iconic Y Bridge, 2018)
Figure 4-20 Old image of Cholon area
(Duong Hai Thuong Lan, n.d.)
Figure 4-21 Taken by Author



The test site is the informal settlement community along Doi and Te canal (informal settlement type 03) which contain one of the highest densities of informal houses. The 15 kilometers canal has a width of 90-120 meters and covered the area of district 8 and part of district 4. The canal is located in between the so-called "old town" of district 5 and 6 and "new town" of district 7 and Saigon – Nam Sai Gon area, which brought a network of infrastructures with many highway lines and new street developments to the area.

In the past, the Tau Hu-Ben Nghe has been dug earlier to function as the main commercial routes for carrying local goods from the Mekong Delta region to HCMC. Due to its prime location, the canal is known as the shortest, safest and one of the most strategic water navigation routes during 18th to the beginning of the 20th centuries (Hanh, 2006). These canals connected the Saigon River to the Mekong Delta through water channels and river systems, and this allows the boat to transport without experienced the meandering waterway through the Can Gio mouth of Mekong (figure 4-23). Consequently, Doi and Te canal has been dug to provide an alternative route and drainage improvement to the city. Along the two canals, the area used to be the essential spots for goods exchange, daily market and Chinese community which was one of the most dynamic waterfront areas (District 8 in Ho Chi Minh City 2018, para.3). The two canals were regularly dredged and widened not only for water transportation but also to attract the other handicraft activities and business along canal sides (Hanh, 2006).

Figure 4-22 Doi and Te Canal and surrounding map, drawn by author

- DOI,TE CANALS AND SAIGON RIVER
- WATER STRUCTURE
- HIGH WAY
- MAIN ROAD
- ROAD SYSTEM
- CENTRAL BUSSINESS DISTRICT & CITY CENTER
- INDUSTRIAL AREA
- COMMERCIAL AREA
- BOAT CROSSING PIER

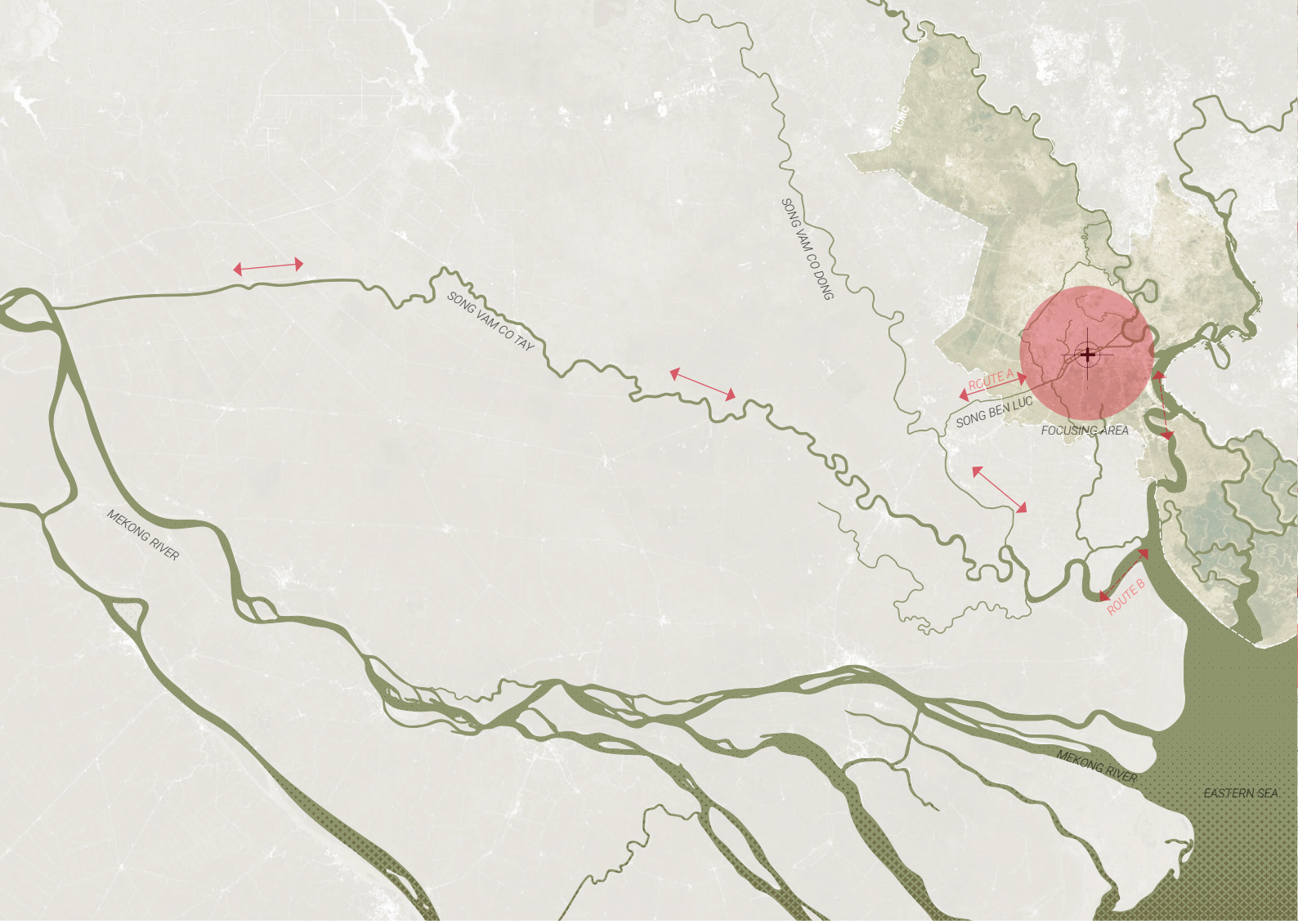
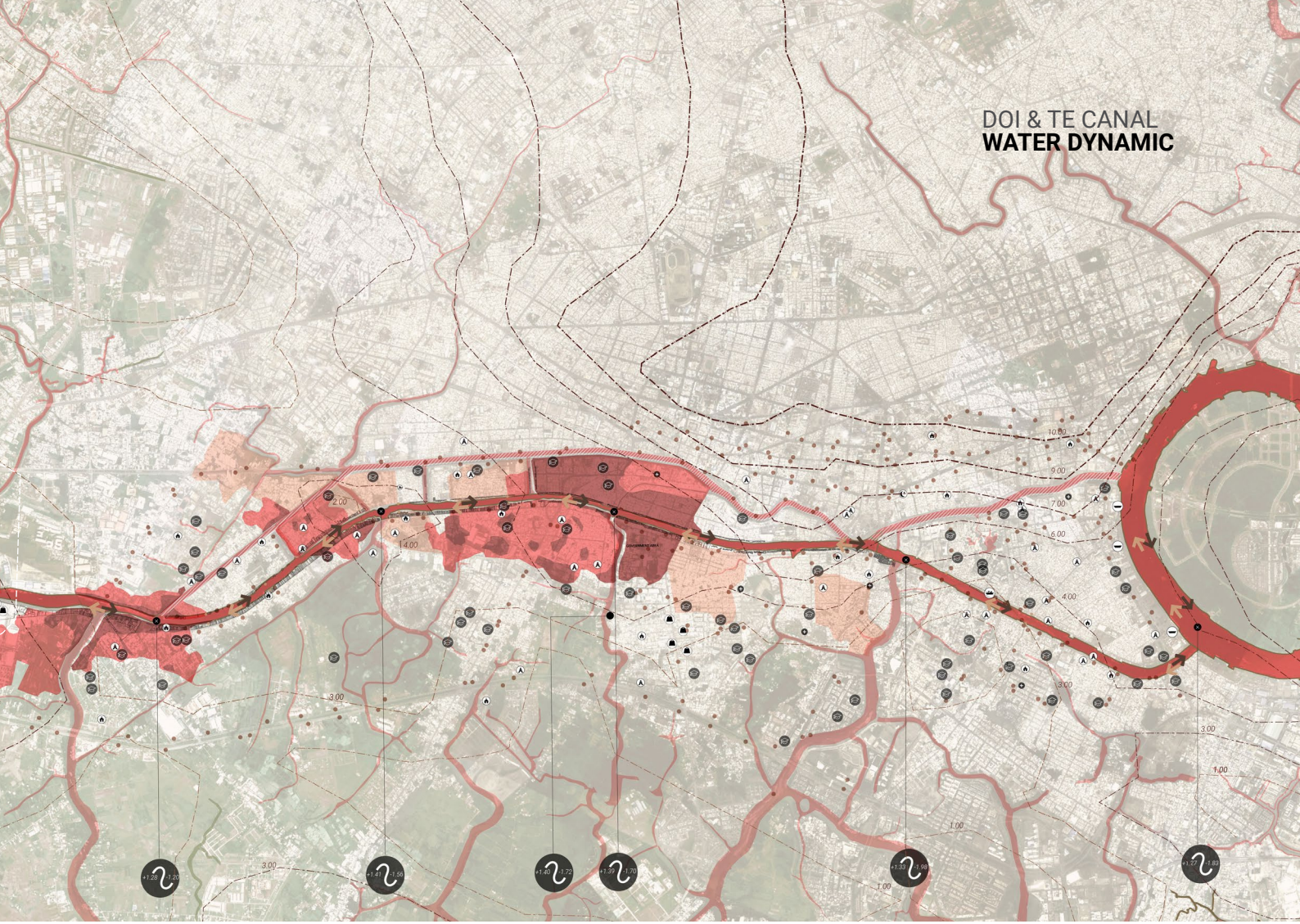


Figure 4-23 Relationship of Doi and Te canal and Mekong Delta, drawn by author

ROUTE A: The shortest distance from The Mekong river to district 4 (port area)

ROUTE B: Wider river for big scale ships, the route go through mangrove area with curvy water way which made this route difficult for small boat to access.



Nowadays, the two canals still functioned as the significant water routes to transport a variety of goods including rice, agricultural product, an industrial product such as sand, fertilizer, and cement (Hanh, 2006). However, the importance of water transportation is relatively decreasing, and there is a lack of water maintenance in HCMC. The canals are becoming shallower and narrow which created a difficulty for big ships to access. Thereby, warehouse and factory began to move out and left the area abandoned. The overall area has been replaced with the informal housing and new residential area with a relatively high density.

On the other hand, the topographical condition and water dynamic are also essential. Doi and Te canal is highly influenced by the sea tidal which created the 2.68 differences between high tide and low tide twice a day (JICA, 2001). The water direction is also influenced by the eastern sea which created the eastward movement during low tide and flowed toward the west during high tide. However, the tidal dynamic has brought some problem to district eight since the area is characterized by flat topography with an average elevation of 1.2 meters above mean sea level which is lower than other districts in HCMC (Dang & Kumar, 2017). As a result of topography and the effect of a high density of water structure, district 8 is one of the most vulnerable areas of HCMC induced by tidal fluctuations.

Figure 4-24 Flood and topography map (Dang & Kumar, 2017, p.1804) Redrawn by author

FLOOD AREA (0.00-0.30 m.)
FLOOD AREA (0.30-0.50 m.)
FLOOD AREA (>0.500 m.)
WATER DIRECTION - HIGH TIDE
WATER DIRECTION - HIGH TIDE
WATER ELEVATION
SCHOOL/UNIVERSITY
SHOPPING MALL
CHURCH
TEMPLE
MOSQUE
HOSPITAL
FISH MARKET
PORT AREA

4-25


4-26


4-27


4-28

Figure 4-25, 4-26, 4-27, 4-28
Situation of floating waste on canal surface without waste collecting
(24h , 2017)

Figure 4-29 Water quality and waste collecting map (Chung, Strady & Perset, 2016, p.12) Redrawn by author
Figure 4-30 Waste Collecting Process by DVCIQ8 Public Organization (Chung, Strady & Perset, 2016, p.10) Redrawn by author

One of the distinctive problems in Doi and Te canal appeared to be a water quality issue. This can be described by two sources; one is the polluted water carried out by Lo Gom canal which is located in the industrial area (figure 4-31), and another is the floating debris from human discarding and natural vegetation. The water quality of the canal is predicted to be higher if there is still non-protection to the freshwater resources h. Similarly, the floating debris is also a severe problem, as the paper of Chung, Strady and Perset (2016) have described their interviewed with inhabitants that "...the amount of floating waste was so huge that people could walk on it to cross the canals." The waste found on canal surface varies from daily product to clothes and medicine, surprisingly more than eighty percent appeared to be natural vegetation such as coconut, Water Hyacinth and leaf. However, the floating waste has occupied most of the water surface, in 2013 the amount of waste reported as high as 5,742,479 kilogram, and it kept on rising to 11,264,234 kilogram in 2014 (Chung, Strady & Perset, 2016). The massive amount of waste flows directly to the sea which undoubtedly will interfere the marine life shortly.

As a result, in 1999 the public organization DVCIQ8 has established in order to contribute to the mentioned problem. The process of daily collecting is described in a diagram (Figure 30); the waste is collected from the canal and bury on the ground without any sorting. This issue will certainly become the future issue of HCMC when there is inadequate space for waste management and also for living.

Figure 4-31 Simulation of Water Quality (JICA, 2001, p.S-22)

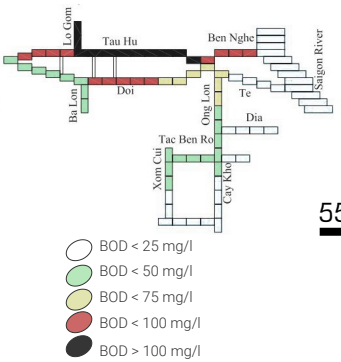
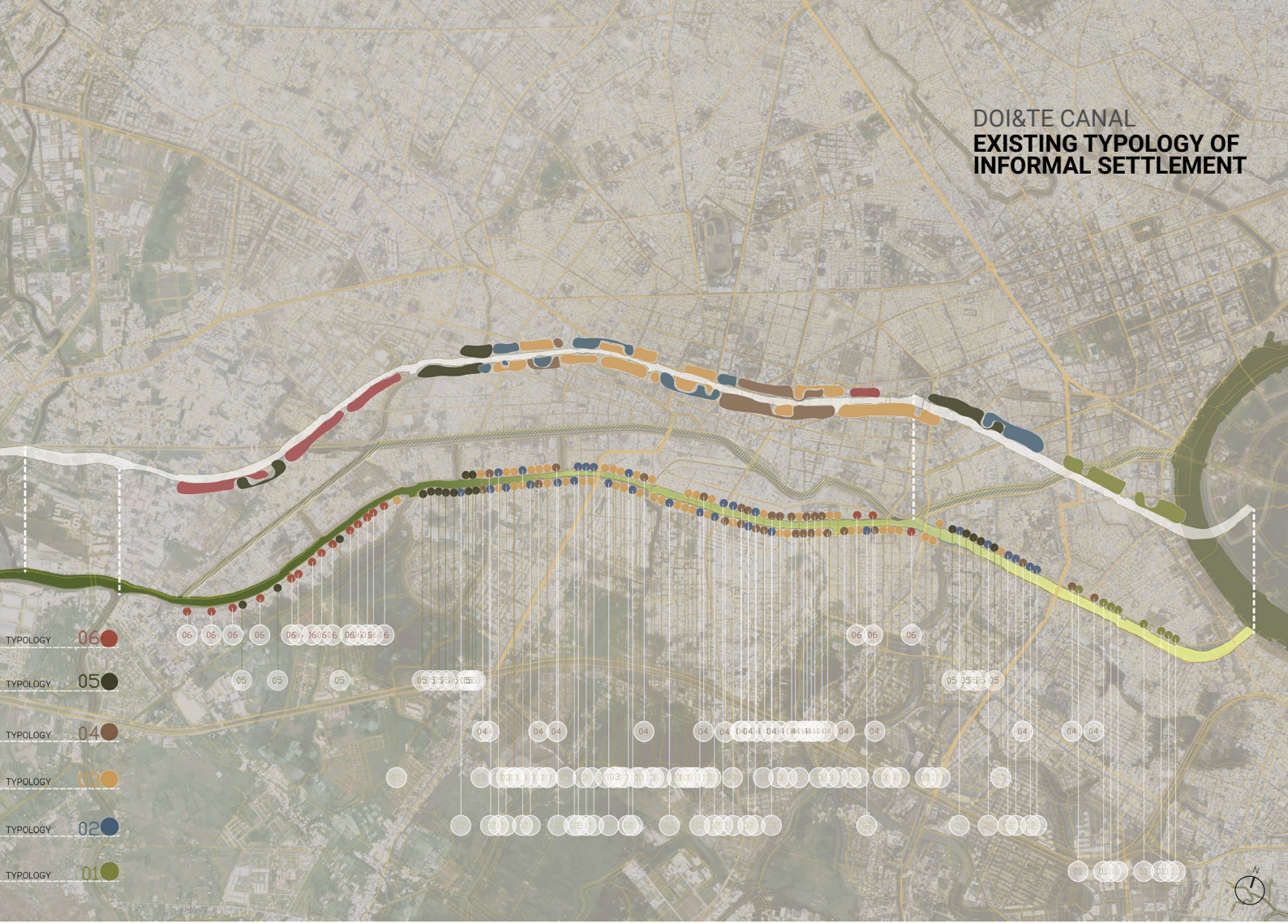


Figure 4-32, 4-35 Informal settlement along Doi and Te Canal, taken by author
Figure 4-33 Small alley inside informal communities, taken by author
Figure 4-34 Inhabitant who work as a boat driver in the canal, taken by author



From site visit in December 2018, the informal settlement along Doi and Te canal can be categorized into six typologies according to the supporting structure of the houses and its relation to the landscape. The most dominant typologies are found in type 03 (Wooden Piles) and type 04 (Concrete Piles) which are mainly occupied in the middle of the canal with a high density of houses. All the six typologies have impressively been integrated into the surrounding landscape. For example, on the west side of the canal with a saltier water condition, the houses have been settled in a small group to allow the large size of mangrove trees to grow while in the east side of the canal with fresh water of the Saigon River, the houses are more compact with only a few meters for a tropical tree to grow.

Figure 4-36 Typologies of informal housing projected on map (Google, n.d.)
Drawn by author

BARRIER
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

01

DENSITY:

DURABILITY:

ACTIVITIES:

HOUSING STRUCTURE:

PLANTATION:

SOIL TYPE:

Compact soil & sand
Holocene sediment
Debris

SANDBAG & ORGANIC MATERIAL
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

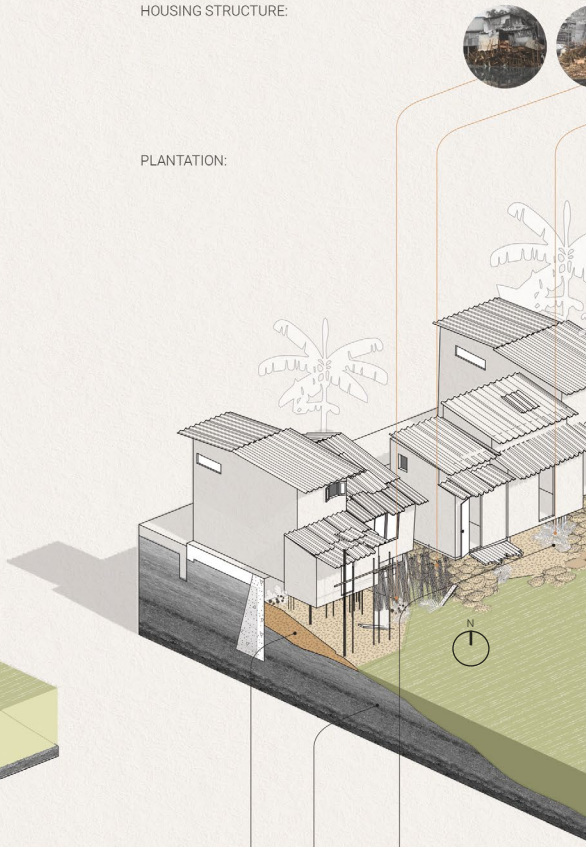
DENSITY:

DURABILITY:

ACTIVITIES: FISHING, RAISING CHICKEN & BIRDS

HOUSING STRUCTURE:

PLANTATION:



SOIL TYPE:

Debris
Holocene sediment
Dry leafs

02

WOODEN PILES
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

DENSITY: ●●●●●

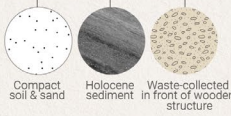
DURABILITY: ●●●○○

ACTIVITIES: FISHING, COLLECTING DEBRIS

HOUSING STRUCTURE:

PLANTATION:

SOIL TYPE:



03

Figure 4-37 Typologies of informal settle ment in relation to the landscape, Drawn by author

CONCRETE PILES
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

04

DENSITY:

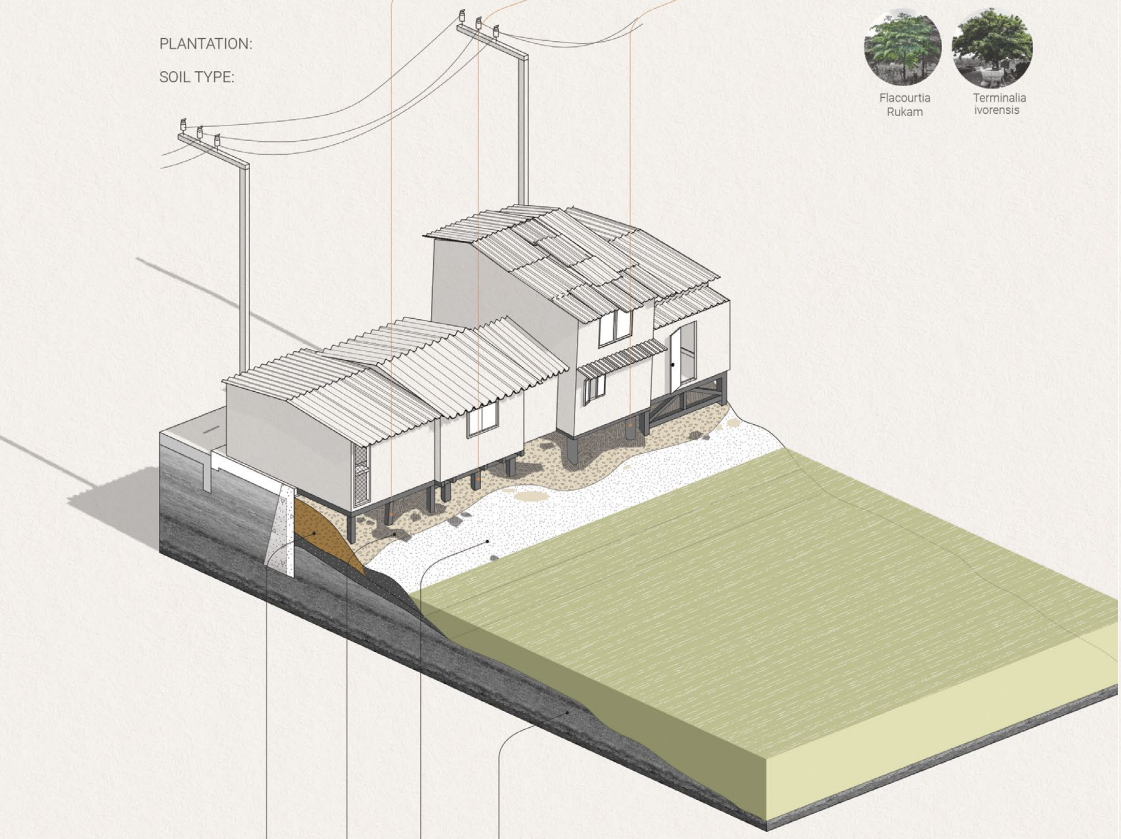
DURABILITY:

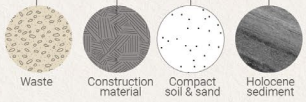
ACTIVITIES: FISHING, COLLECTING DEBRIS

HOUSING STRUCTURE:

PLANTATION:

SOIL TYPE:





WOODEN PILES AND BOAT PARKING
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

DENSITY:

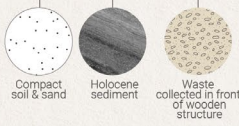
DURABILITY:

ACTIVITIES: BOAT PARKING, HANGING CLOTHES, RAISING

HOUSING STRUCTURE:

PLANTATION:

SOIL TYPE:



05

VEGETATION BASED
INFORMAL SETTLEMENT
LANDSCAPE TYPOLOGY

06

DENSITY: ●●○○○

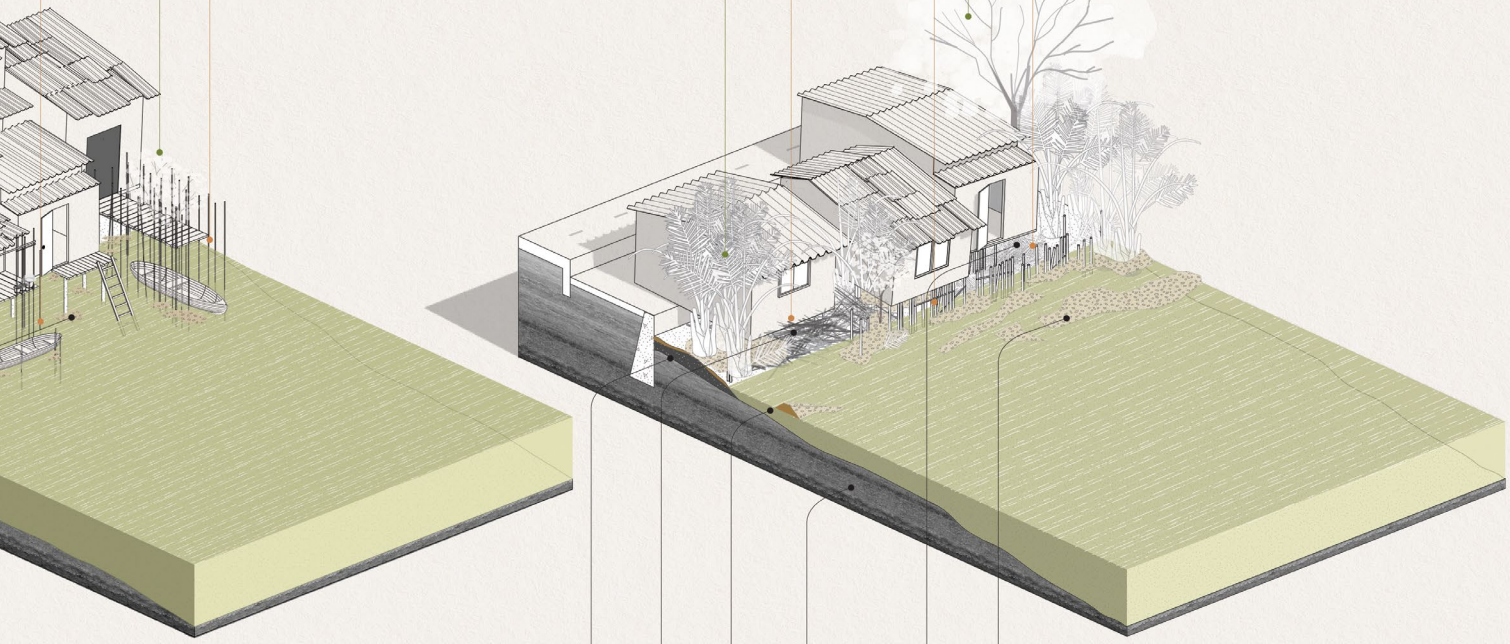
DURABILITY: ●●○○○

ACTIVITIES: FISHING, COLLECTING DEBRIS

HOUSING STRUCTURE:

BIRDS

PLANTATION:



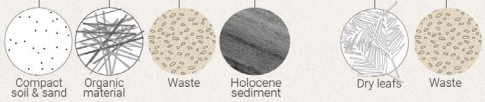
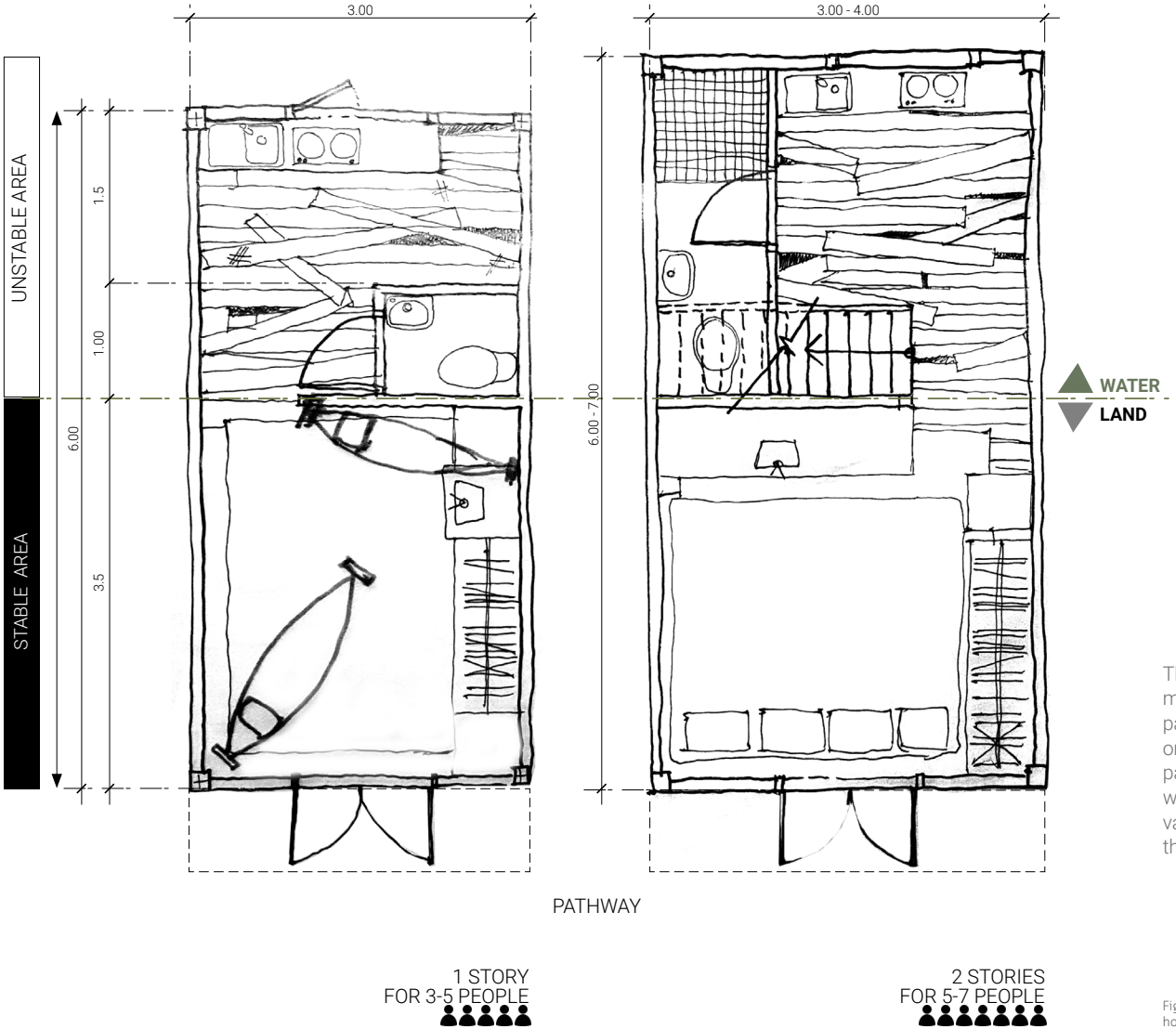


Figure 4-37 Typologies of informal settle ment in relation to the landscape, Drawn by author



The interior of the house mostly divided into two parts; the stable part located on ground and the vulnerable part located on piles over water surface. Bed room and valuable belongings are in the stable part.

Figure 4-38 Typical floor plan of informal house, drawn by author















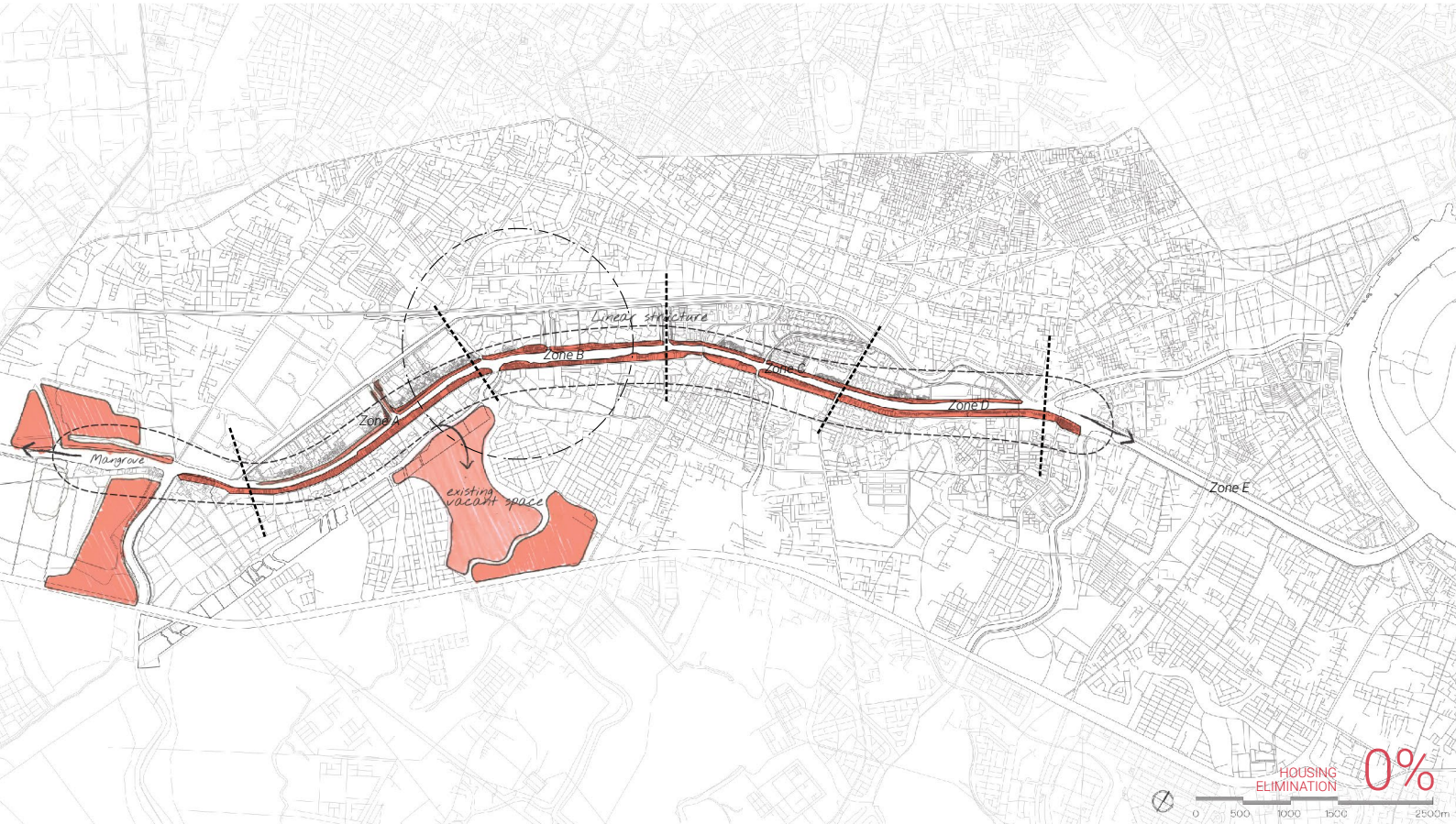



MAIN CAREER | DAILY ACTIVITIES | BELIEVE & RITUAL | WATER MANAGEMENT | SIGN OF TIDAL EFFECT

Figure 4-39 Observation detail collection along Doi and Te canal, Captured by author

5 CONCEPTUAL DESIGN

Figure 5-1 Conceptual plan - remain all the informal houses, drawn by author

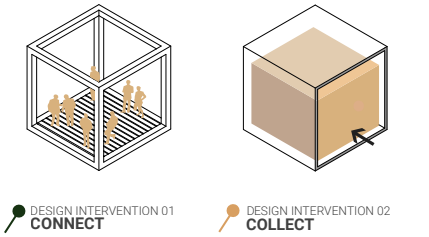


With the first attempt towards the bottom-up approach, the first scenario aimed to explore the design strategy by using only the linear structure of the informal settlement and an existing green patch. There were zero houses which have been eliminated from this approach. By doing that the four landscape design principles are proposed which are connect, collect, restore and release. The solid waste will be collected while polluted water will be restored or recycled and released back to the canal. The long linear site is divided into five zones, and each zone is operated separately in order to manage the waste and purify water. Lastly, the entire zones are connected by the idea of flushing system which is the cleaning system control by blocking the access of water and flush the existing water out of the area.

Even though the design strategy can preserve all of the informal settlement, but the idea appeared to be over control by large scale infrastructure. There are several water gates and pump required in the plan while the small design interventions have an inferior contribution to the city.

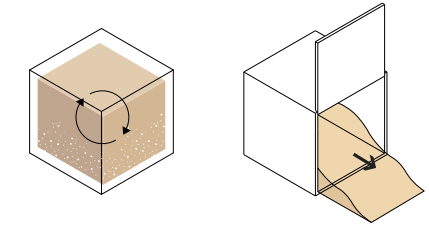
Figure 5-2
Zoom in scale - Zone B
Normal Situation
drawn by author

Zoom in scale - Zone B
Flooding Situation



DESIGN INTERVENTION 01
CONNECT

DESIGN INTERVENTION 02
COLLECT



DESIGN INTERVENTION 03
RESTORE

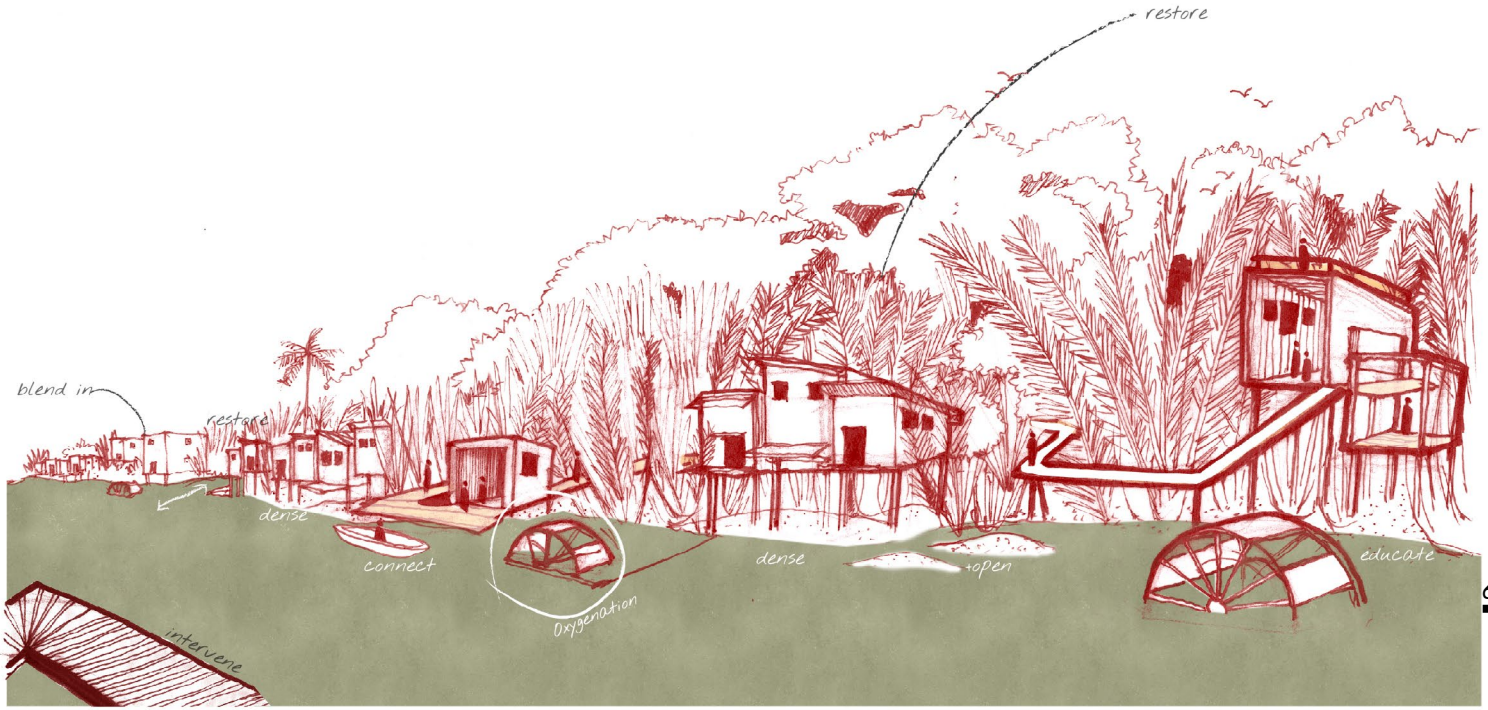
DESIGN INTERVENTION 04
RELEASE

Conceptual design of
Design Interventions

Figure 5-4 Conceptual plan - Using part of the existing landscape as part of the design, drawn by author

The next design scenario intended to explore the new green sponge within the area while eliminating some of the informal houses if necessary. The main idea is to use the informal settlement as part of the living purification system, and the whole area functioned as one system. Starting from the west side of the canal, the linear mangrove structure will be restored and expanded to the edge of the canal, following by the existing green patch and left-over aquaculture field will be combined into one large piece of land for water purification. The strip of informal settlement is expected to break into a small block which will function differently according to landscape condition. Finally, water quality will be improved before reaching the Saigon river.

The plan seemed to fit in the context of District 8 since the area used to be the industrial area with several left-over lands. Besides, the existing green structures are abundant, but there was dying out due to lack of maintenance and low environmental quality. This design strategy acquires a higher potential to be developed in comparison to two others scenario. However, the cultural approach and urban aspect are still lacking in the plan which will be explored on the further stage.



Sketches vision of the West Zone
Mangrove forest restoration and integration to the informal settlement

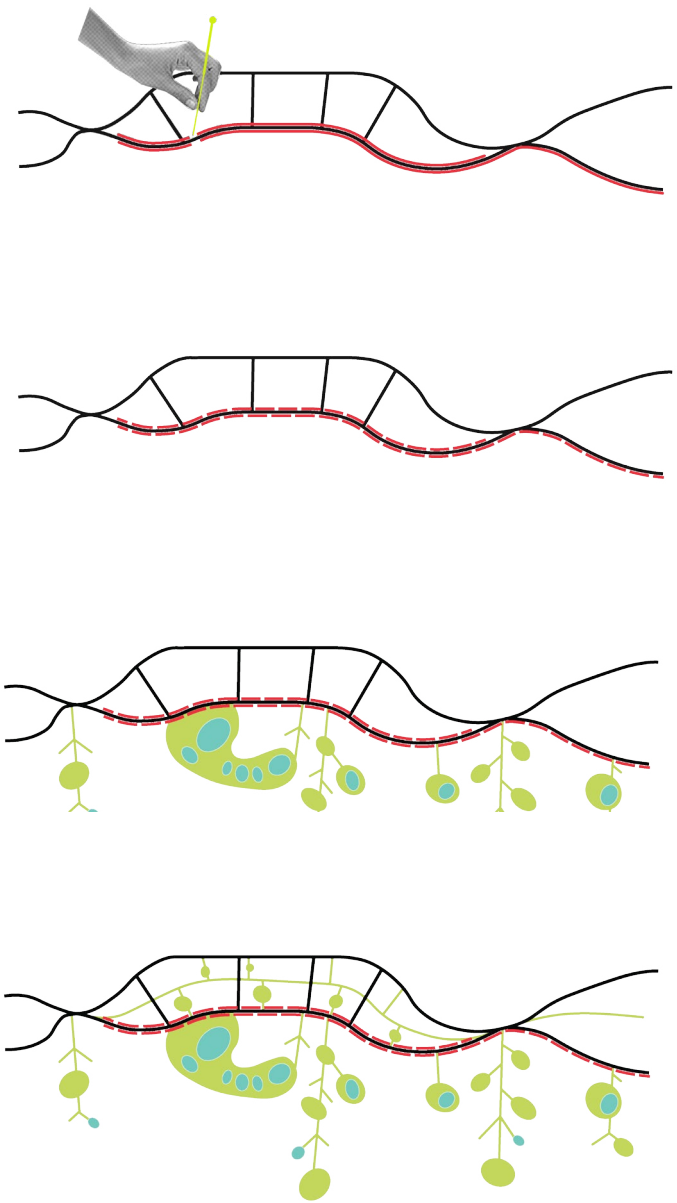
Mangrove restoration

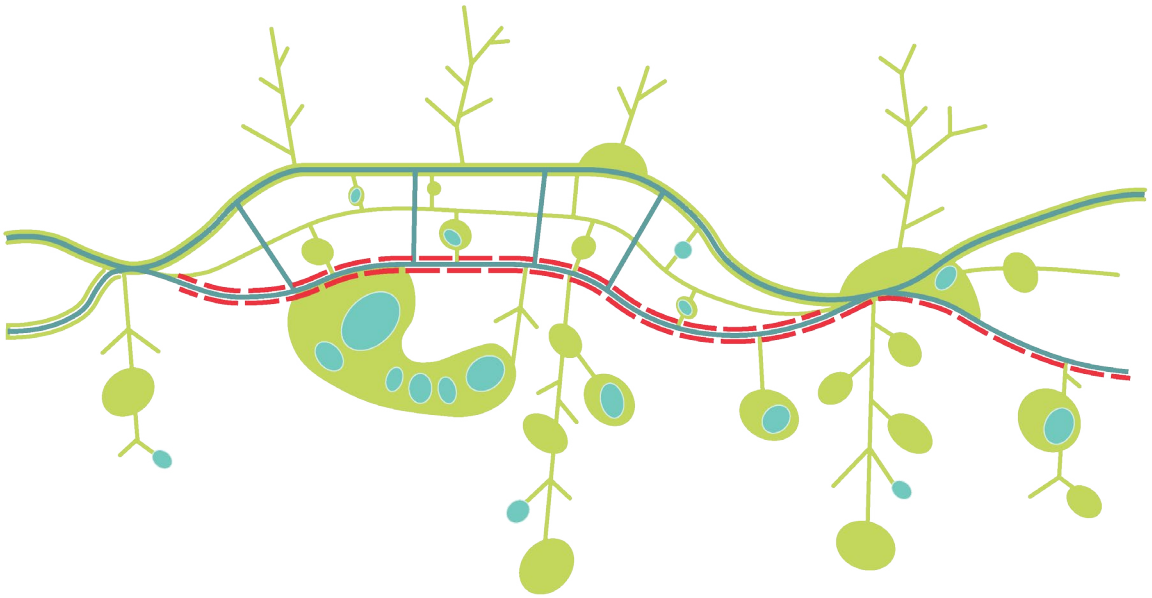
Figure 5-6 Conceptual plan - Using the existing landscape in a rural area as part of the design, drawn by author

The extreme scenario derived from recognizing the area in between the two canals (Tau Hu-Ben Nghe and Doi-Te) as an island. What will happen if the mentioned island will function as the green lung of Ho Chi Minh city and the informal settlement will act as a living boundary of the lung. The aim is to create a new green sponge system all over the area in order to improve the environmental quality to the city while exploring alternative spaces for a new informal settler to occupy.

This approach have a strong potential to enhance the massive-concrete city into a more ecological friendly city, the existing informal settlement and new informal settlement will receive a better quality of life. Never the less, by calculating the number of houses which will be removed from the plan, there will be more than 400,000 houses moving out of the area. The strategy appeared to be a top-down approach which is contradicting with the original intention. Hence, this scenario is not suitable to be developed further.

Vision sketch showed the green lung and the iconic Y brdige of the area. The connection have been created from theurban area to the rural area through different means of transportation.





According to the chosen design scenario. the scenario 2 is the chosen one. The design will be elaborate under concept:

" BREATHING SYSTEM "

By acupuncturing the linear strip, the informal settlement as the begining of a new green and blue structure that rub through the whole city

6 DESIGN IMPLEMENTATION


THAM LUONG
TO MEKONG DELTA
SONG CAN GIUOC
DELAY

MASTERPLAN

The design scenario 2 is chosen to be developed further due to its strong potential to use the existing structure as the left-over agricultural field, aquaculture farm, and mangrove forest as part of the purification system or so-called breathing system. Besides, the zone of the informal settlement will be used as a core to connect the whole system and allow the urban residence from the upper part and the rural residence from the bottom part to have more interaction. This zone is represented in the brown strip along two sides of the Doi-Te canal. The overall system of the masterplan can be divided into three zones which are Delay, Divert and Release. The water stream from the Mekong Delta will firstly be delayed by mangrove forest zone before being diverted into the purification park and released back to the Saigon river.

Figure 6-1 Masterplan, drawn by author

PROPOSE

- a SPONG PARK
- b SPONGE AREA
- c CITY PARK
- d WATER INLET TO PURIFICATION PARK
- e PURIFICATION POND
- f AQUACULTURE FARM
- g GREEN BUFFER
- h CONSTRUCTED WETLAND
- i RECREATIONAL AREA
- j BIOGAS ISLAND
- k ECOLOGICAL STRIP ALONG DIVERTED CANAL
- l MANGROVE FOREST & ECOLOGICAL PARK
- m EXPERIENCING ROUTE
- DEMOLISHED HOUSES
- NEWLY PROPOSED HOUSES
- INTERVENTION TYPE 2
- INTERVENTION TYPE 3
- INTERVENTION TYPE 4
- INTERVENTION TYPE 5
- WATER GATE
- PUMP
- BRIDGE

EXISTING

- INFORMAL SETTLEMENT ZONE
- EXISTING INFORMAL HOUSES
- 1 PORT AREA
- 2 DISTRICT 4 - CBD
- 3 HIGH WAY ALONG CANAL
- 4 INDUSTRIAL AREA
- 5 GOVERNMENT OFFICE AREA
- 6 RESIDENTIAL AREA
- 7 ABANDONED AQUACULTURE FARM
- 8 RURAL AREA FOR FUTURE DEVELOPMENT

HO CHI MINH CITY

DESIGN STRATEGIES
DOI & TE CANAL

URBAN RIVER CORRIDOR STRATEGY

URC

LANDSCAPE DESIGN STRATEGIES

SMALL SCALE DESIGN INTERVENTIONS

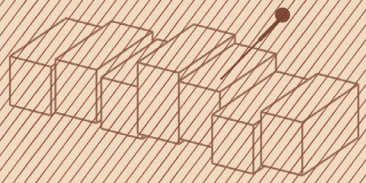
URBAN ACUPUNCTURE STRATEGY

COLLECT

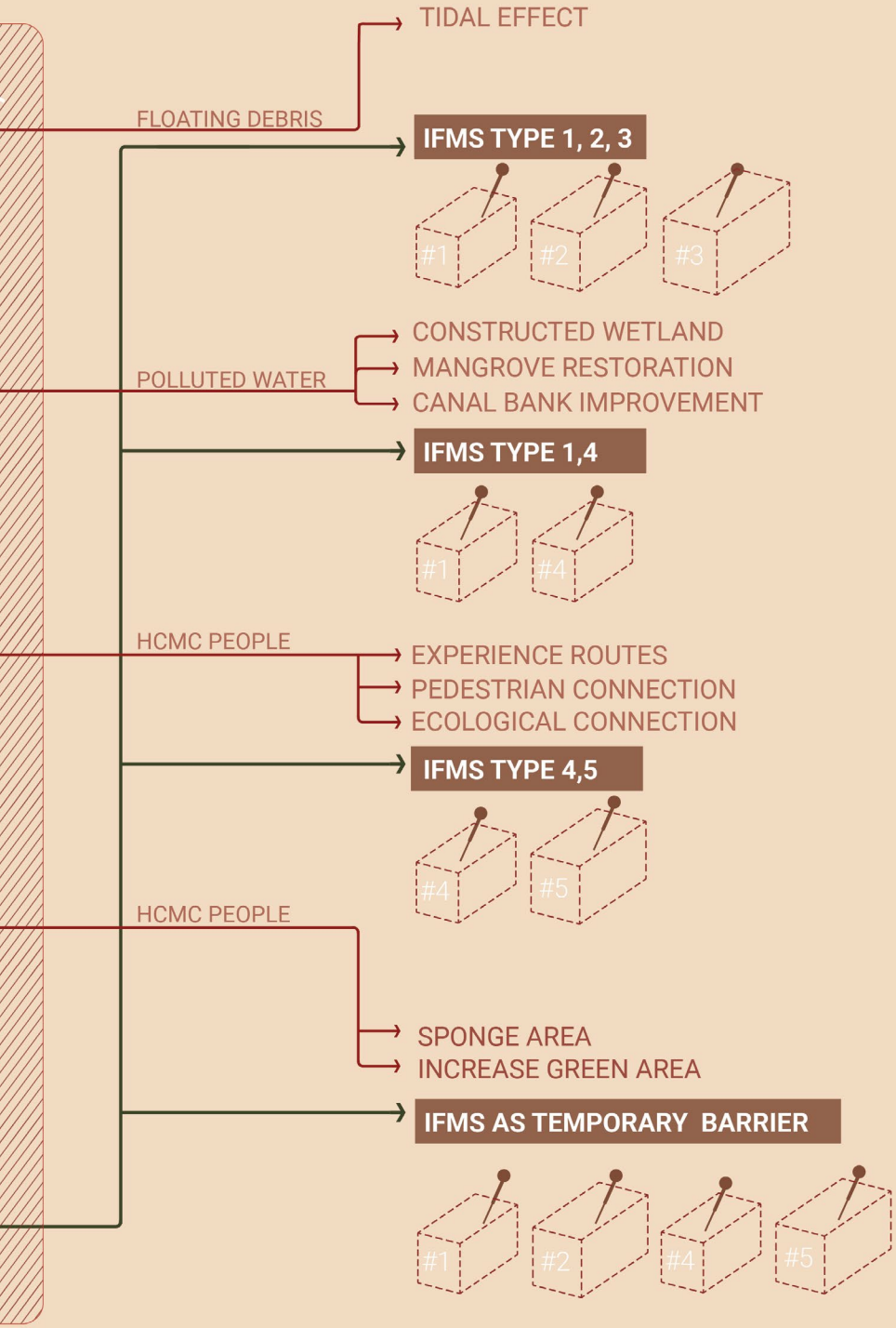
PURIFY

CONNECT

ADAPT



INFORMAL SETTLEMENT



DESIGN **STRATEGIES**

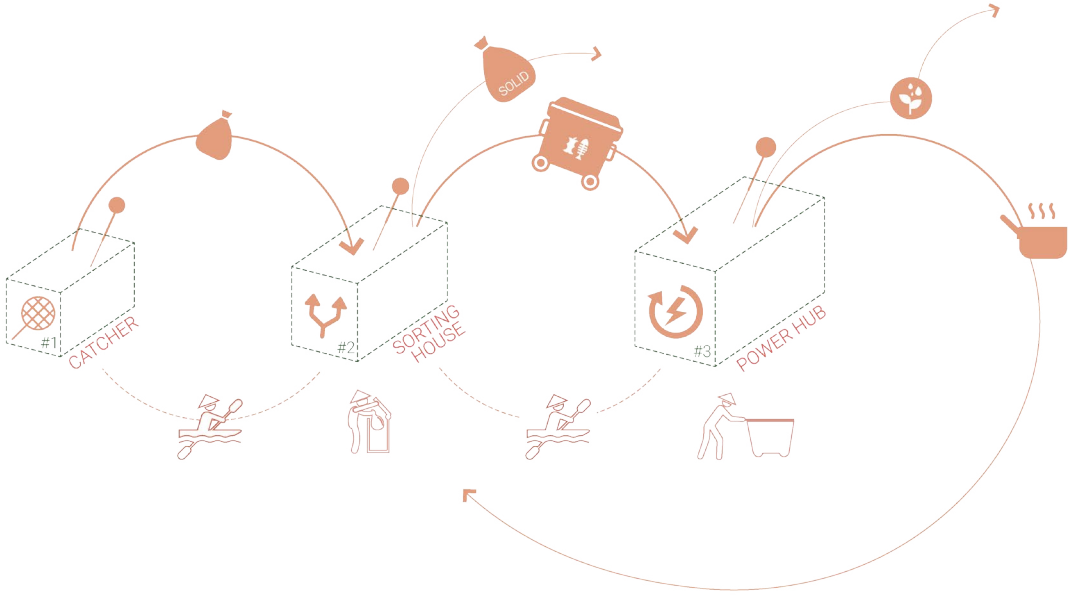
The design proposal is composed of two approaches which is derived from two design theories, as mentioned in chapter 3. The first one is the landscape design strategy which is referred to the Urban river corridor theory, while the second one – small scale design intervention is referred to urban acupuncture theory.

The landscape design strategies is composed of 4 design layers, which aims to create a better environment for HCMC in terms of both ecological and sociological quality. These four layers are being linked and activated by small-scale design interventions , the interventions are inserted in every layer and tfunctions as one system. In this report, the four design layers and its relationship to the small-scale design intervention will be elaborated in detail.

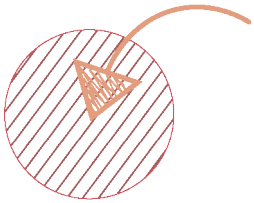
Produce

Intervention

Job Opportuniy

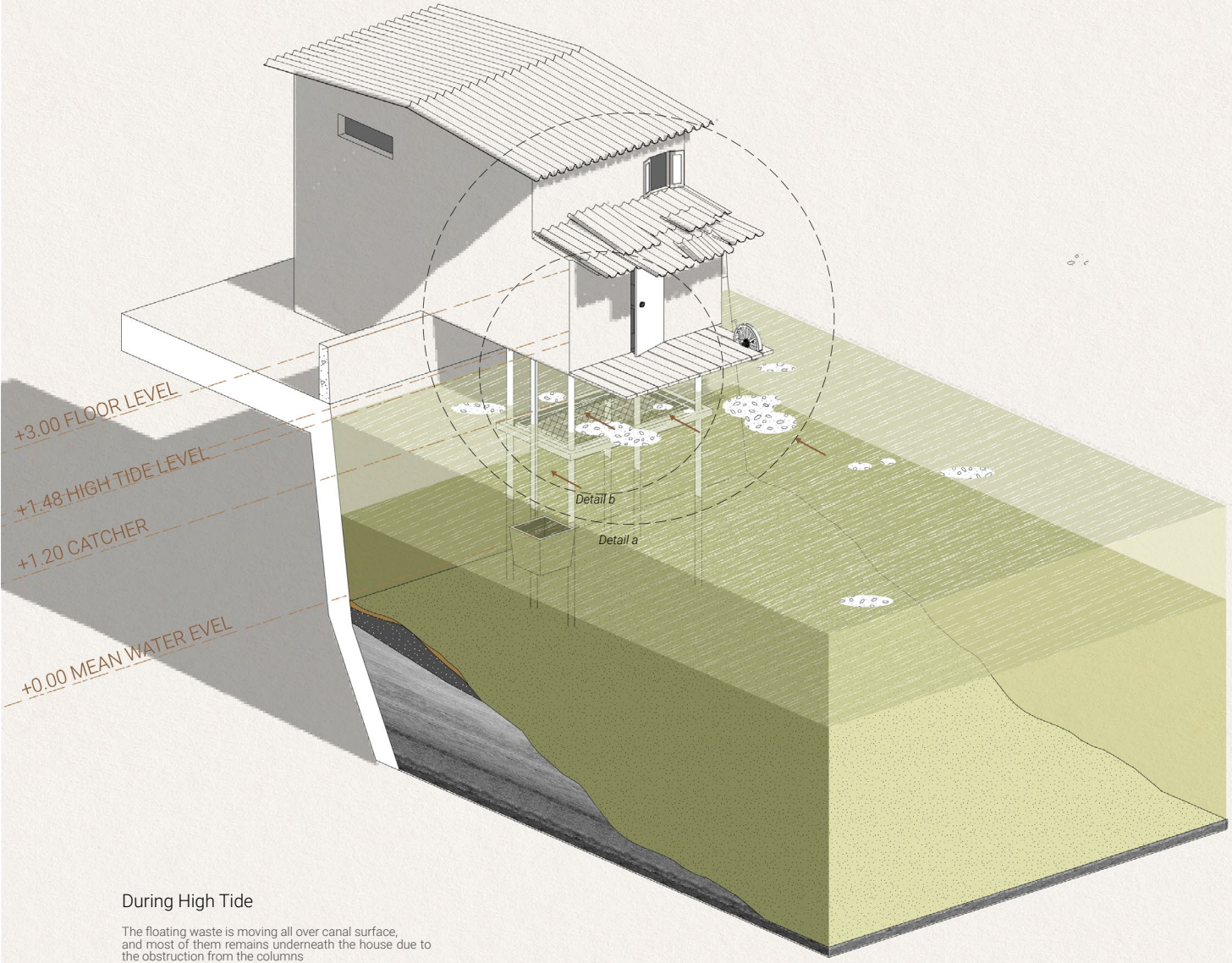


COLLECT



In the present day, floating debris from Doi-Te and Ben Nghe-Tau Hu canals is accumulated up to 5 million to 10 million kilogram per year (Chung, Strady & Perset, 2016). All the waste flow directly to the Saigon river and the Eastern sea respectively without any treatment. As mentioned in chapter 4, 86% of the floating waste is an organic matter, therefore the first design layer intends to "collect" the waste and utilize them. By doing that the informal inhabitants are strongly required to be part of the plan since it is undenyable that they are also the contrubutor of pollution.

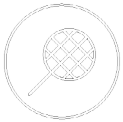
The design proposes to make use of the existing informal houses to be a waste collector or Intervention 01 (#1 Catcher). It will naturally collect the floating waste on water surface by the design intervention. As the inhabitants will be involved in collecting and transferring the waste to the delivery boat.The collected waste will be gathered and separated at the Intervention 02 (#2 Sorting House). Solid waste will be removed and given to the informal settler who work at the (Sorting House). Generally, in South East Asia, the recycle center is a common business who buys damaged items, useless items or even garbage before tranfer them to recycling center (Taokaemai, 2016). Informal settler in HCMC mainly works as a street vendor who collect the waste to those antique business. The new job opportunities from the project will not only provide stable income to the informal settler but also offered daily garbage for their personal business. On the other hand, organic waste will be packed and delivered to the Intervention 03 (#3 Power Hub). At this stage, the large amount of organic matter will be transformed into biogas for community kitchens.



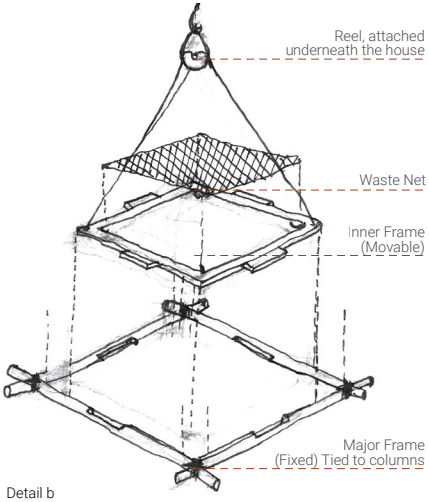
During High Tide

The floating waste is moving all over canal surface, and most of them remains underneath the house due to the obstruction from the columns

#1 CATCHER

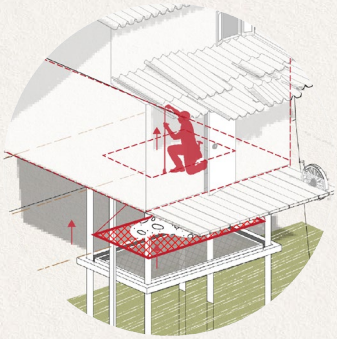


The catcher is installed in every informal house allowing them to catch the large portion of floating wastes daily. Therefore, the intervention is proposed as a low-cost, easy to construct, flexible and with local material use. The catcher is composed of wooden planks as a frame with the fish-net stretched at the center, the frame is movable by a small reel attached to the bottom of the house. It is operated by the movement of water during high tide and low tide, the location of the catcher is fixed at +1.20 meter above mean water level. Twice a day, the water level will rise to +1.48 meter which is above the catcher frame, then the water will gradually decrease to be as low as -1.20 meter (JICA, 2001). During high tide, water brings waste underneath the informal houses, after the water decrease, those floating waste is being collected automatically on the catcher frame. The informal settler will only need to remove the trash from the catcher frame and the waste delivery boat will pick up by the following day.

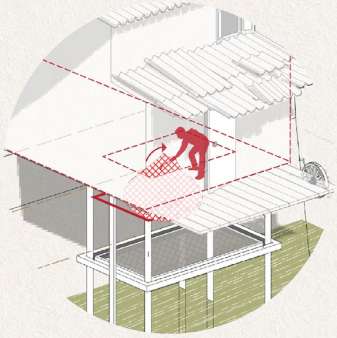


Detail b
Catcher Frame
Exploding Diagram

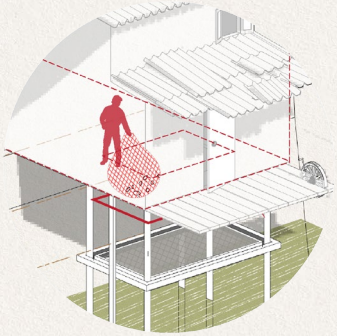
Detail a
Waste Collecting Process



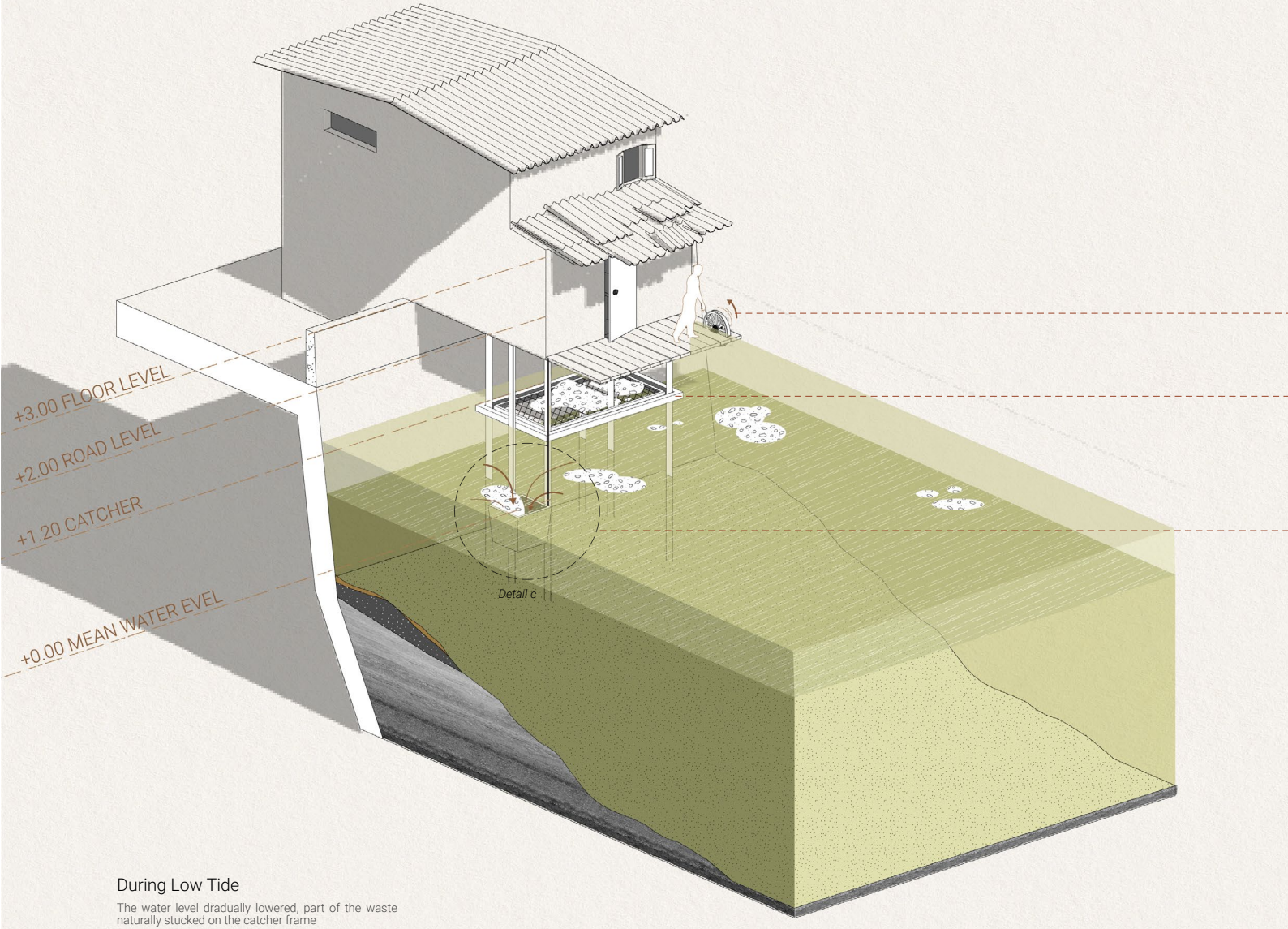
Step 1 Open part of the wood plank-floor,
Pull the frame up by the reel



Step 2 Pull up the trash net



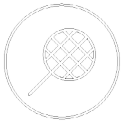
Step 3 Transfer the waste to garbage bin,
Readty to be picked up by the boat



During Low Tide

The water level dradually lowered, part of the waste naturally stucked on the catcher frame

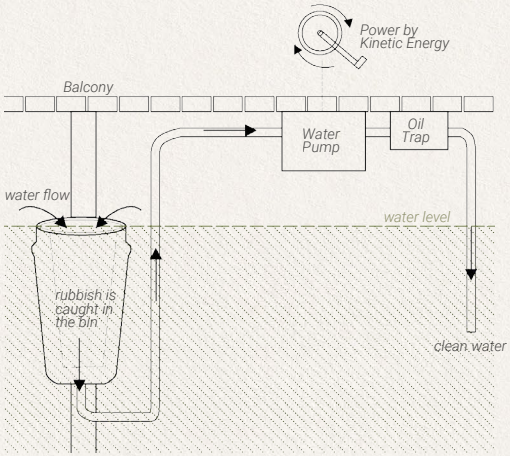
COLLECT
#1 CATCHER



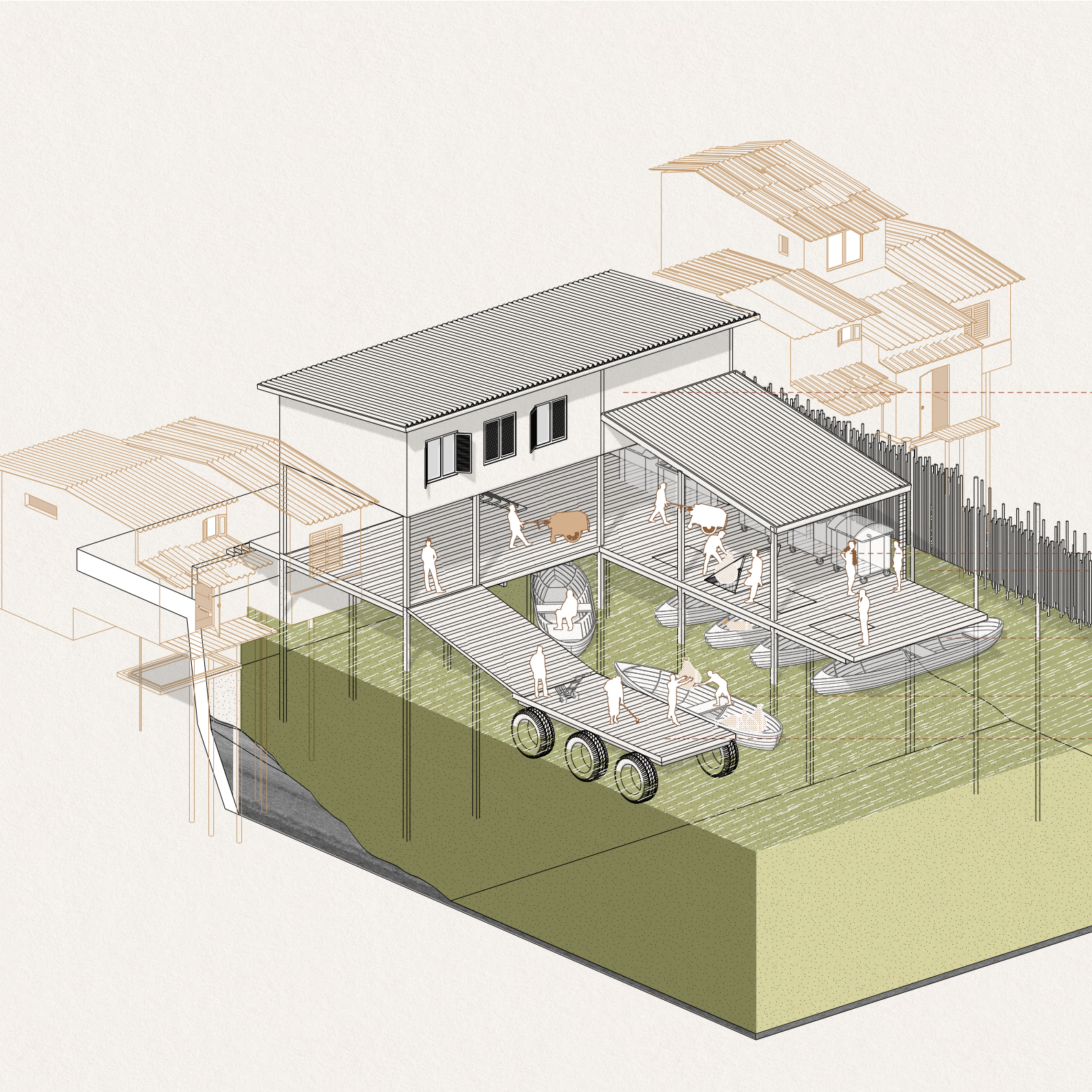
In the early stage where the amount of floating debris is still abundant and water quality is relatively low (JICA, 2001), the use of "Sea Bin" can be implemented as the transition tool. Before the whole Breathing system is fully implemented, Seabin has a strong potential to contribute to purifying water temporarily. Seabin is defined by their creator ("Seabin V5", n.d.) as "The unit acts as a floating garbage bin skimming the surface of the water by pumping water into the device. The Seabin can intercept floating debris, macro and microplastics and even microfibers with an additional filter. By acting as a trash skimmer, the Seabin is also able to clean the water from contaminated organic material (leaves, seaweed, etc…)." With the use of material found locally and easy implementation, Seabin can be installed to the existing column of a house at the height of the mean water level (+0.00 meter). The kinetic energy generated by daily movement such as rolling window blind can activate the pump and initiate the purifying process.

The use of traditional wooden wheel to generate power for water pump, the other wheel such as bicycle and curtain roller can

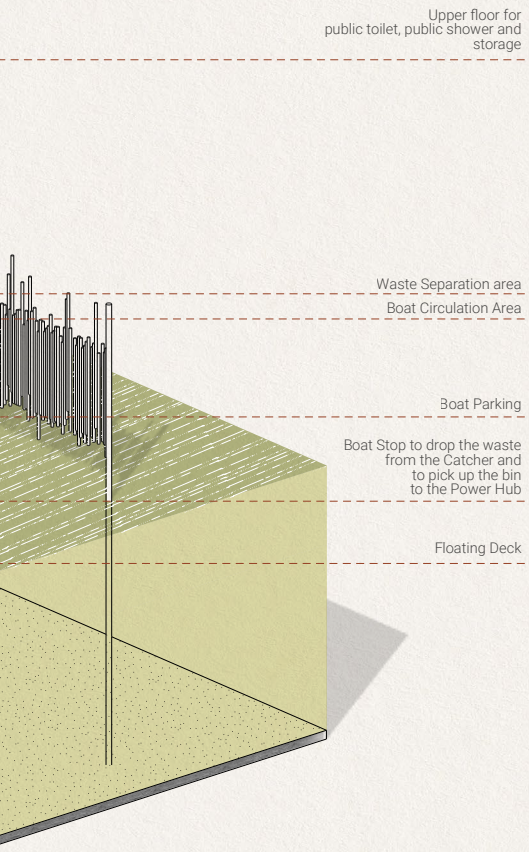
The waste are catched on the frame by tidal dynamic

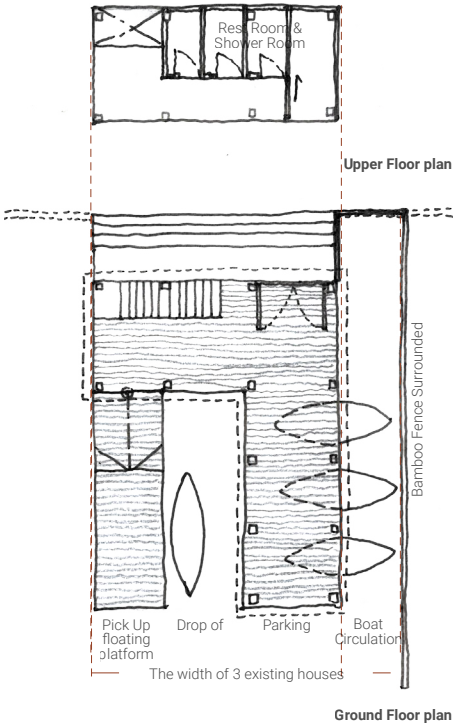


Detail c
Seabin installation
in Ho Chi Minh City context

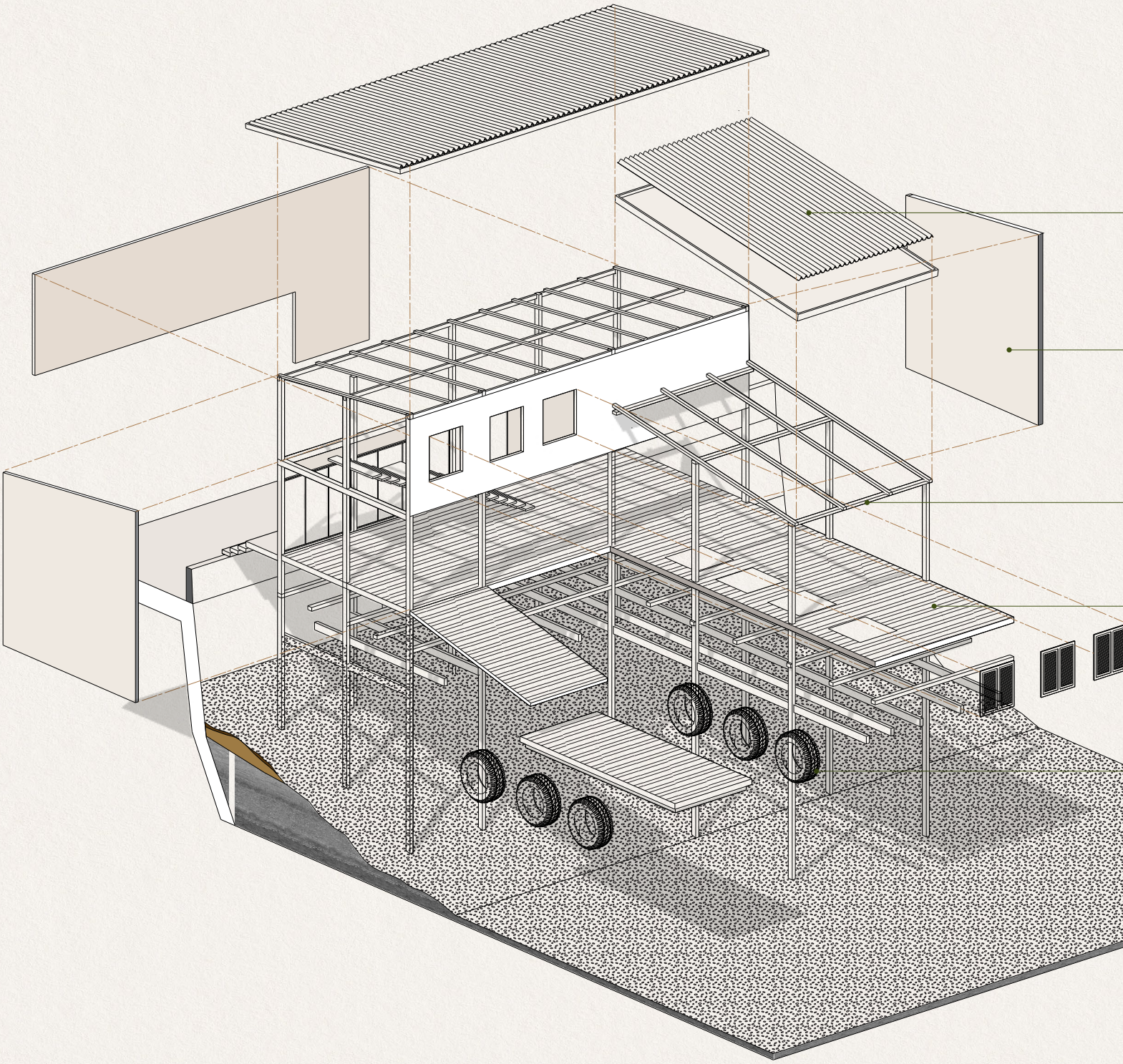


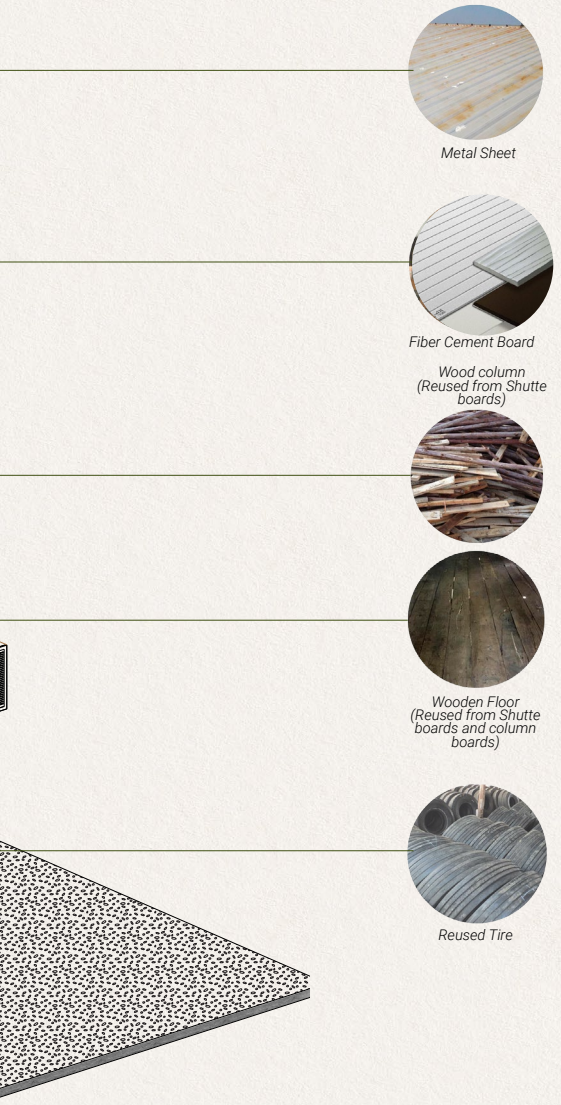
#2 SORTING HOUSE





After the floating waste is collected by the Catcher, it will be delivered to the Sorting house. The house will be integrated into the community between every 50 – 70 houses. It stands out from neighbors as it occupied a more substantial amount of space tripling in width and double in height. The primary function of the house is to separate the waste and prepare the organic waste to be delivered to the next station. Therefore, large areas are required for boat circulation and smell prevention. The bamboo fences have been surrounded two sides of the area in respect of neighbors' perception. The ground floor of the house is fully opened for ventilation and it has been elevated above the average level to allow the boat to go underneath. After the waste delivery boat arrived, the waste will be lifted to the ground floor and sorting out between solid waste and organic waste. Solid waste will be further divided into plastic, paper, glass, can and others before given to the informal settler. The organic waste will be crushed and packed for smell prevention before located back to the delivery boat. On the second floor, there are storage and public toilet provided for the workers.



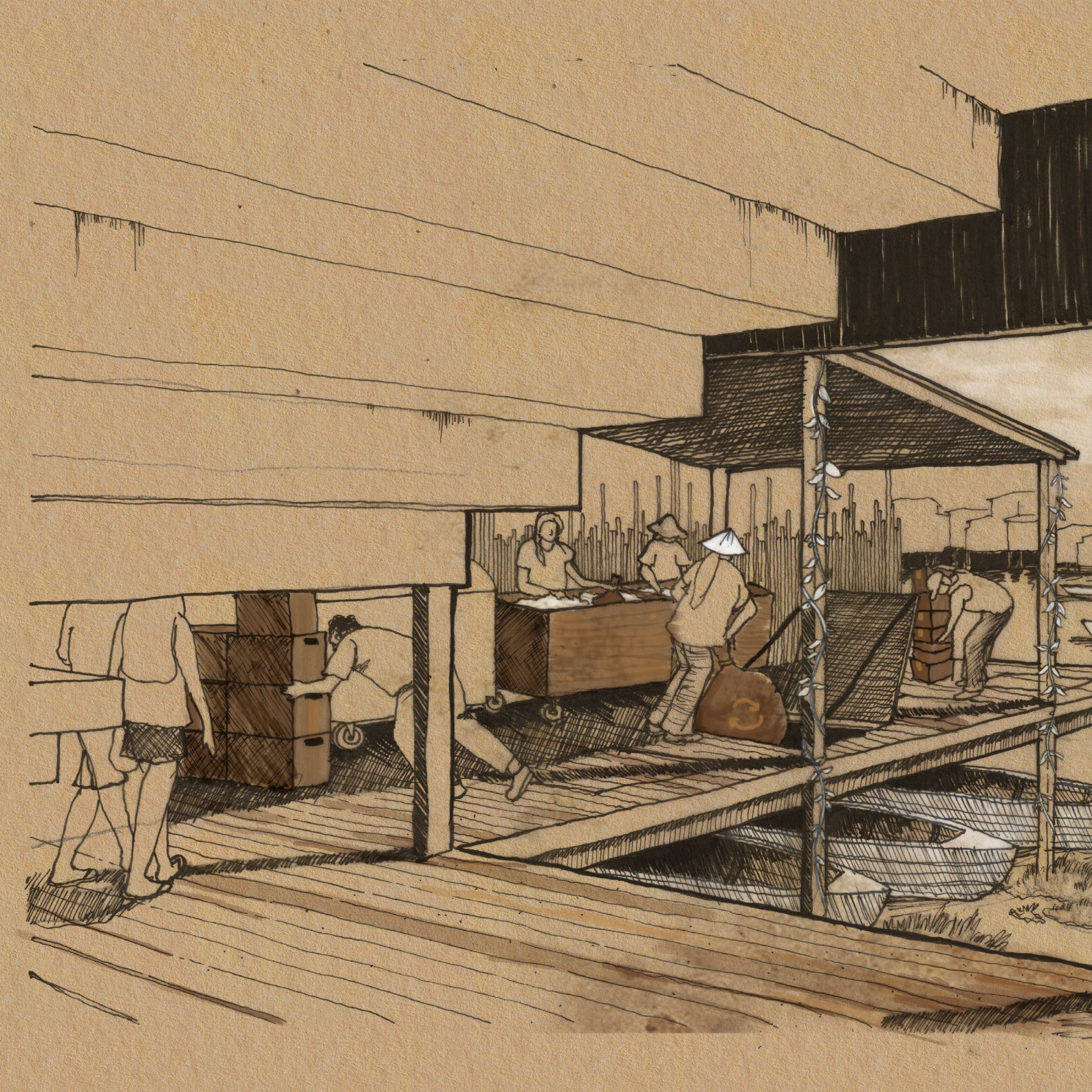


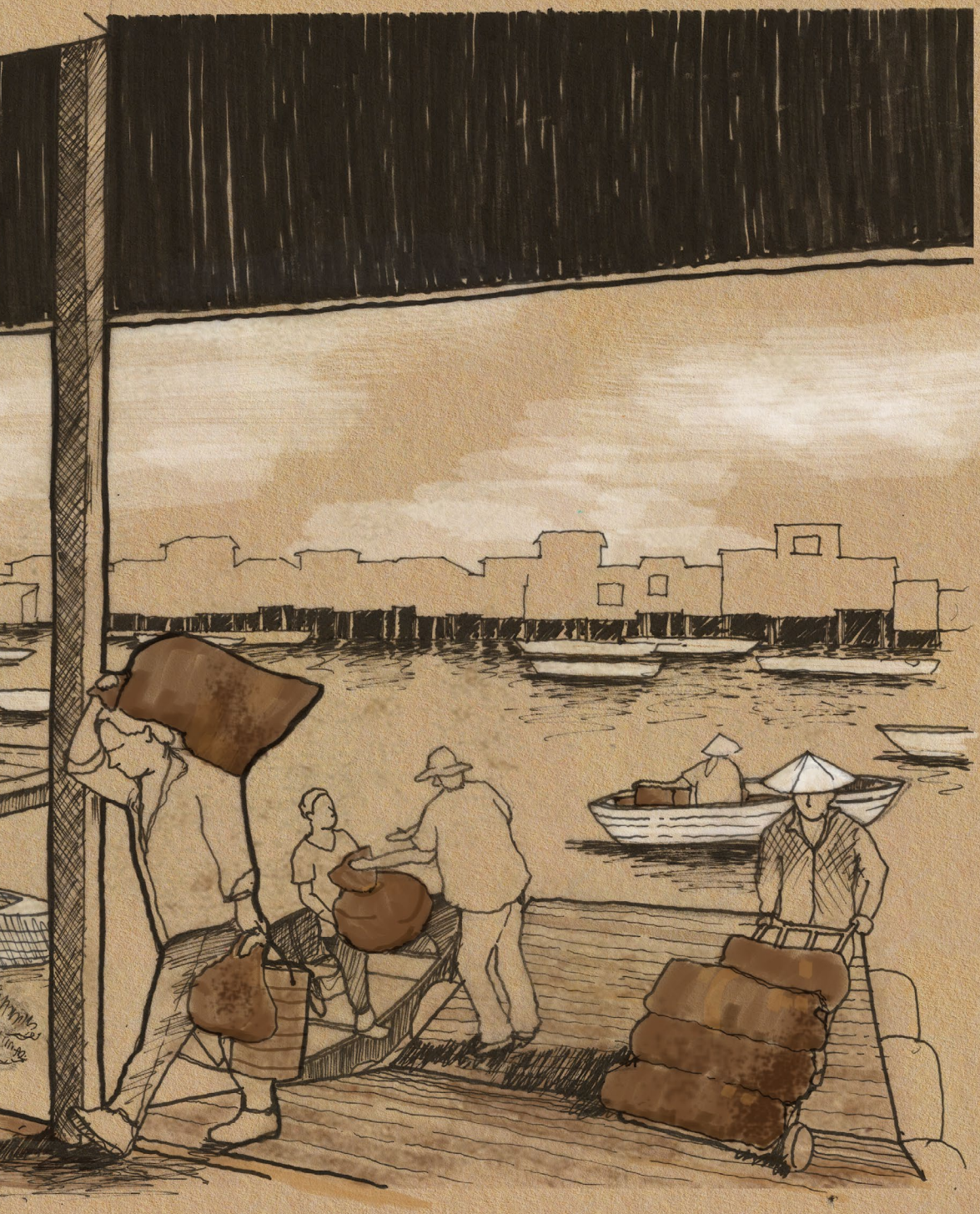
COLLECT
#2 SORTING HOUSE
MATERIAL &STRUCTURE

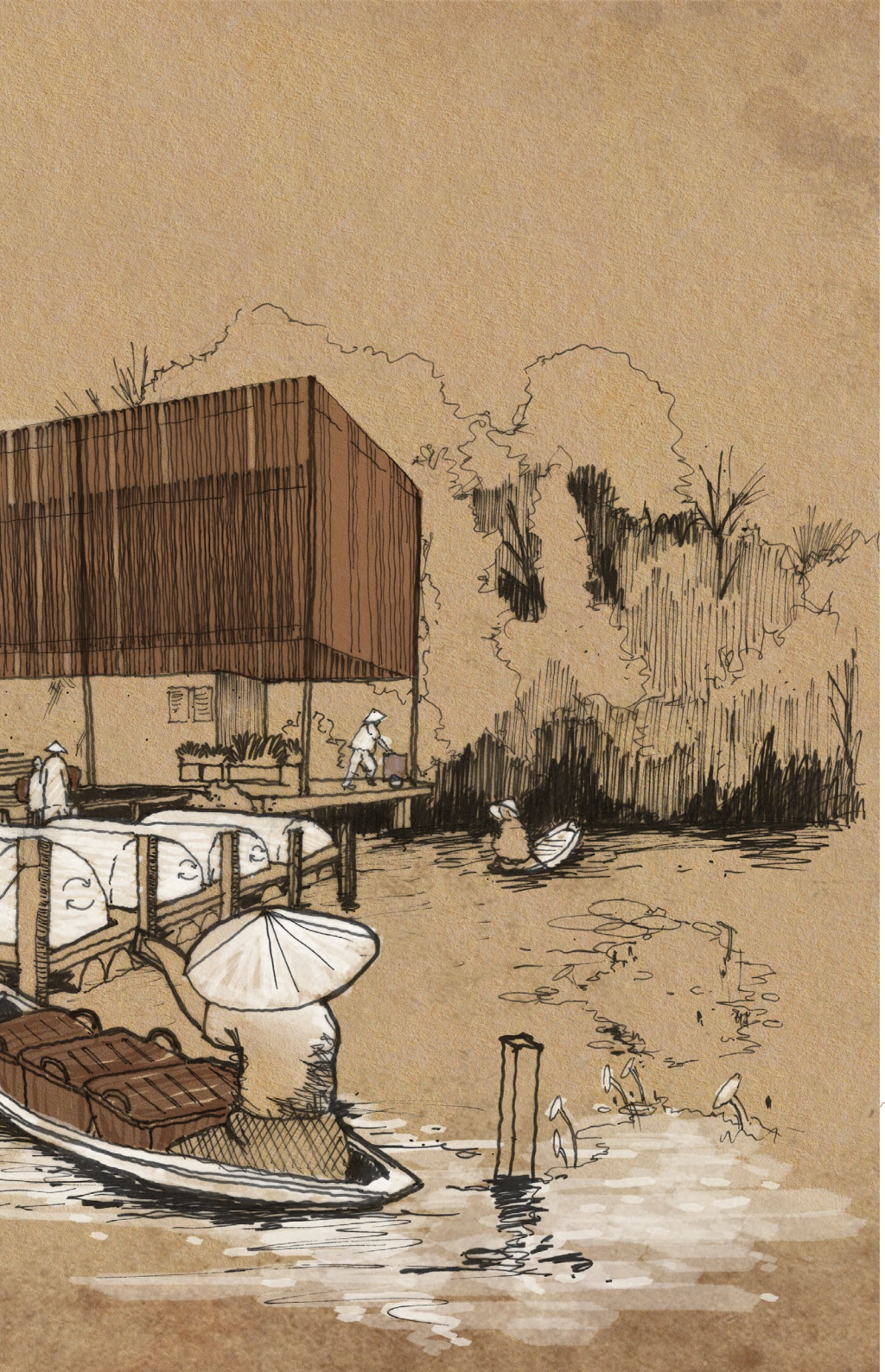
The diagram showed the simple structure of the sorting house which used a local technique to build. The entire appearance is attempted to harmonize with the existing informal houses. The choice of material will be limited by cost and locally harvested material. Hence the proposed design of all design interventions will share similar peinciples which are as follow

- Ease of construction
- Light weight
- Minimal Maintenance

The wood structure is the common building method that the community is capable of doing. The wall is made out of wooden frame and finishing with fiber cement board to be easy to install and maintain while the roof material is a metal sheet for similar reason.
One of the essential part is the depth of the main columns that is strongly required to be inserted into the layer of stiff to very stiff clay in order to stabilize the house.



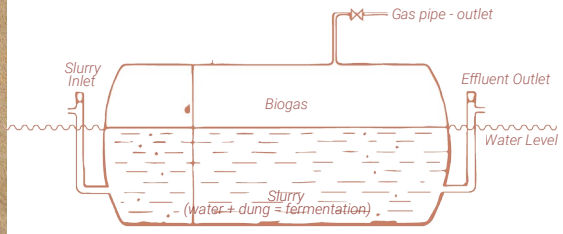




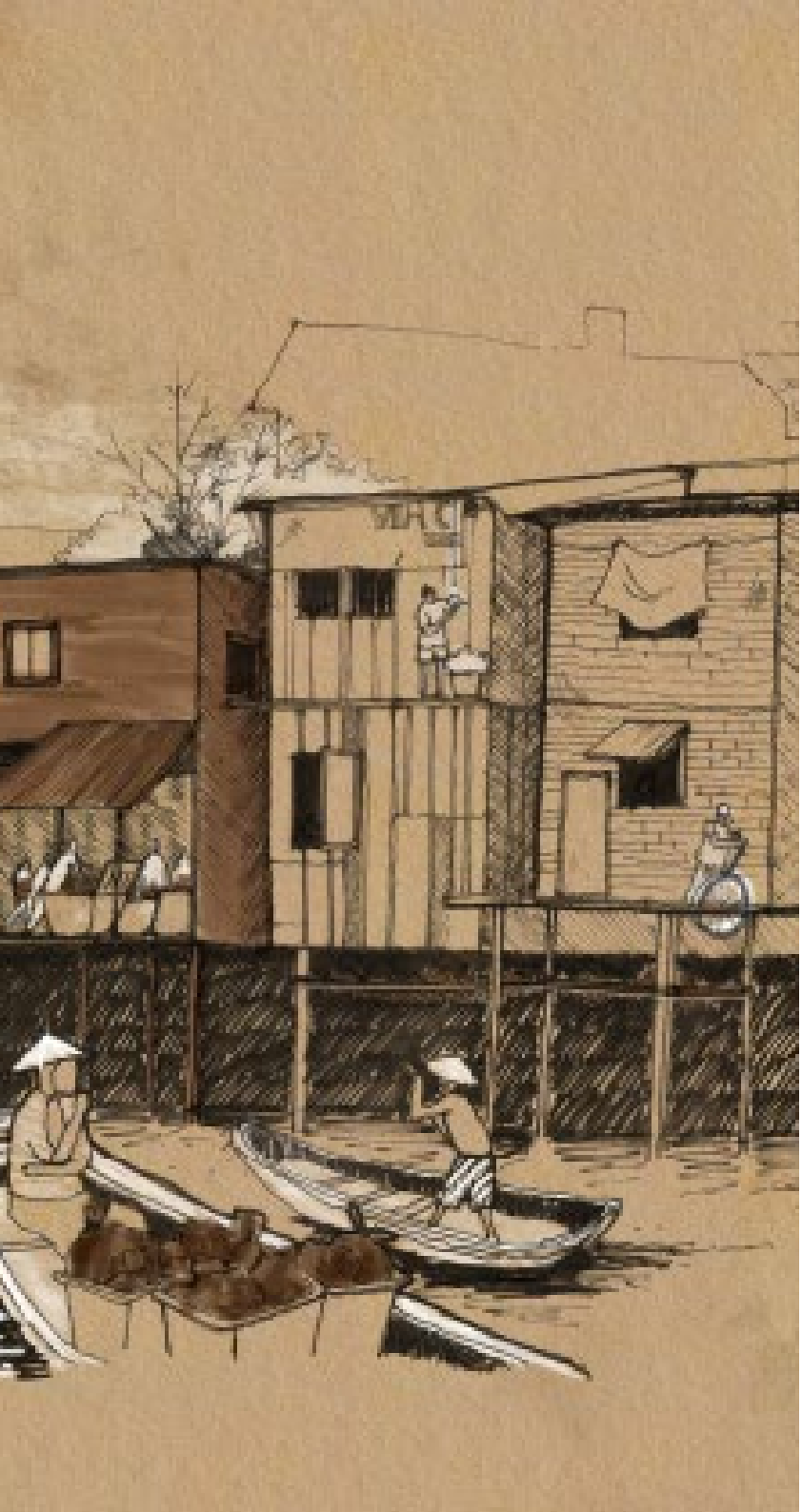
COLLECT
#3 PUWER HUB

The power hub is located further away from the community for safety reason. It is located inside the private zone of the purification park. The organic waste will be delivered to the Power hub which functions as a biogas plant. The waste will be dropped to the biogas digester bags which are floating on the water. With the amount of sunlight in HCMC and the stage of oxygen-free condition, the anaerobic bacteria will consume the waste and convert them to biogas (Aro, 2015). The daily organic wastes collected from Doi-Te canal together with Ben Nghe-Tau Hu canal can be converted to approximately 10,000 liters of biogas per day ("Biogas Production" 2017, para.7). The biogas will be used for community kitchen (#4 Gather house) and the residual waste will be used as a liquid fertilizer to maintain the purification park.

Furthermore, the so-called Power hub is not only referred to the power from biogas but also the community power. As the education center is located on the upper floor. The process of waste management and renewable energy production are a valuable asset for the future generation to learn and to raise awareness for community people.

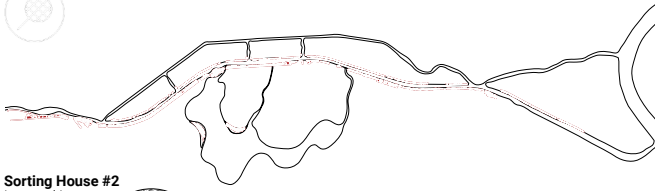


("Bag Biogas Digestor", n.d.)
,Redrawn by author

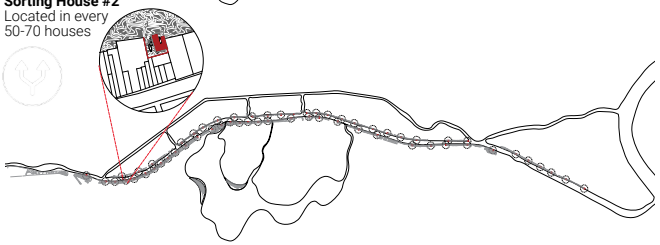


The three interventions from the Collect layers will not only collect floating wastes from the canal surface, but it will also rehabilitate the irresponsible inhabitants. As the strategy requires the involvement of the community, the responsibility that they obtained is expected to change their relation to the canal gradually. The habit to throw the waste directly to the water should be eliminated from the community. More Importantly, the strategy provides more job opportunities for the informal settler while offering a better environment and renewable energy to Ho Chi Minh City.

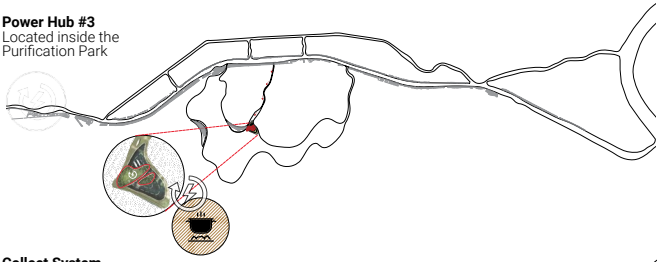
Catcher #1
Located in every houses of informal settlement zone



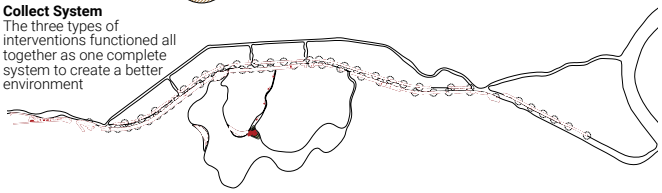
Sorting House #2
Located in every 50-70 houses



Power Hub #3
Located inside the Purification Park



Collect System
The three types of interventions functioned all together as one complete system to create a better environment




Canal
Fresh water
Salty water
Mangrove area
Polluted water
Proposed green bank
Pump
Sluice
Pollluted water flow
normal water flow

PURIFY

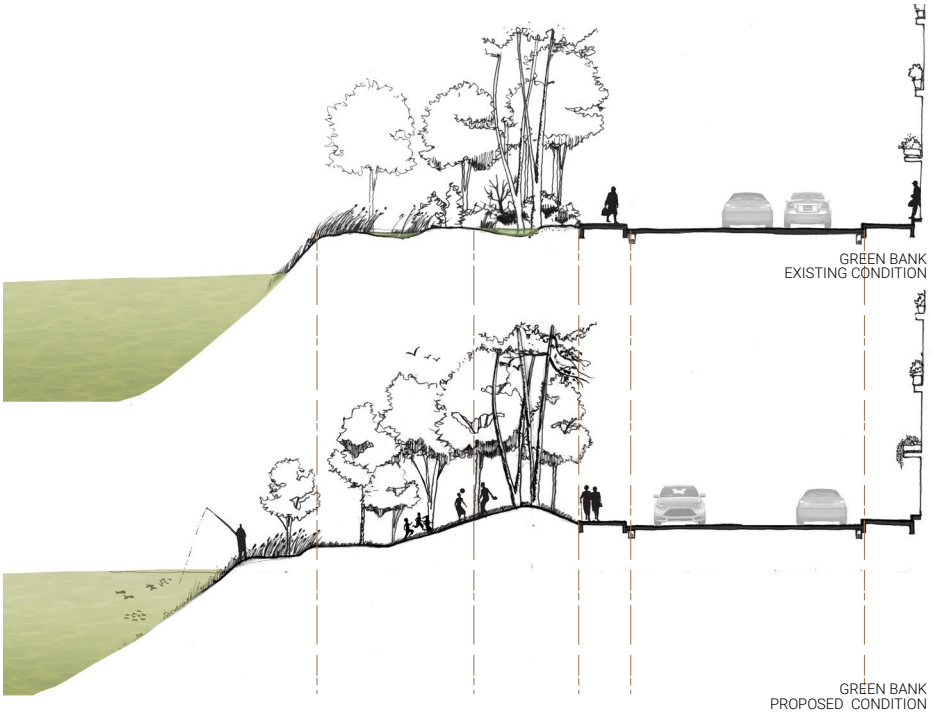
By collecting the floating waste, the water surface as well as environmental quality will be improved. However, the quality of water is also required to be improved. The life of informal settler who lives next to the water have insufficient access to water resources. The water from the Doi and Te canal found to be contaminated due to the industrial area (JICA, 2011), it is undrinkable for people and unlivable for the aquatic animal.

Therefore, the second layer of the design intends to improve water quality for Doi-Te canal. The design is composed of three zones that are interrelated to one another; Mangrove Forest Restoration Zone, Green Bank Improvement Zone and Purification Park Zone. The water flows from the west before it reached the Saigon river, it will be delayed while flow through the mangrove forest. The water will firstly be purified by the mangrove trees along the canal before flow through the zone of informal settlements. The existing zone of mangrove forest is proposed to be restored and maintain for ecological purposed. On the other part of the canal, branch canals which connected Doi-Te and Ben Nghe-Tau Hu canals together are proposed to acted as a green bank. The use of constructed wetland along the bank and gradual change in land slope allows the variety of vegetation to grow. The water that flows through the branch canal will also be purified by the constructed wetland.

More importantly, the polluted water from Lo Gom canal played a crucial role in the plan. The design proposed to establish a new park in order to acted as the green lung of Ho Chi Minh City. The park is located at the bottom center of the canal, it occupies more than 2.5 million square meters of the abandoned aquaculture farm. After the polluted water traveled from Ben Nghe-Tau canal and reached Doi-Te canal, the natural flow will bring the contaminated water into the Purification Park. The 3 kilometers long of water cahnnal is included 10 differences water treatment ponds, it will gradually purify the polluted water. At the end of the water route, the clean water will be retained in the huge lake which is surrounded by a public park. The water pump at the outlet of the park will release the fresh water back to the canal during low tide.

The existing scattered groups of mangrove trees are proposed to be restored and replanted served as a green patch of mangrove forest. The occurrence of mangrove tree can function as a filter zone; the roots of the trees acted as a natural sieve that trapped the dirt and various toxins before entering the canal. Heavy metal and oil stains will also be silted in the mangrove area (Department of Marine and Coastal Resources, 2007). Besides, the mangrove forest will also improve the ecology of Doi-Te canal as it acted as a breeding and nursing ground for the young aquatic animal, it will bring a variety of fish and birds back to the canal. The existing informal houses are integrated into the mangrove while the new proposed informal house (#4 Gather) allows people to explore the forest.

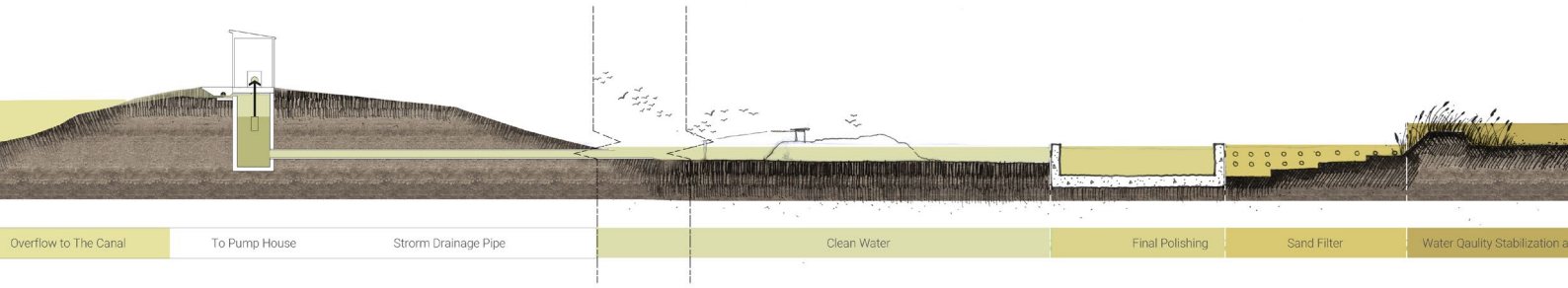
The improvement of the green bank will slow down the velocity of the water while protecting the residential area from a tidal flood. During low tide, the green areas can be used for outdoor activities which will bring the community people and urban residents together.



GREEN BANK
EXISTING CONDITION

GREEN BANK
PROPOSED CONDITION

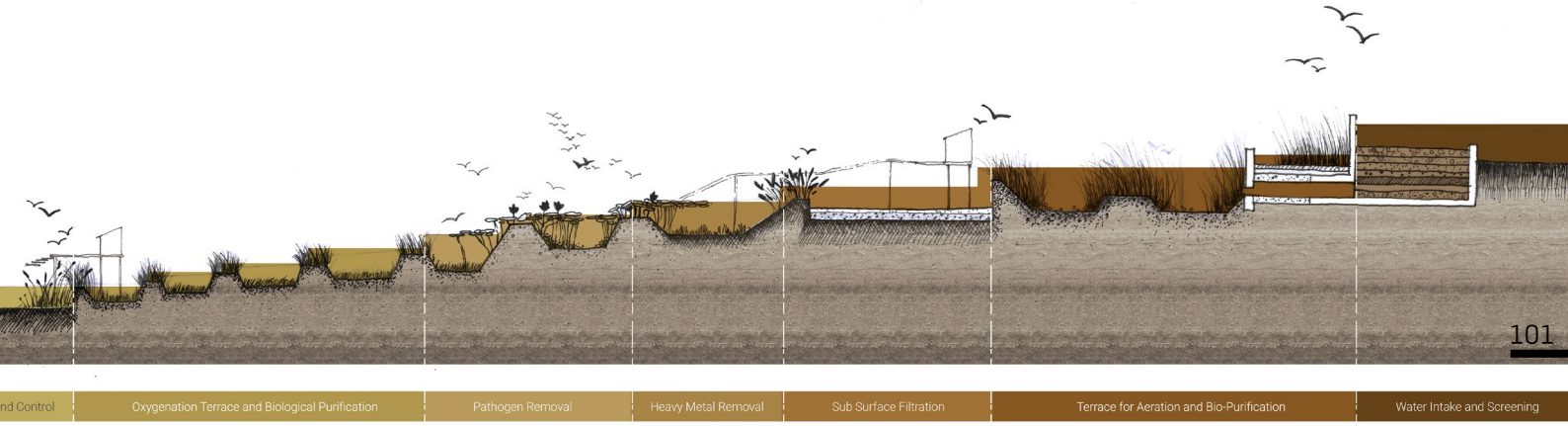

1 Existing informal houses
2 Mangrove Island
3 Public Park - Recreation
4 Amphitheater Island
5 Stage
6 Public Park - Passive Zone
7 Public Park - Active Zone
8 New Area for Informal Settlement (Relocation)
9 Existing Residential Area
10 Ecological Pond
11 Existing Aquaculture Farm
12 Green area Preservation
13 Screening Forest
14 Wetland
15 Power Hub Island
16 Access for Waste Delivery Boat with Sluce Control
17 Existing Highway
18 Water Inlet
19 Water Outlet Controled by Water Pump


Overflow to The Canal
To Pump House
Stromm Drainage Pipe
Clean Water
Final Polishing
Sand Filter
Water Qaulity Stabilization

PURIFICATION PARK

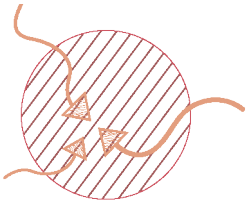
The design approach of the park preserved the shape of the old aquatic farm and developed into a green lung of Ho Chi Minh City. At the North-West side, the park has been integrated into the zone of informal settlement, they are blended by vegetation and wetland. The public park is located right after, the large piece of green space is curved around the freshwater body. A huge open lawn area and amphitheater occupies the center of the area for holding special ceremony and significant events of the city. Various activities such as sports field, fishing area, aqua farm and bird observation are integrated in the public park area.

The Power hub is located at the center of the park. The sluice limits the access of the Power hub at its private waterway in order to control water quality inside the park. The east side of the park has been implemented with the constructed wetland. The principle of the purifying wetland is inspired by the case of Houtan Park as mentioned in Chapter 3. The 10 different ponds have been constructed in various heights to form a set of cascades to oxygenate the polluted water. Different types of wetland species are being used in different ponds to absorb pollution and reduce suspended nutrients (Shanghai Houtan Park: landscape as a living landscape 2010, para.5). The whole park is bonded together by the curvy route which appeared as a walking route on the ground and became a bridge over the water. The mixture of the public park, aquatic farm, wetland, and new zone of the informal settlement are harmoniously integrated within this new lung. The dynamic of programs and user will bring life to the area and revive the ecosystem of the area.




Community Route
Active Route
Cultural Route
Shopping Route
Port Area
Departmentstore
Fresh Market
School/University
Hospital/Medical Center
Church
Temple
Mosque
Bus stop

CONNECT

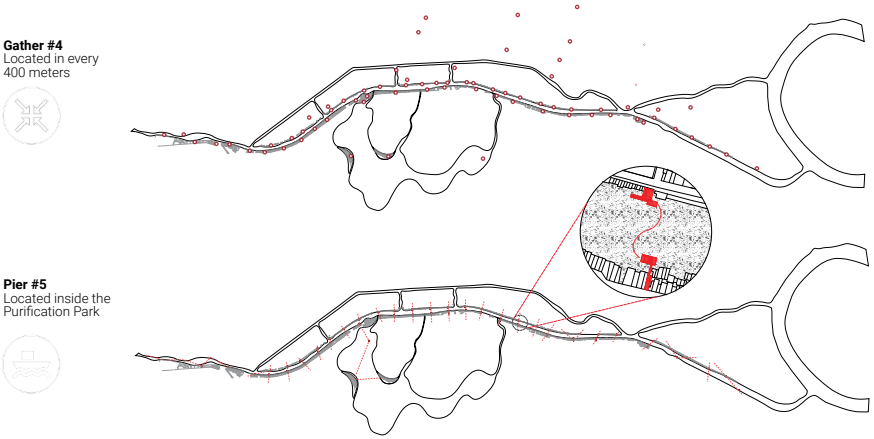


The next design layer will focus on the social aspect. As the zone of informal settlement used to act as a boundary between the city and water. Doi-Te canal is one of the best examples of the crucial canal which dividesthe urban district and rural district from each other. The design in the Connect layers aims to propose a bottom-up approach which can break the boundary and allow the zone of informal settlement to be part of the city.

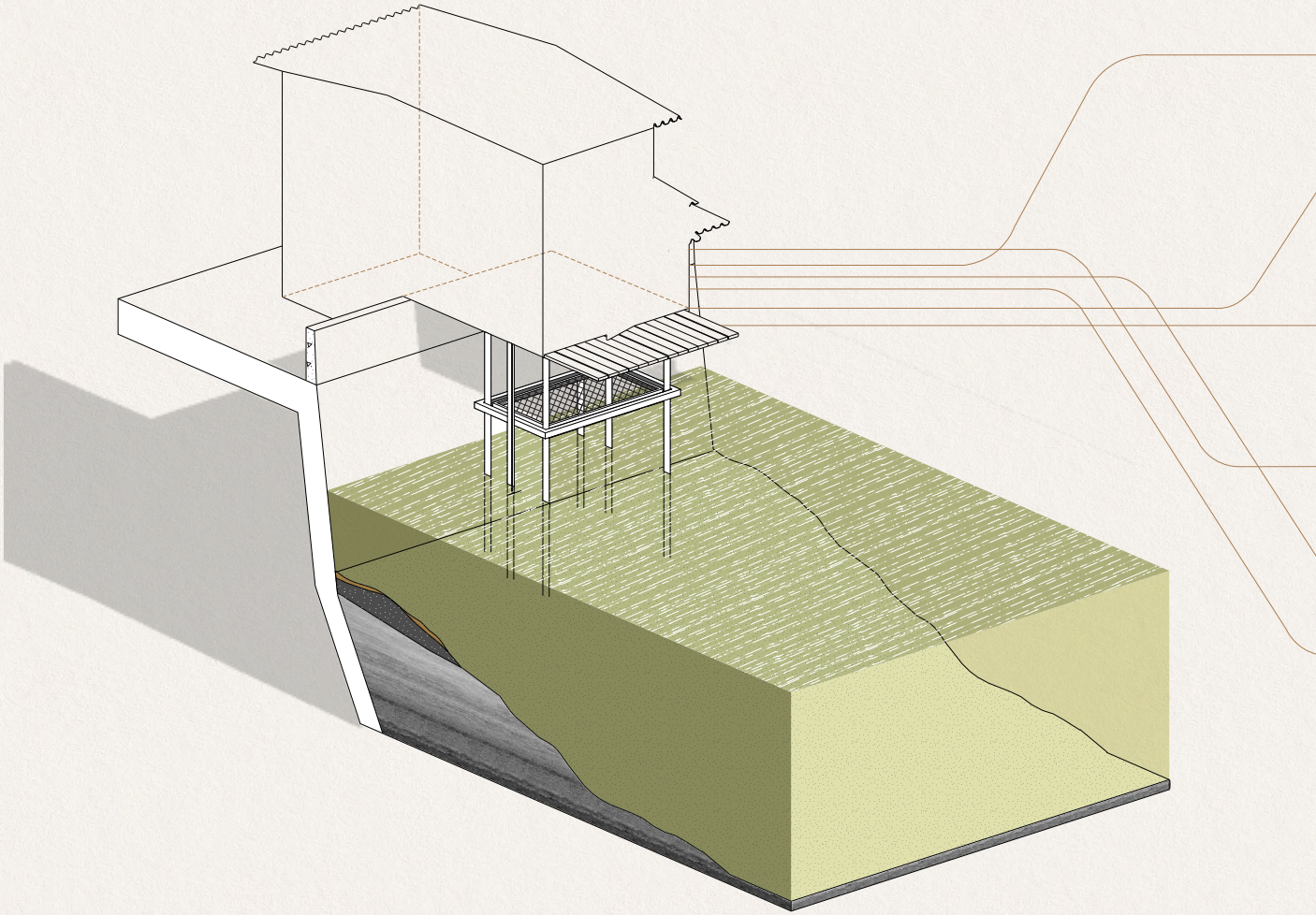
The two design interventions have been proposed which is the Gather (Intervention #4) and the Pier (Intervention #5). Some of the houses are relocated into the provided area within the purification park to provide more space for the community to "breathe". They will be replaced by the Gather which allows a various activity to happen in a single unit of informal house and the pier that is located in every 400 meters along the canal. The two types of interventions are the tool to break down the long strip of informal settlement into a smaller zone. The entire strips of the informal settlement are being linked together again by the proposed experiencing route.

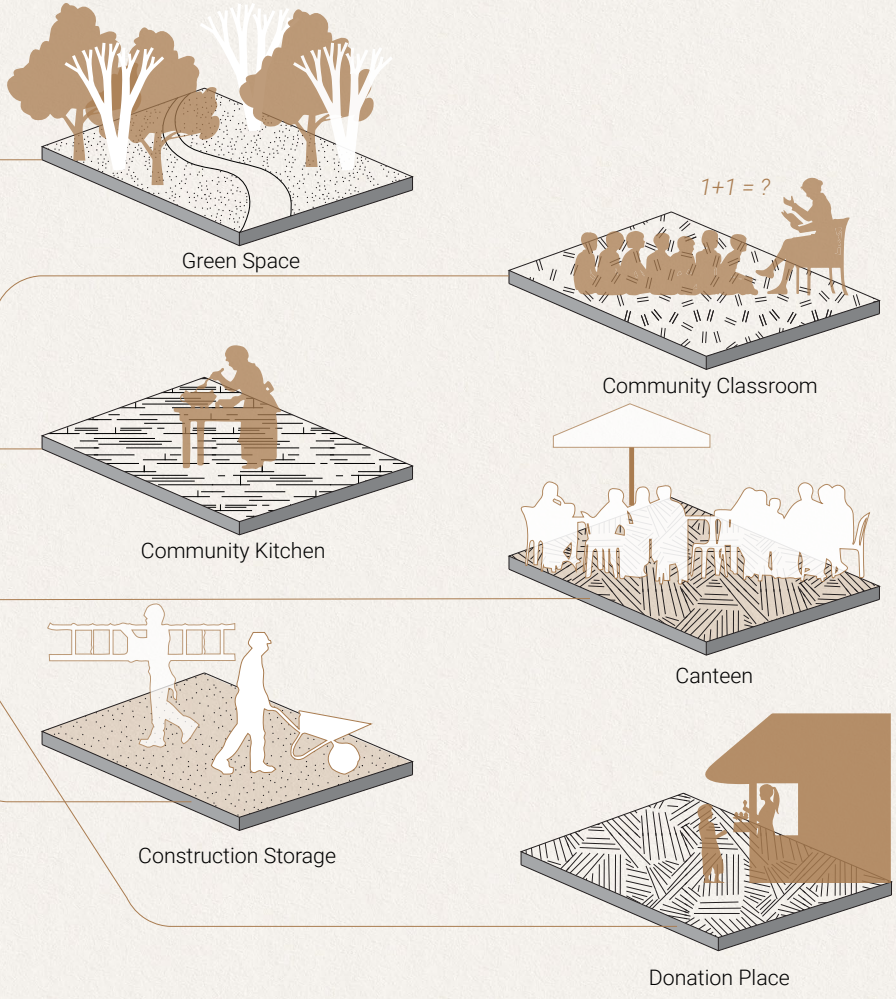
By analyzing the complex mixture of land use in district 8 and nearby districts, the five different routes are proposed. Experiencing routes are created to allow the HCMC residents, Informal settler, or tourist to explore the city from the urban district through the informal settlement and rural district. The experiences from each route are different by programs of the area, different type of transportation, using the boat crossing or the bridge, and the different types of the community along the way. Within each route, there will be a stop to explore in every walking distance (400 meters) until it reached the canal. In this report, the Active route will be used to further explore in Chapter 7.

Gather #4
Located in every
400 meters

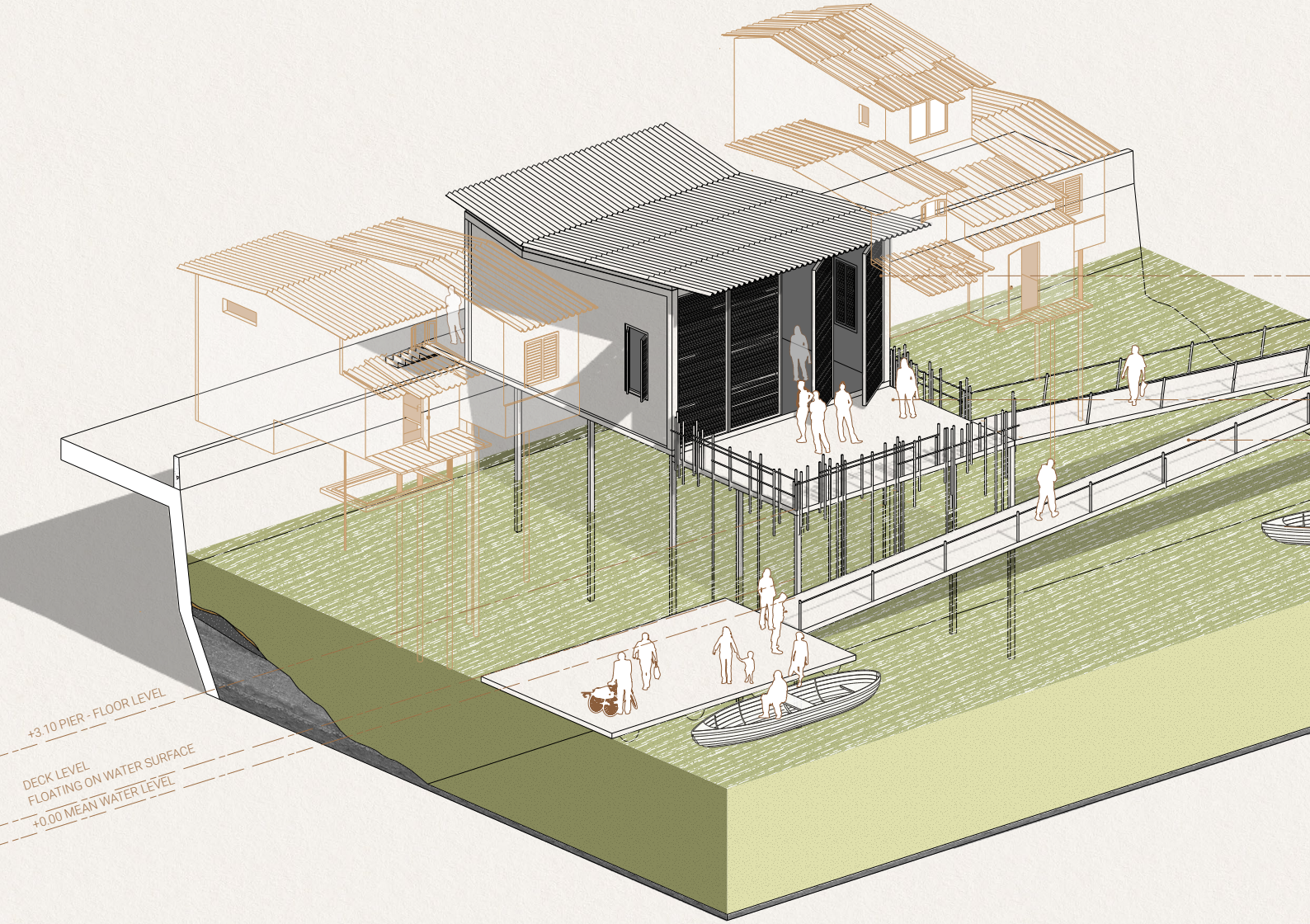


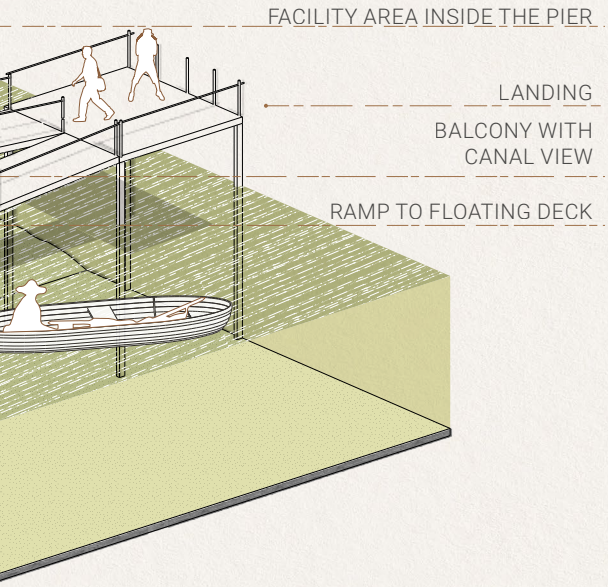
Pier #5
Located inside the
Purification Park





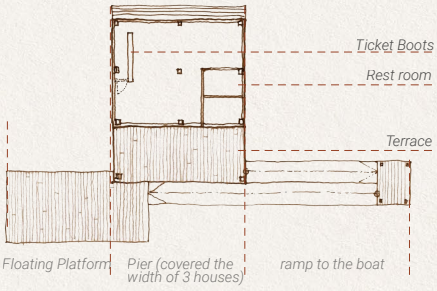
The idea of the Gather is intended to be a multifunctional house for the city. It can be found in every 400 meters in between the pier (Intervention #5) along the canal as well as the area in the city. The program can be varied by the location ranging from educational space, a gadget shop for the informal settler, communal kitchen, eating area, shelter, or green space. Within 3x6 meters house, the interaction between different type of people can be created. Lastly, the image of gathering space next to the water will be revived to Ho Chi Minh City.


+3.10 PIER - FLOOR LEVEL
DECK LEVEL
FLOATING ON WATER SURFACE
+0.00 MEAN WATER LEVEL

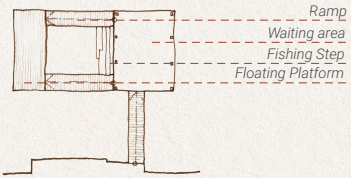


In the present day, the use of boat is a typical mode of transportation in the area. Due to the high demand to cross the canal, community people built a small crossing pier by themselves. Nevertheless, with the limitation of empty space and built material, the crossing piers are almost inaccessible by people outside the community. By recognizing this local intervention, the fifth intervention is proposed.

There are two typical of piers which are the one on the side of district 8 and the one on the side of the rural district. The former one is functioned as the main pier since it located at the high density of the residential area. The indoor part of the pier includes several facilities such as public restroom, seating space and ticket counter. The outdoor part provided a wide balcony to appreciate the canal view and observing the waste management activities of the informal settler. The latter type is located in a high density area with more than three rows of houses located towards the canal side. This created a difficulty to access the pier. Hence, the design proposed to integrate the Gather and the Pier in the same row. In which, one row of houses will be relocated and replaced by the two interventions. One side of the row or the alley will be a boat crossing pier following by the green space with one multifunction house in between and the other side is connected to the bus stop. The design of the pier is designed to opened up to the landscape. The pier is placed on the canal with more than half of the area floating on the water surface. In between the ramps, there are steps to be able to reach the water and experience the change of tide.

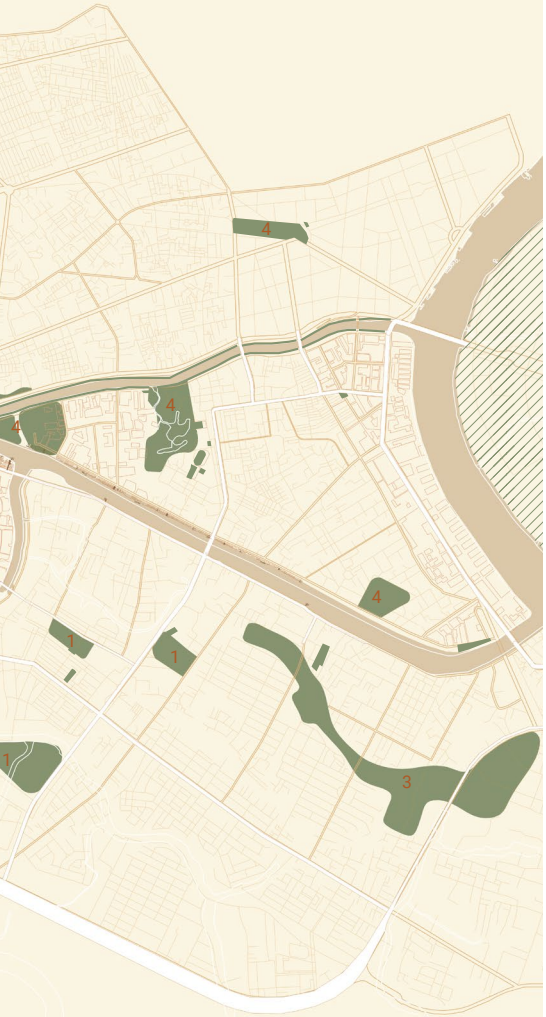


Pier Type 1 - Floor Plan

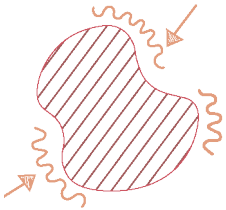


Pier Type 2 - Floor Plan


ACTIVITY LEVEL
1
2
3
4



ADAPT



The last layer will explore the potential of the five design interventions in climate adaptation aspect. The site context in district 8 is considered as a low land in comparing to other areas in Ho Chi Minh City (Dang & Kumar, 2017), the design will not be complete without the adaptive quality. Therefore, the design is composed of two strategies which are the sponge strategy and the dike house strategy.

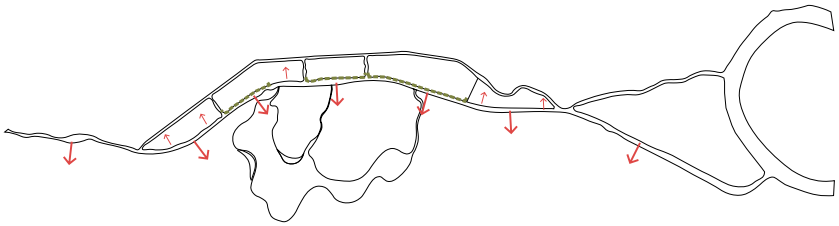
The site is a high density residential, warehouse and remaining factory area. There are limited green spaces established in the area. As a consequence, the sponge strategy is proposed to the city. The essence is to implement the measures which could drain or store rainwater. This could be performed in particular areas such as sports field, school courtyard, along the street, a plaza with porous pavement and vacant space. By analyzing through the overall site, the series of the sponge surface are being implemented.

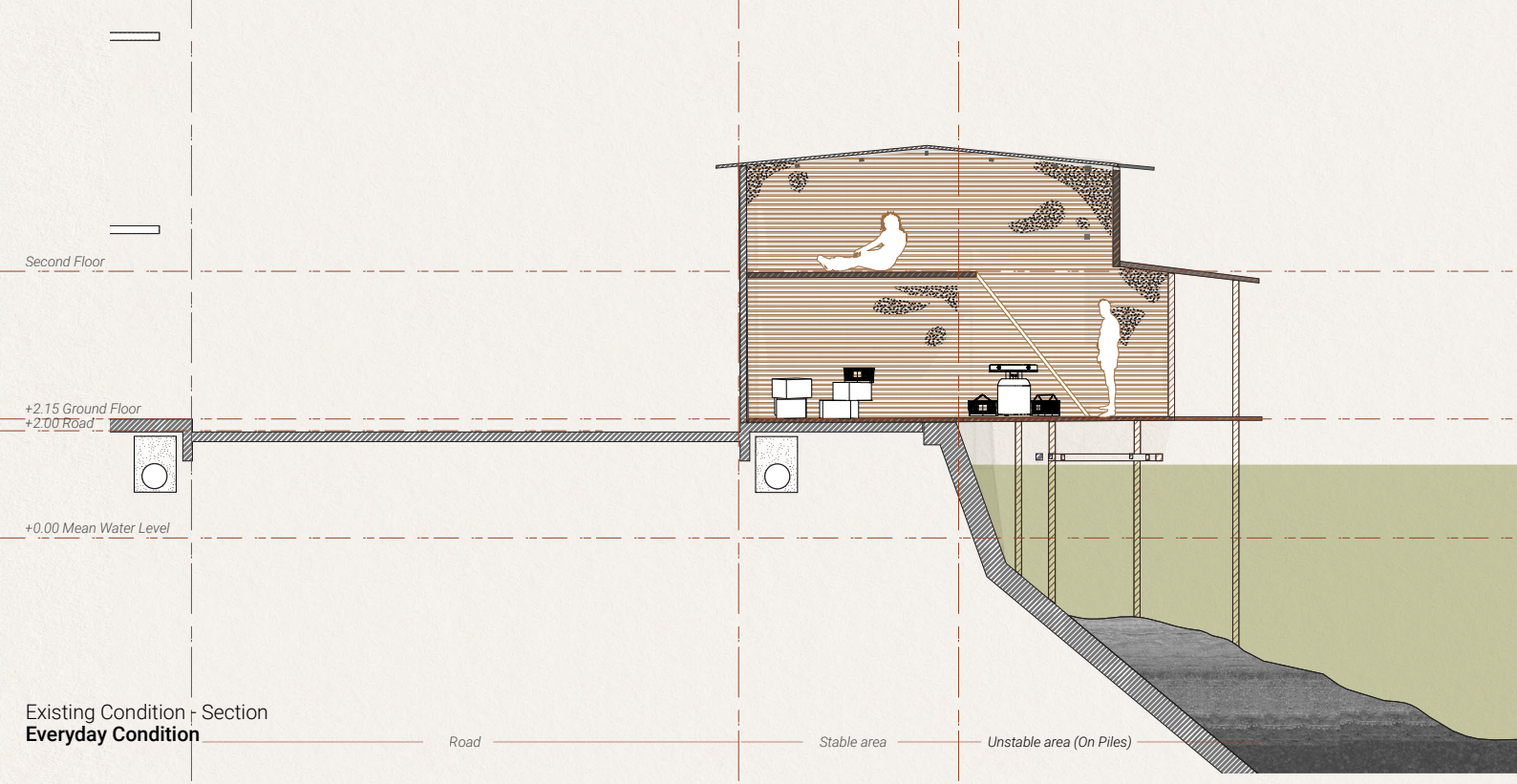

Water way with exceesisve water
Availability of pond with the ability to hold water
Porous area to increase the drain surface
Dike Houses

ADAPT

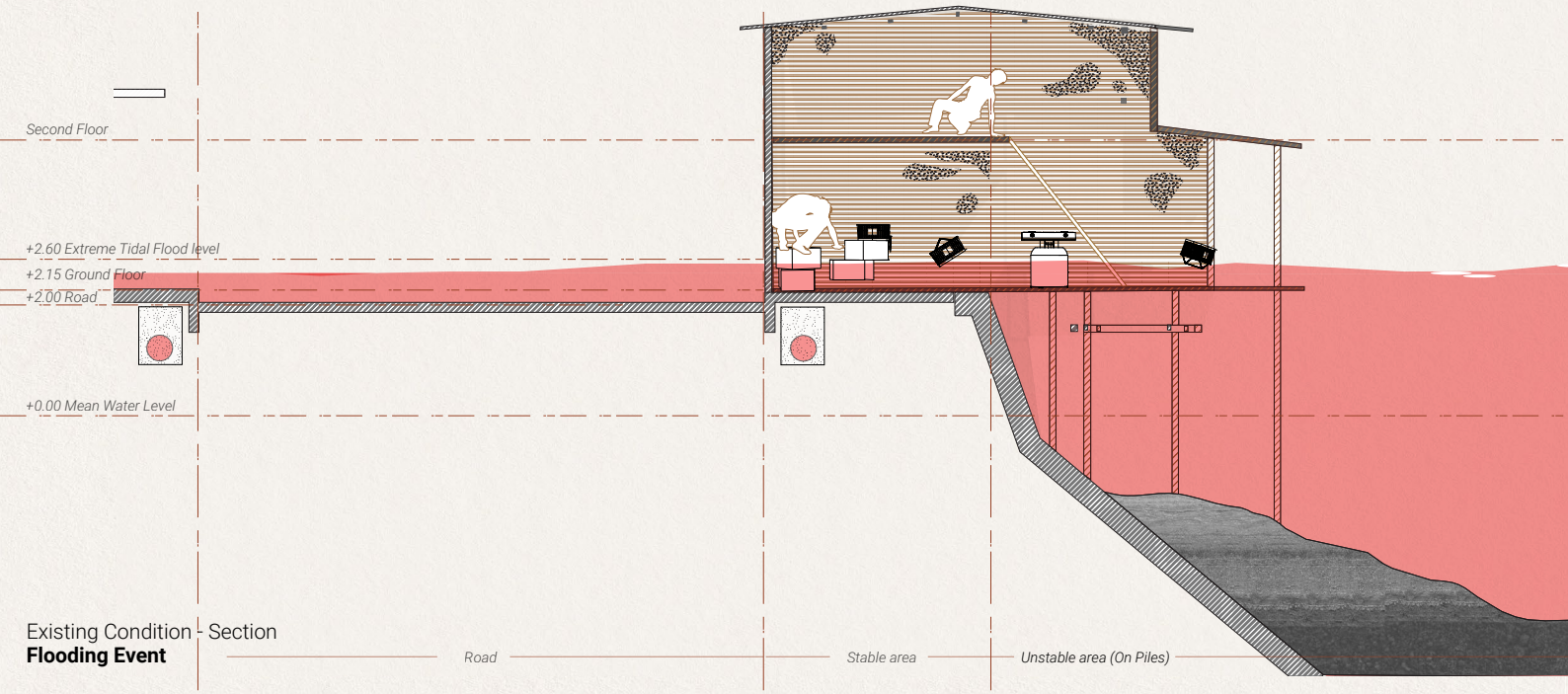
SPONGE STRATEGY

During the dry season, the sponge can be used for different purposes. During the rainy season, it will become a part of the flood protection plan which allows the water to flow through or be stored. This will improve the drainage efficiency of the city and slow down the occurrence of a flooding event. After the monsoon season ended, the water will be gradually released to the city's drainage system while some of the sponge can be used as water storage during the extremely dry season.





Existing Condition - Section
Everyday Condition

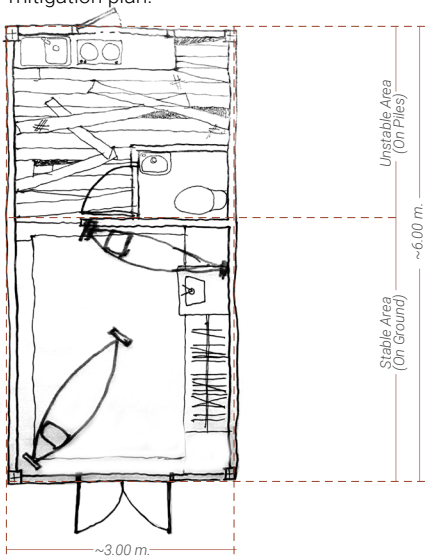


Existing Condition - Section
Flooding Event

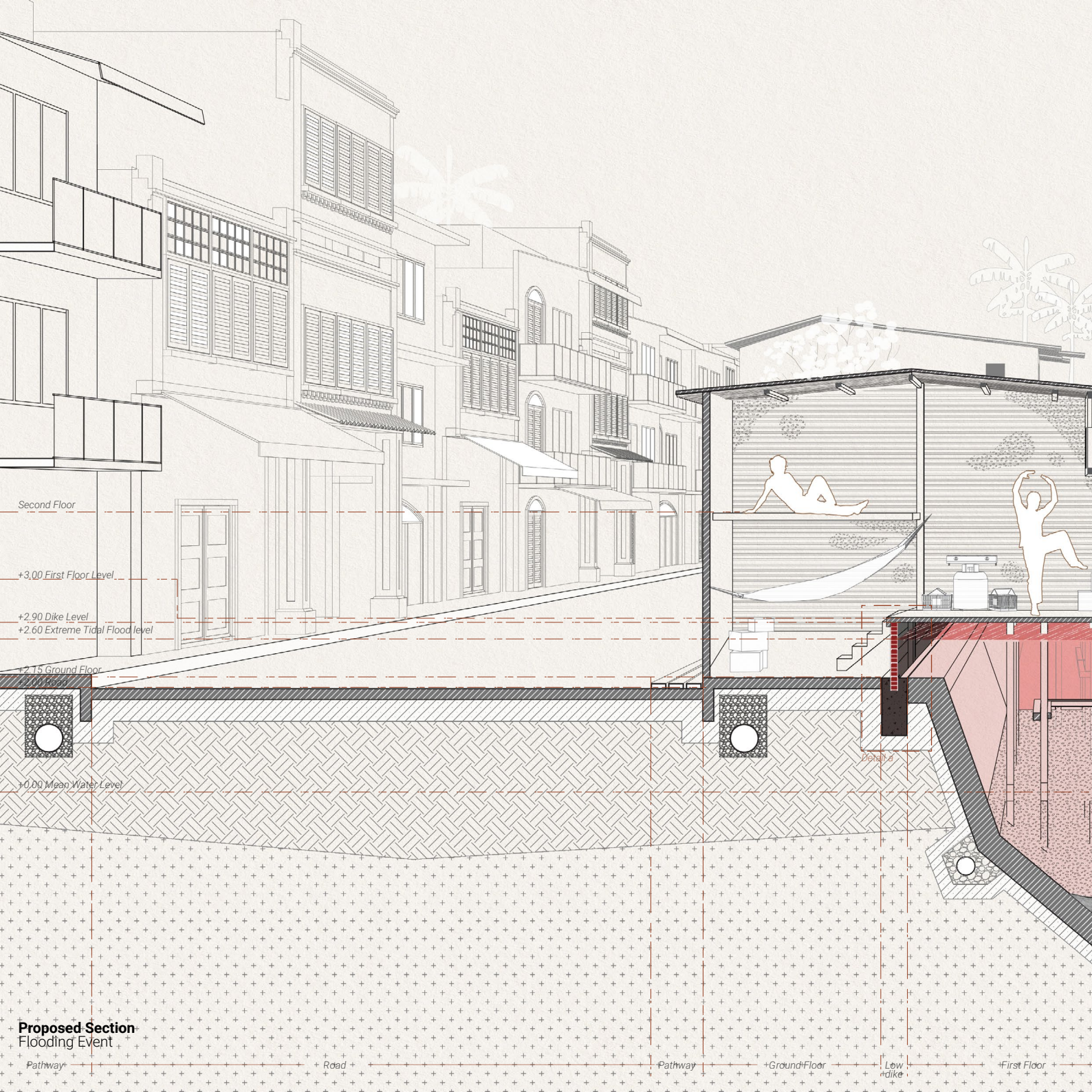
ADAPT
DIKE HOUSE (EXISTING CONDITION)

However, the amount of possible sponge area is insufficient to mitigate the tidal flood. The protection is strongly required to save the residential area. The line of the informal settlement can be recognized as a long dike surrounded the island of district 8. Hence, the adapted strategy of Dike house is proposed to tackle with the mentioned issue.

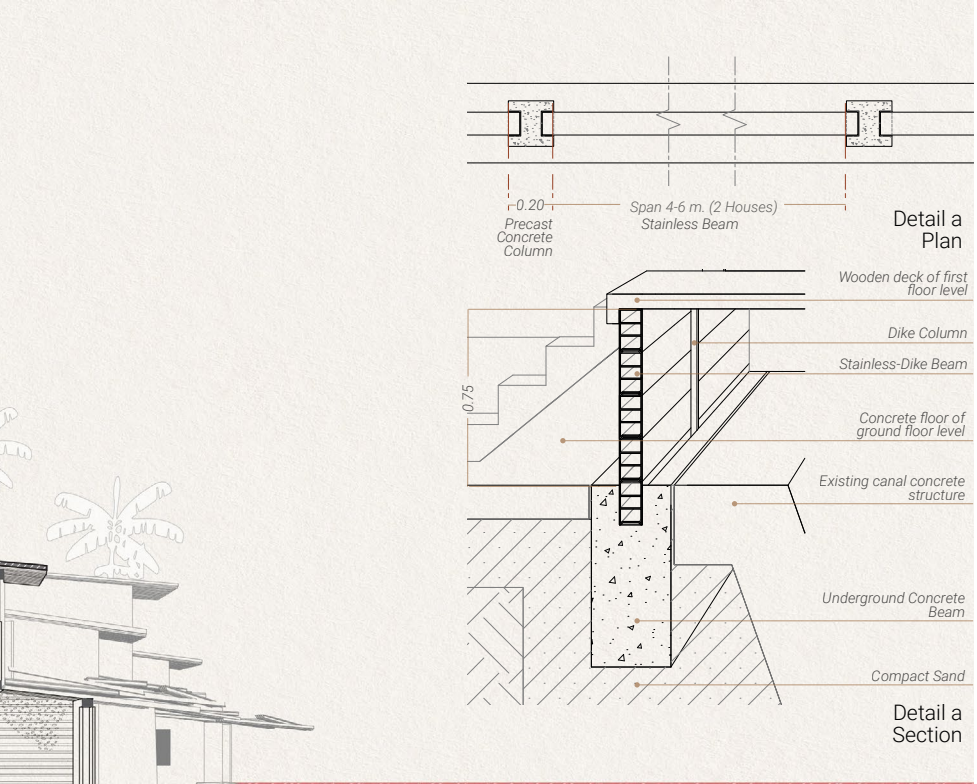
The dike house will only be implemented at the upper side of the canal where the elevation is low. It aimed to protect the upper part of the canal due to relatively high numbers of residents living in district 8. The sponge system will mitigate the area which is not protected by the dike house. On the other hand, the excessive water from the canal will be leaded towards the lower part or the rural area. The availability of green spaces and big scale sponge area are able to hold more water than the upper part. As a result, during the monsoon season, the zone of the informal settlement will be the protection of district 8 and contribute to the city's flood mitigation plan.

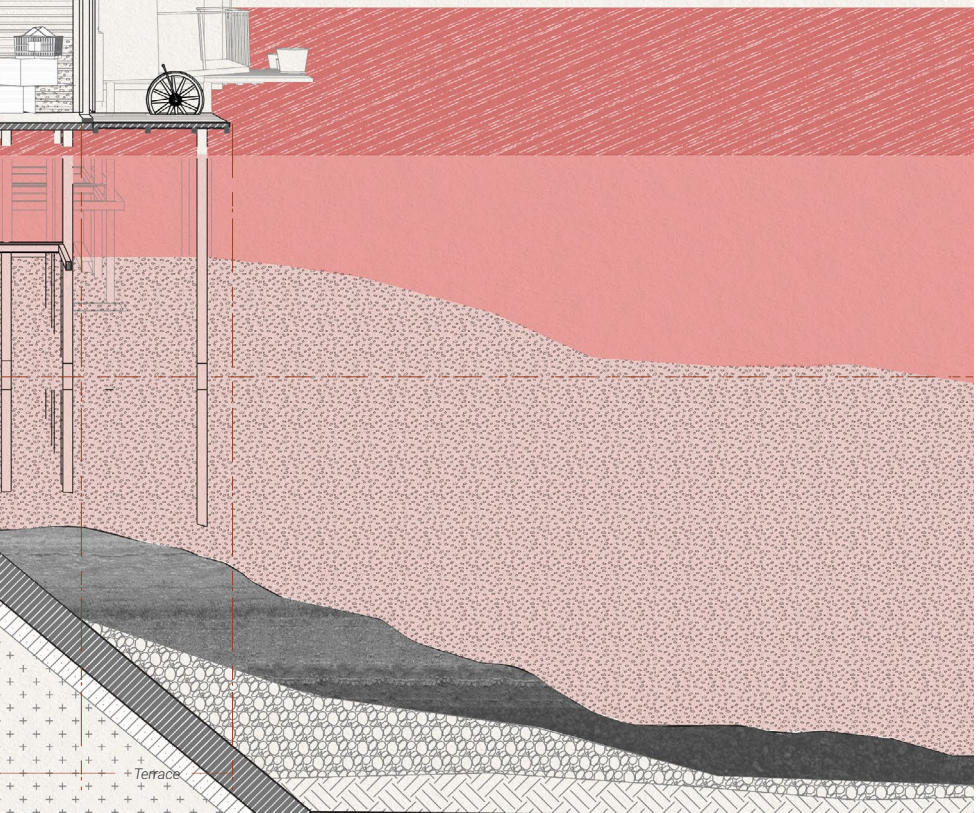


Existing Condition - Floor Plan



Proposed Section
Flooding Event

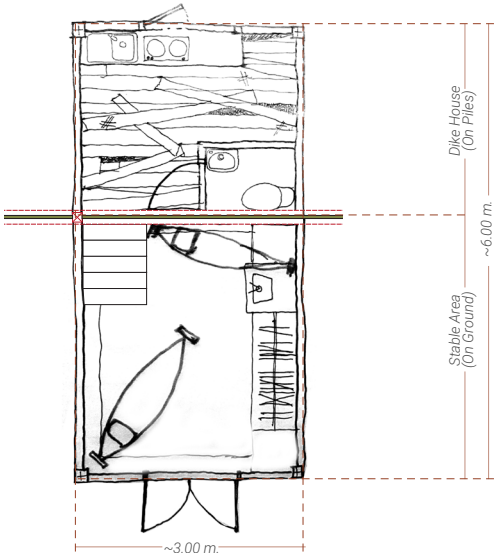




ADAPT
DIKE HOUSE (PROPOSED DESIGN)

The existing typical floor plan of the informal house can be divided into two part; the stable part and the vulnerable part. The main idea of the Dike house is to make use of the vulnerable part by inserting a 75 centimeters low dike underneath the structure of the house. The existing vulnerable part which is placed on piles will be elevated up.This created a new module of the informal house that acted as a one and a half story house and a low dike simultaneously.

The implementation will require support from the government to construct the low dike for its stability and continuity. Firtly, the concrete beam will be built beside the existing canal structure following by precast concrete column which will be located every 6 meters along the canal. Lastly, the stainless beam dike can be inserted in between the column. This technique has been proven to be used as a flood control gadget by IBS group (IBS, n.d.)



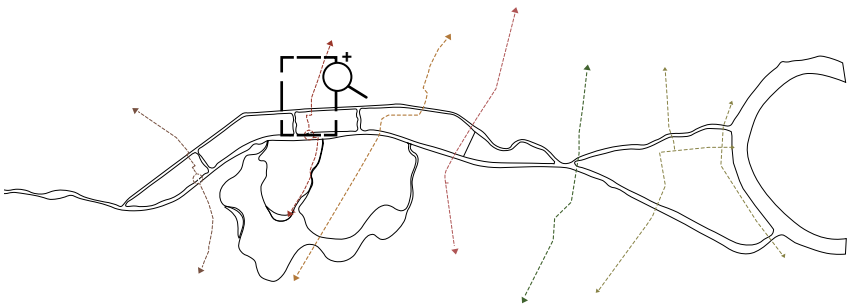
Proposed - Floor Plan

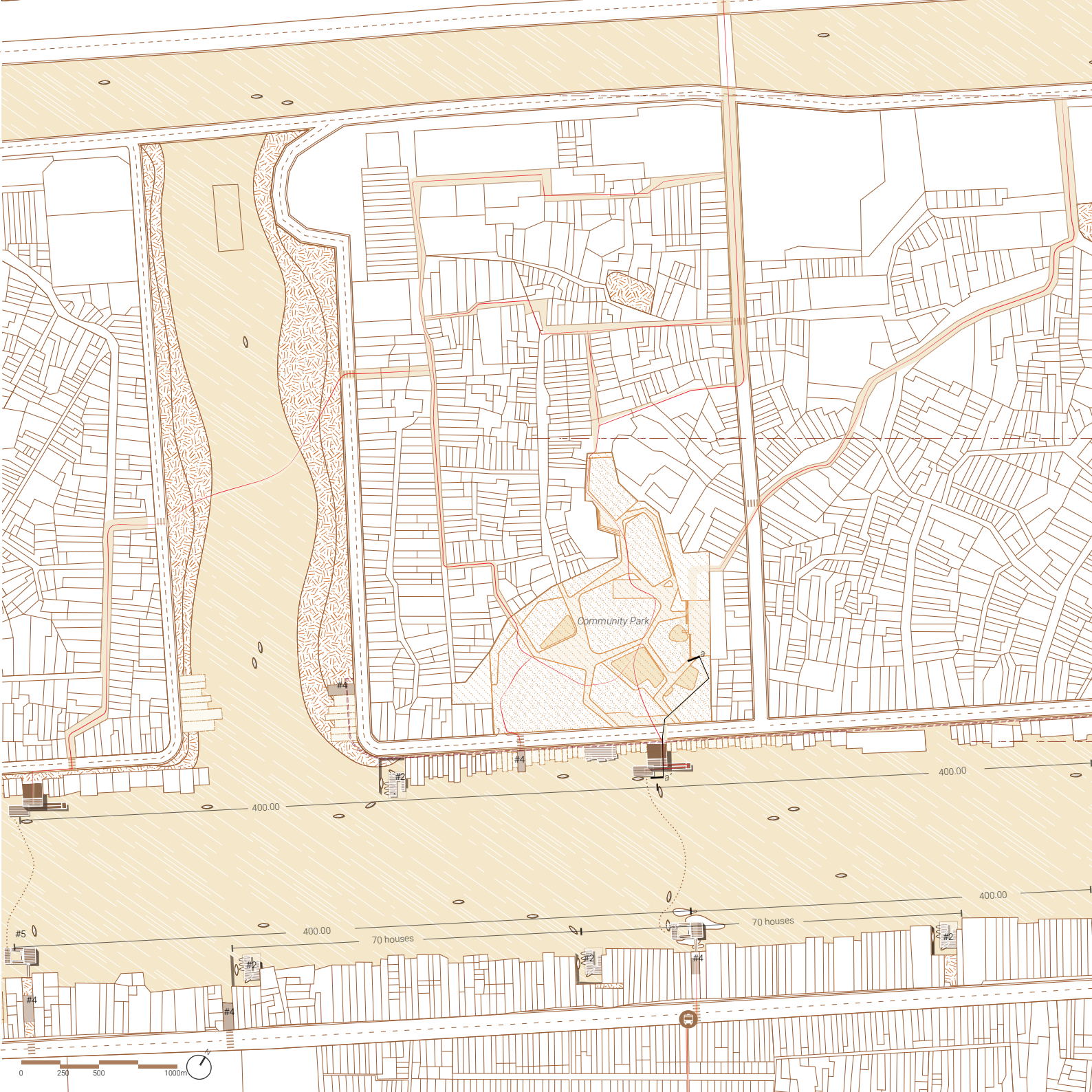
7 DESIGN ELABORATION

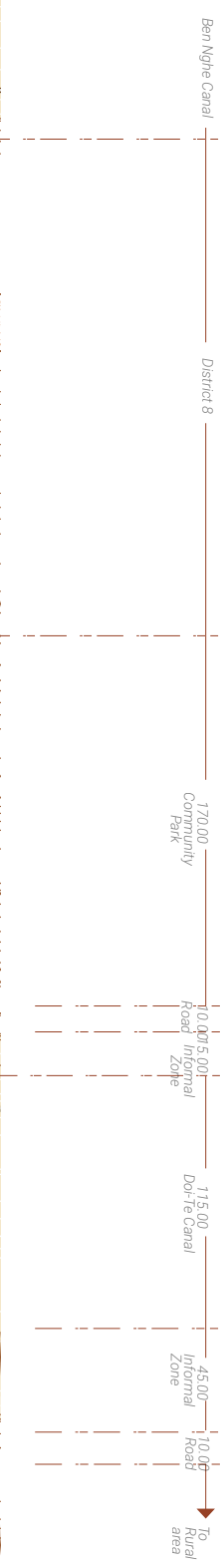

District 6
Golden Water Pumpet
Tau hu - Ben Nghe
Binh Dong Flower Market
District 8
Nha Tho Binh Minh Catholic church
Mua Xuan Tattoo Studio
Phap Minh Pagoda
TRƯỜNG MẦM HOA HỒNG
Truong Mam Non Bong Hong
Doi-Te Canal
HAY ĐẾN CÙNG GIUSE
Đền Thánh Giuse Temple
0
50
100
150m
N

According to the four design layers, the design interventions are scatted all along Doi-Te canal and they are functioned collectively as one whole system. The detail design will be focused on the active route, as stated in Chapter 5. The zoom in plan (figure 7-1) illustrateS the experience through the Active route. The pedestrian will experience the diverse culture in a different areas, the urban district atmosphere to the rural district atmosphere. Most importantly, the route will lead through the zone of informal settlement and the design interventions from one side of the canal to another side of the canal.

The route begins from district 6, which is where the Vietnamese-Chinese community is located. The area is the hub of local goods such as clothes, handicraft, textile or jewelry ("District 6 in Ho Chi Minh City" 2018, para.2). Moreover, this old town still preserved the traditional Vietnamese theater-water puppet for future generation to appreciate. The walking route continues to cross the proposed pedestrian bridge to the area of district 8. Along the bridge, the pedestrian can observe the newly constructed highway which functioned as a dike to protect the urban district. Inside the island of the district, there are various stop waiting to be explored such as Nha Tho Binh Minh-Catholic Church, Phap Minh Pagoda, visiting the elementary school of Trường Mầm Non Bông Hồng and Vietnamese tattoo studio. One of the remarkable places is the Binh Dong Flower Market, which provides a variety of flowers selling on the boat and also on the ground. The route will lead to a small alley in between the residential areas to the proposed community park.




Community Park
a
a'
#2
#4
#5
400.00
70 houses
0
250
500
1000m



DETAILED PLAN
OVERALL SYSTEM

The map illustrated the relationship between the new proposed routing and the zone of the informal settlement. The Doi-Te canal which used to be the barrier between the city and water is currently accessible. Difference types of design interventions have been inserted to provide a breathing space for informal settler and allow Ho Chi Minh City's people to reach the canal. Many boats on the canal surface has revived the life with water back to the city. There are the informal settlers who returned to their boat to work for the waste management as well as to provide the service of boat crossing at the Pier. The zone of informal settlement became a cultural active zone which allow the people from the urban district on the north side to meet the people from the rural district. In addition, this will also attract tourist to visit and explore the traditional lifes of local Vietnamese community.


1
2
3
4
5
6
12
13
14
15
16
17
18
19
20
a
b
d
e

DETAILED PLAN
COMMUNITY PARK

The community park is constructed above an old factory area. The primary purposes of the park are recreational uses and provide extra surface for draining. Hence, the entire park is linked by Vietnamese soil-brick pathway that has slightly been elevated from the ground and the rest are sunken courts with various programs.

There are six entrances from different sides and the front of the park is visually connect to the Doi-Te canal. Inside the park, there are a variety of spaces and activities for a diverse group of people. From the north side, the multi-functional sports fields are located following by different pocket space such as community garden, flower field, and playground. At the center, there is the main facility building which used the existing structure of the factory and transformed into multi-functional spaces. It is surrounded by the amphitheater and open lawn area.

At the front of the park, there is a space for flea market which allows vendor cart and street food seller to settle during the daytime. The structure of the Gather (Design Intervention #4) is also used as a shelter for selling purpose as well as storage. People outside the park and inside the park can support the local food directly from this area. Moreover, another main feature of the park is the long ramp which leaded people from the park to another side of the canal.

1 North Entrance
2 Football field/ Baseketball field
3 Sport field 2 - Open Lawn
4 Main Facility Building
5 Sunken Court
6 Amphitheater
7 Parking Space
8 Playground
9 Foot Massage Area
10 Activity Space
11 Flower Field
12 Chest Tables
13 Community Farming
14 Public Plaza
15 Flea Market Area
16 Motorcycle Parking
17 Loop Sepak Takraw Area
18 Exercise zone
19 Old brick pathway
20 Spirit house

a Pier (Intervention #5)
b Gather - Public Terrace (Intervention #4)
c Sorting House (Intervention #2)
d Proposed Dike House
e Green Bank
Entrance

PLANTING PLAN

The trees chosen for the community park have been considered from criteria which includes endurance, water resistant and evergreen. The shape and form of the trees are diverse to create an atmosphere of nature to the city area while providing the different shade of color with flowers and fruits. In each area, there is a mixture of feature trees which functioned as a sculpture with distinctive form and shading trees that provided shady area underneath. The screening trees with the vertical form will mainly be located around the boundary of the park. More importantly, at the entrance, there is two huge lotus pond as the welcoming space. They are the national flower of Vietnam which give a beautiful color and movement to the static pond.

Feature Trees

Scientific Name: Ficus benjamina
Height : 10.00 - 20.00 m.

Scientific Name: Barringtonia Acutangula (L.) Gaertn.
Height : 5.00 - 15.00 m.

Shading Trees Medium Size with Flowers

Scientific Name: Mayodendron igneum (Kurz)
Height : 6.00 - 15.00 m.

Scientific Name: Plumeria
Height : 6.00 - 10.00 m.

Shading Trees Medium Size

Scientific Name: Maerua Siamensis (Kurz) Pax
Height : 5.00 - 10.00 m.

Scientific Name: Azadirachta indica
Height : 7.00 - 12.00 m.

Scientific Name: Terminalia catappa-
Height : 8.00 - 25.00 m.

Screening/Fencing Trees

Scientific Name: Dolichandrone serrulate (Wall. ex DC.) Seem
Height : 10.00 - 15.00 m.

Edible Trees

Scientific Name : Cocos nucifera
Height : 10.00 - 30.00 m.

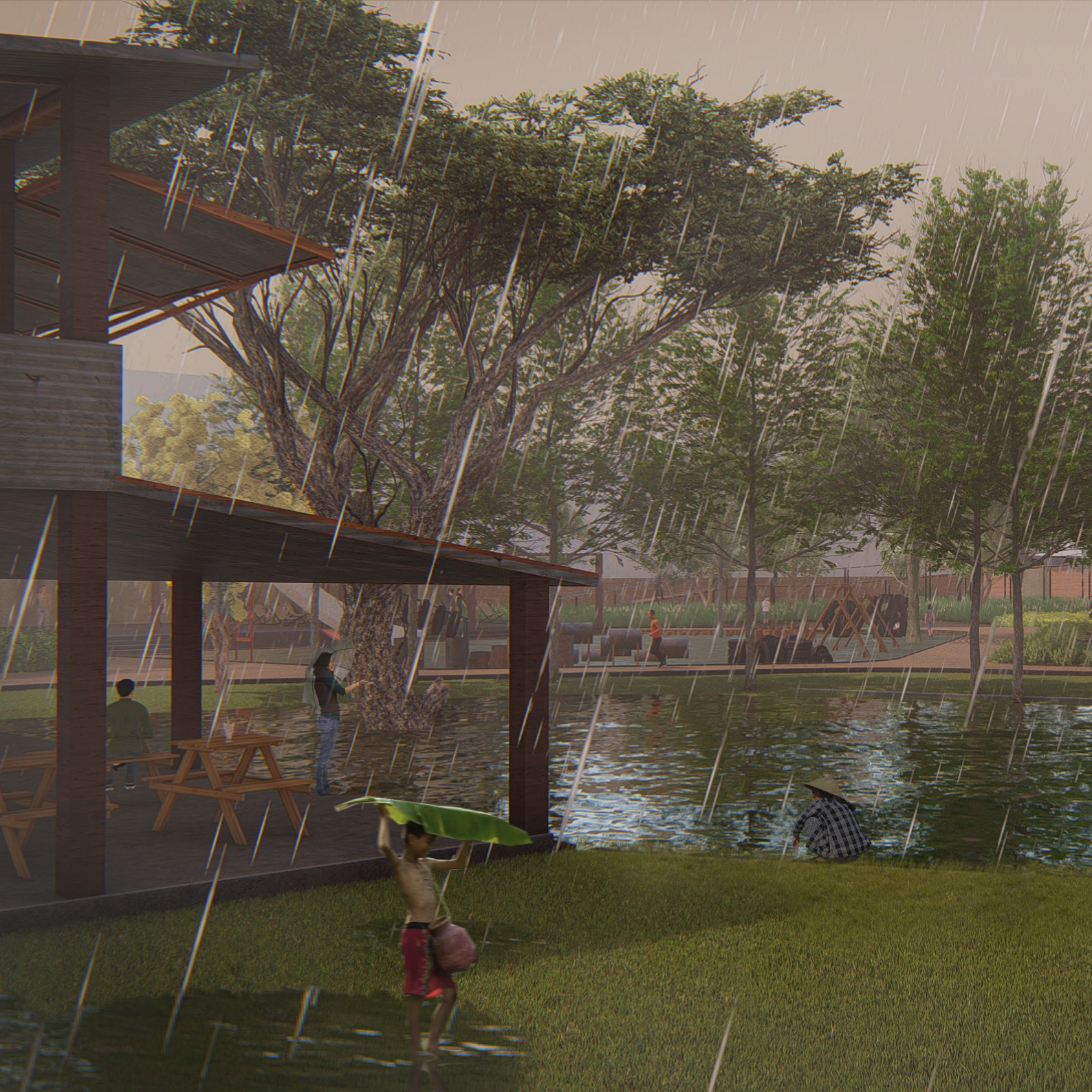
Scientific Name : Ravenala madagascariensis
Height : 6.00 - 20.00 m.

Scientific Name : Mangifera indica
Height : 8.00 - 15.00 m.

Scientific Name : Tamarindus indica L.Height : 15.00 - 25.00 m.

COMMUNITY PARK
PLAYGROUND&
SPIRIT HOUSE

COMMUNITY PARK
AMPHITHEATER&
EXISTING FACTORY'S
STRUCTURE

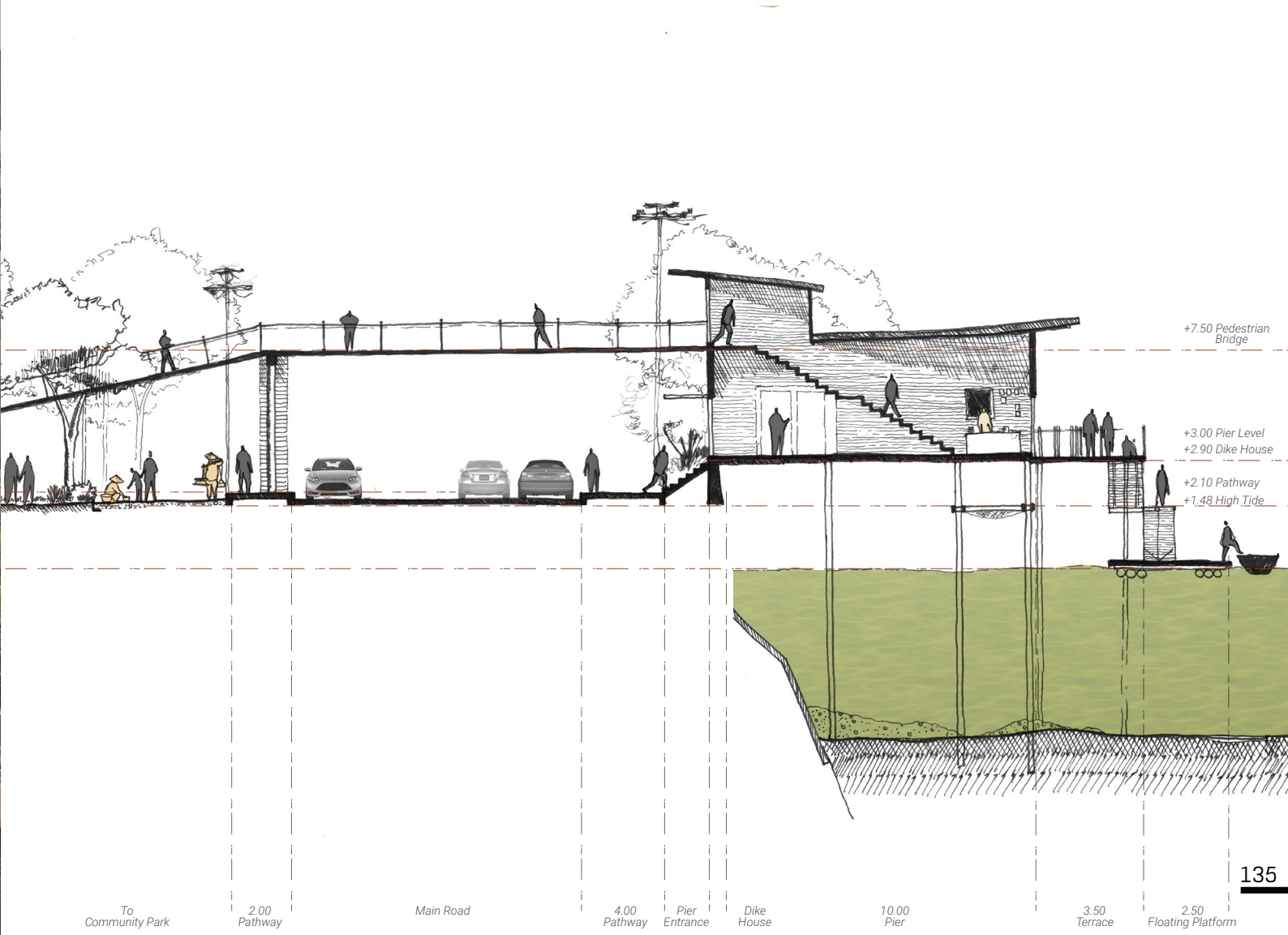


COMMUNITY PARK
AMPHITHEATER
IN MONSOON SEASON

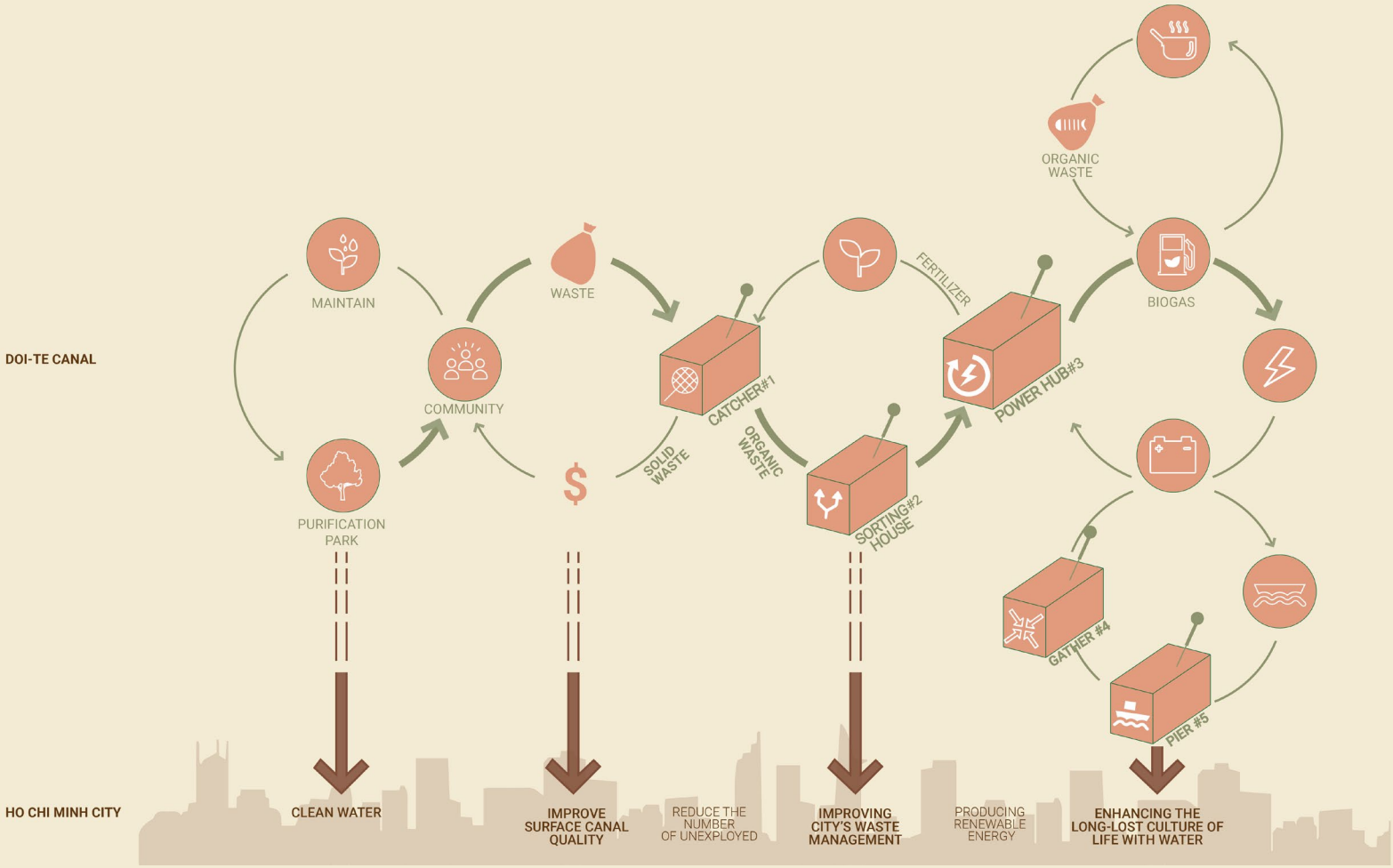
COMMUNITY PARK
FLEA MARKET&
COMMUNITY FARMING


FLEA MARKET&
COMMUNITY FARMING
IN MONSOON SEASON

SECTION A


+7.50 Pedestrian Bridge
+3.00 Pier Level
+2.90 Dike House
+2.10 Pathway
+1.48 High Tide
To Community Park
2.00 Pathway
Main Road
4.00 Pathway
Pier Entrance
Dike House
10.00 Pier
3.50 Terrace
2.50 Floating Platform

INFORMAL
SETTLEMENT AS
PART OF THE
COMMUNITY PARK


DOI-TE CANAL
MAINTAIN
WASTE
ORGANIC WASTE
BIOGAS
COMMUNITY
CATCHER#1
FERTILIZER
POWER HUB#3
SOLID WASTE
ORGANIC WASTE
SORTING#2 HOUSE
PURIFICATION PARK
GATHER #4
PIER #5
HO CHI MINH CITY
CLEAN WATER
IMPROVE SURFACE CANAL QUALITY
REDUCE THE NUMBER OF UNEXPLOYED
IMPROVING CITY'S WASTE MANAGEMENT
PRODUCING RENEWABLE ENERGY
ENHANCING THE LONG-LOST CULTURE OF LIFE WITH WATER

CONCLUSION

From the flaw of the city as the informal settlements, it has been transformed into a living system that generates abundant benefit to the environment and society. The enormous amount of waste produced by HCMC residence and tourist has been captured by design interventions that are integrated into the informal houses called The Catcher (#1). This daily waste will be delivered to the waste station called The Sorting House (#2). Solid waste after separation will be given to the community people to create local-recycle product or exchange at the recycle shop to generate more income. The organic waste is converted into biogas at The Power Hub (#3) for cooking gas used at community kitchen while the excessive waste is used as a high-quality fertilizer for The Purification Park. This park is where the constructed wetland is located, the Purification Park converted polluted water from Doi-Te canal into the wetland and purified water through a biological purification process. This closed loop activity generated the least waste back to the environment while supporting the involvement of the community from the first process of collecting the waste to the last process to maintain the purification park.

On the other hand, the zone of informal settlement is not the only process as a cleaning machine, but it is also supported the tourism and raised awareness for HCMC residence to take care of the canal. Some of the informal houses will be eliminated and replaced by The Gather and The Pier, however, the project already provided space for the informal house- relocation inside the purification park. The Gather allowed several activities to occur, such as recreational activity, educational activity, as well as a cultural activity. This offered additional public spaces in the area which allow interaction between informal community people and HCMC residence to take place. The Pier is located in every 400 meters along two sides of the canal, it is not only connected the urban district to the rural district but also revived the use of Vietnamese boat back to HCMC. These two design interventions generated more income to the community while integrated the zone of informal settlement as part of the city. Furthermore, the entire strip of the informal settlement acquired a hybrid function. Every house also acts as a dike which can protect the urban district from the tidal flood. The yearly monsoon season will no longer be a complication for the area since the project created relatively sufficient sponge area to allow excessive water to penetrate and the high density of residential area has already been protected by the Dike House or the zone of informal settlements.

In conclusion, the zone of informal settlements has already been redefined. From the problematic area into the essential zone that can generate further opportunities to the environment included improving waste management of the city, purifying water before release back to the Saigon River, increasing green spaces, preparing the area for annual flood and imminent challenge as climate change. Moreover, it is also contributed to the city by creating renewable energy, proving job opportunities for the unemployed, and most importantly, it is enhancing the long-lost culture of life with water back to HCMC. The approach and design intervention from this project is applicable to be implemented in other canals in HCMC, this to support the city to be a social-ecological resilient city in the near future.

Figure 2-3, 2-5, 2-6.
Everyday life of people in the informal settlement
(Sciosia, n.d.)
Figure 2-4
Access to fresh water of informal settler
(Slum tour by motorbikje, n.d.)

Pier #5

Generating energy for seabin

PROPOSED ELEVATION OF DOI-TE CANAL

The drawing represented various activities along the water and how the life of community connected back to the canal

8 DESIGN EVALUATION &REFLECTION

HO CHI MINH CITY

DESIGN STRATEGIES
DOI & TE CANAL

URBAN RIVER CORRIDOR STRATEGY

URC

LANDSCAPE DESIGN STRATEGIES

SMALL SCALE DESIGN INTERVENTIONS

URBAN ACUPUNCTURE STRATEGY

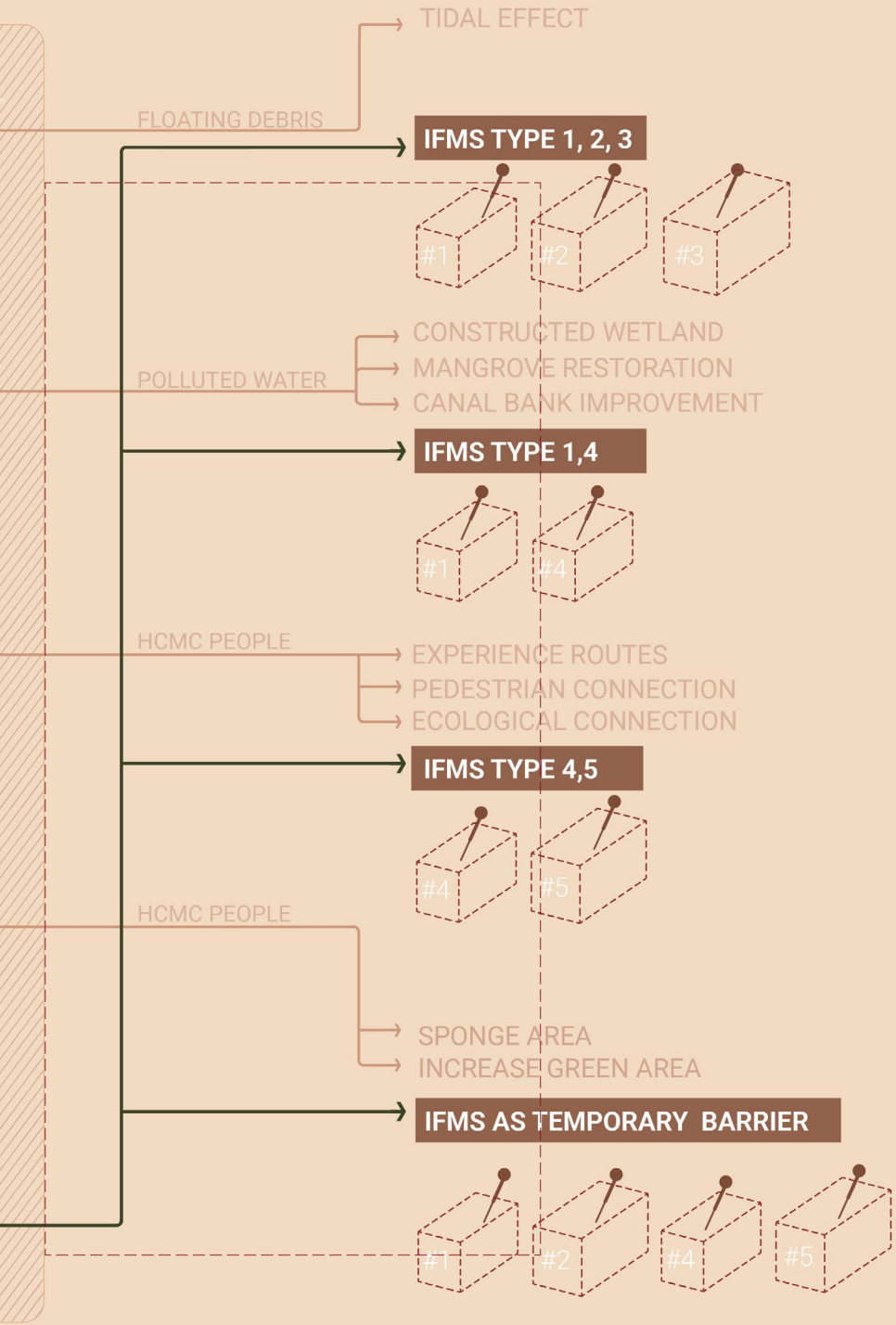
COLLECT

PURIFY

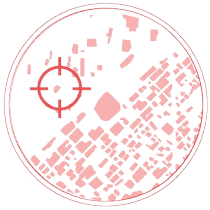
CONNECT

ADAPT

INFORMAL SETTLEMENT

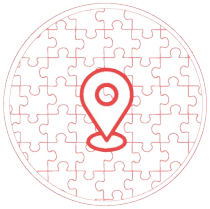


EVALUATING THROUGH
THE LENS OF
URBAN ACUPUNCTURE



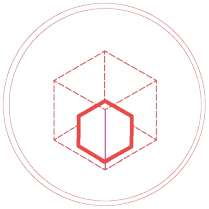
Sensitive Point

The first principle is the first steps in the application of urban acupuncture. Determining a specific location where there is little energy, lack of energy or faced with a blockage in the energy flow.



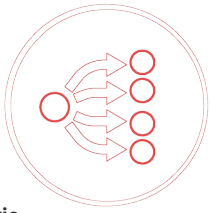
Creating Place

The design is expected to deliver awareness to the meaning of the place. Looking at the richness of places that before were none (Sola-Morales et al., 2008).



Small Scale

The scale in this agency refers to the proportion of the intervention in relation to the impact of the transformation that it has generated. Manuel stated that "big physical changes might encompass irrelevant projects. With small pinpricks, urban acupuncture aims for a big impact. A scale is not bounded to size (Sola-Morales et al., 2008, p.64)".



Scenario

In designing the city, the plan or the strategy strongly requires an understanding of other stakeholders and the majority group of people. The scenario design should be proposed to envision the design in every possible direction in order to represent the possible scenario of the city.

Participation

It is relevant to understand the local context and local culture to initiate a successive intervention to a specific location. The participant is significant guidance to a local perspective and a great catalyze of the process.

Education

The successful plan could not be created to be maintained by itself, the well-educated community will sustain the design objective and sustainably pass the knowledge to the next generation.

EVALUATING THROUGH THE LENS OF **URBAN ACUPUNCTURE**

As mentioned in earlier chapters, the scope of landscape architecture has been widened from the last decades and the effect of the design is usually expected to create a greater impact in the broader area. This thesis is one of the examples that reflected the ability of landscape architecture which work resiliently through the dynamic of space and time. Therefore, the proposed design will be evaluated through two lenses that clearly exemplified the dynamic of landscape design, which is Urban Acupuncture and Social-Ecological Resilience.

The essential concept of Urban Acupuncture, as mentioned in chapter 3, can be defined by the aims to create better livability by using the small-scale intervention to stimulate the flows in a particular spot of the city in order to catalyze the more substantial effect to its surrounding and urban context. "Breathe" Project has developed the design intervention from a similar mentality with the final goals to transform the problematic element of the city into the significant element that can create social and environmental benefits to HCMC. Therefore, the design will be evaluated by using six principles of Urban Acupuncture.

The Sensitive Point (1) has been clearly identified at one of the highest densities of informal houses in District 8. This area used to be neglected and inaccessible from the public, it is apparently the area with lack of energy flow. The design has been developed and proposed through the understanding of the context as well as the consideration of possible future events. The Scenario (2) approach has been reflected by the "Adapt" layers that concerned the seasonal changes and the imminent problem as climate change in the design. Moreover, the breathing system can be functioned in different scenarios, the four layers are working collectively, however, if there is one layer could not be operated, the three remaining layers will still be functioned. Within those layers, the Participation (3) of informal community and stakeholders are the most crucial element. The project has been developed based on the daily life of local people and their action as part of the breathing system. Nevertheless, the system can be activated by outsider people assigned by the government, but this project considered the community involvement as the strongest driving force to sustain the system and an excellent catalyst for the city. In order to simply convince the informal community to participate, the project offered a variety of job opportunities, income, clean water, and renewable energy in return. These led to the most important principle, which is Small Scale (4). In this thesis, the acupuncture is defined as the whole breathing system rather than one single unit of the house. The linear zone of informal settlements is the pinprick in which the scale is considered to be small in comparison to its impact on the city and the environment. As Manuel stated that "big physical changes might encompass irrelevant projects. With small pinpricks, urban acupuncture aims for a big impact. A scale is not bounded to size (Sola-Morales et al., 2008, p.64)".

Lastly, this acupuncture showed the educative approach (5) and created a meaningful place (6) to the city. By using the idea of community involvement, it is not only contributed to the breathing system, but it also offers knowledge in waste management and know-how in construction for the community people to pass on to the future generation. The existing sensitive point has been transformed and revived into a sustainable community. It is expected to be the place to raise awareness to HCMC people as well as tourists to notice the importance of the environment and their own culture. Through the lens of Urban Acupuncture, the project has achieved six principles from the theory and offered a better living quality and better environment for HCMC through the small scale intervention.

HO CHI MINH CITY

DESIGN STRATEGIES
DOI & TE CANAL

URBAN RIVER CORRIDOR STRATEGY

URC

LANDSCAPE DESIGN STRATEGIES

COLLECT

PURIFY

URC CONNECTOR

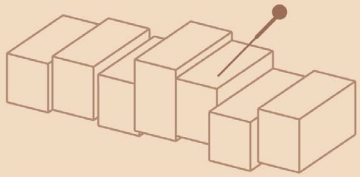
CONNECT

URC SPONGE

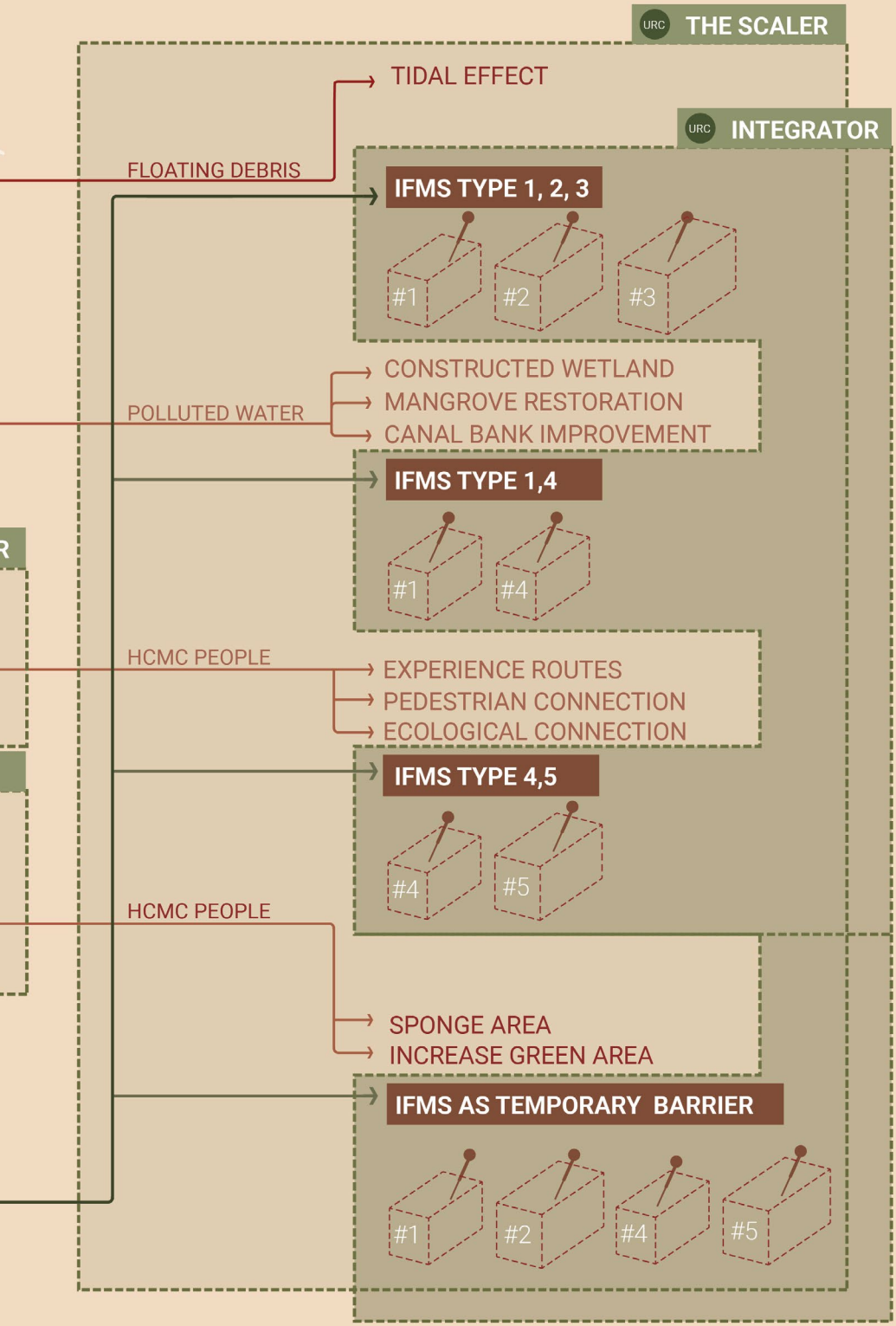
ADAPT

SMALL SCALE DESIGN INTERVENTIONS

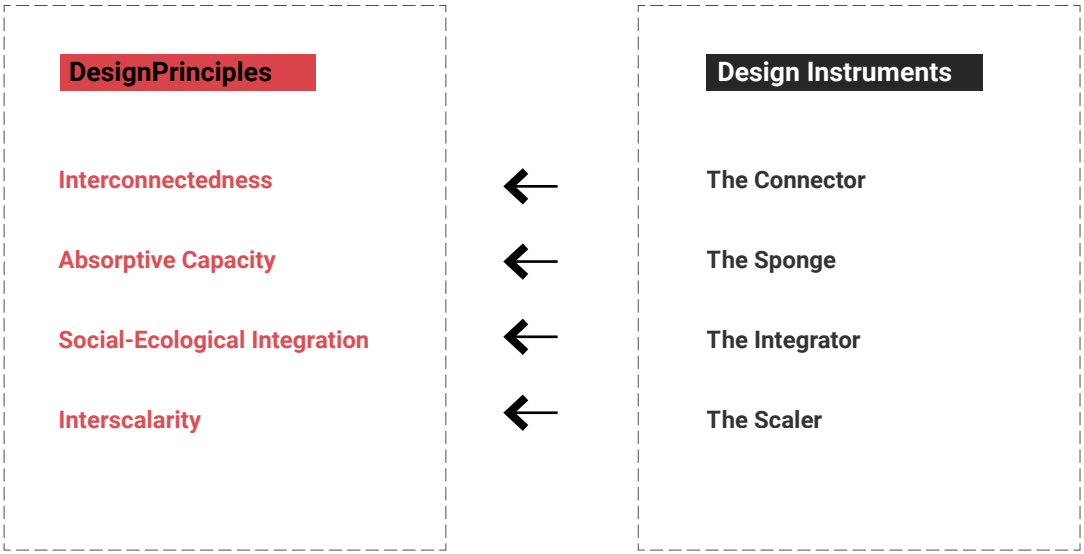
URBAN ACUPUNCTURE STRATEGY



INFORMAL SETTLEMENT



REFLECTED THROUGH
THE LENS OF
SOCIAL ECOLOGICAL RESILIENCE & URBAN RIVER CORRIDORS


DesignPrinciples
Interconnectedness
Absorptive Capacity
Social-Ecological Integration
Interscalarity
Design Instruments
The Connector
The Sponge
The Integrator
The Scaler

EVALUATING THROUGH THE LENS OF **SOCIAL ECOLOGICAL RESILIENCE & URBAN RIVER CORRIDORS**

Another lens that will be used to evaluate the design is the lens of Social-Ecological Resilience. The previous approach has been focused on the design intervention and its impact while this lens will mainly focus on the adaptive ability in social and ecological aspect. According to chapter 3, Social-Ecological Resilience is referred to the ability of a complex socio-ecological system to change, adapt, and, crucially, transform in response to stresses and strains" (Davoudi, 2012). In order to achieve those qualities, the design has been developed under the framework of Urban River Corridors, which provided the design instrument to adopt in the design practice. As a consequence, the evaluation in this lens will be divided into two approaches as follow:

Social Aspect
The project not only concerned about waste management, but it also attempted to integrate the zone of informal settlement to the city. By doing that the urban context and surrounding network have been taken to account. In the layer "connect" (Chapter 6), the design illustrated five different pedestrian routes which connected the urban district to rural district. The proposed routes allow the pedestrian network to connect with main traffic network. Each route has been composed of the experienced along the small alley, community road, variety of activity spots, cross over bridges or tunnel to the main road with public transportation. It allows social interaction to occur in different spaces with a diverse group of people through different traffic network. More importantly, all the routes bring people back to the canal; it revived the use of the boat as a mean of transportation and established a social connection back to the Canalside.

Ecological Aspect
The water network and ecological network also play an important role in the design. In the "Purify" layer, the design proposed to diverse the waterway into the Purification Park. This waterway has been created by expanding the existing creek to be a water channel that refilled water in the constructed wetland. This expansion of water network allows a new ecological system to take place in the constructed wetland together with the improvement of water quality, the ecological network along Doi-Te canal will surely be restored. Moreover, in the "Adapt" layer also elaborated the possible water routes during monsoon season. The proposed design showed an attempt to create alternative waterways when excessive water arrives without interrupting the existing water network.

Hence, the first two design instruments of urban river corridor as "The Connector" and "The Sponge" have been implemented in the project. It is not only appeared in one design layer, but it also involved from one layer to another which created the adaptable quality to the design. The design instrument still be activated even if one of the design layers could not be operated. The design showed the integration of pedestrian network, traffic network, water network, and ecological network showed no conflict with one to another by using the small design intervention as "The Integrator." The five types of design intervention have been inserted all along the two sides of the canal; it is considered as the common ground which allows the different network to interact. As a result, the overall system revealed the quality of Interconnectedness, Absorptive Capacity, and Social-Ecological Integration of the design by four design layers. All the layers are functioned in different scales from the smallest scale as a house to a large network as canal and river; the ability to operated across the different scales created the Interscalarity quality to the project. As Forgaci mentioned that "Interscalarity reveals temporal constraints and path dependencies inherent in the networks and spaces of the urban river corridors (Forgaci, 2018, p.263)." The overall design delivered the four principles of Urban River Corridors, which reflected the achievement to the Social-Ecological Resilience.

This document represented a reflection of the graduation project: "BREATHE - Redefining a zone of informal settlement for Ho Chi Minh City" through the process, outcome and the relationships to other related fields. The discussion will be analyzed from the lesson learned, trial and error in different aspects and further elaborated on the future development of the project.

Reflecting through the process

The relationship between research and design

The project aims to propose an alternative way for the informal settlement. It is strongly required an understanding of the context and cultural living of people while offering a new approach back to the context. By reviewing the process from the beginning to the outcome, the project has been created through two essential processes which are research and design. In different stages, one method will be used more often than another, but the two methods always collaborate.

The analysis stage has been done mostly by research in which the design is used as a framework to limit the scope of analysis. On the other hand, during the design stage, the design has been implemented by using the research as a guideline to frame the design. Throughout the process, the interactions between research and design were implemented; it has been tested and evaluated several times to acquire the most integral outcome. Therefore, the relationship between research and design is strongly represented in the process of this graduation project. It is part of one another, and it is hardly operated in separation.

The limitation of the project

Throughout the process, the most difficult process is in the analysis part. Vietnam is a country govern by socialism, in which the data involved in the stability of the country will hardly be published. The updated map of the critical data, such as infrastructure, settlement and geographical map, has been provided only in image form.

More importantly, as the essence of the project involved in the "informality," the official data related to the informal community was limited and most of the physical data have not been documented. As a consequence, the accessibility to the community during the site visit was also one of the complications. Not all of the communities allows the outsider to enter and, in some case, taking photo was restricted.

The Ethical issues and Dilemmas encountered in doing the project

Social segregation and human right have been concerned as a crucial aspect of the project. The zone of

informal settlement is one of the residential areas in which it represented the cultural value of the Vietnamese community and the water. The design proposal offered an alternative way of living to the community in order to provide a better living quality to the informal settler. On the other hand, the design is also an attempted to change the perception of the informal settlement. The approach of social segregation and perception from the outsider of the city need to be redefined. Furthermore, the design also considered the ethical issue from the perspective of the informal settler. As it has been proposed to be accessible by the public, but the privacy of the community will have remained.

Reflecting through the relationship to Flowscapes Studio

The project is part of the Flowscapes studio, the graduation studio of the MSc Landscape Architecture. The studio offered a various approach in landscape design including landscape as infrastructure, green and blue structure, landscape and urban development and landscape as ecology. The studio expectes an ultimate goal to create a better environment for the society in the form of different flow in the landscape. As a result, this graduation project has created various flows to society. It showed the notion of landscape architecture as a living system that improves the quality of water and quality of life for people.

Reflecting through the outcome

The proposed design strategy acted as landscape acupuncture which not only upgraded the problematic area as an informal settlement but also improved the environmental quality to the city. Therefore, the design has answered the initial intention through the aspect of sociology, ecology, and landscape architectonic design. The crucial part is the use of a small-scale intervention in which the 3x6 meters of the small house has revived into the element of the landscape living machine. This represented that design has been explored through different scales, and every scale has been carefully connected as one complete system.

However, with the limitation of time and travel distance, there are several issues that the project can explore further. The first one is in the large-scale approach; the design has been proposed under the criteria of Ho Chi Minh City's culture which is specific to the site. The design intervention could be explored further to be applicable to the other area in South East Asia. This would create more alternative to the design intervention and enhance the life of local communities in a different context.

Another approach is the idea of participatory design; the idea of the local community can enrich the programs of the intervention. The next step could be the process of design development through the approach of informal settler. The opportunity to discuss the design proposal with people who are involved in the plan would bring about a more solid social strategy.

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