INTERWEAVING FRAGMENTS

Activating Green-Blue Infrastructure in Pearl River Delta, China

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ABSTRACT

The Greater Bay Area, known as the GBA, ultimately incorporates 11 main cities (consisting of the Hong Kong Special Administrative Region (HKSAR), the Macao Special Administrative Region (Macao SAR) as well as the municipalities of Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing) into an urbanised population of over 70 million people. It represents a significant opportunity to shape the future of the Pearl River Delta region. In the last decades, this region has experienced an unprecedent rise of urbanisation and a rapid economic growth positioning itself as the future centre of global economy. However, the uneven development has been the reason behind several environmental and socio-spatial challenges that threaten the future of this mega region. The research intends to comprehend these issues under the fragmentation perspective, by classifying and analysing the challenges within three main themes (Society, Economy and Environment) in three different scales. Furthermore, the research proposes that the integration of bio-physical infrastructures (Green and blue network) respecting the natural ecosystem and the delta conditions throughout the whole process of development and urbanisation, will help redefine the future of globalisation in the GBA. In order to achieve that, an explorative method using the 'strips game' was used as a method to produce a vision and urban scenarios on multiple scales providing functional and spatial distributions. This method was conducted in Hong Kong to give access to the feeling and environment in question.

Key Words:
Urbanisation
Globalisation
The Greater Bay area
Hong-Kong
Green and Blue infrastructure
Integration
Fragmentation

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1 INTRODUCTION

1.1 INTRODUCTION

1.1.1 Greater Bay Area

The Greater Bay Area (GBA), also known as Pearl River Delta (PRD), is situated in Guangdong Province in southern China and is the fastest growing region in the country. The advances in urbanisation in the area are strongly linked to the economy mayday of GBA, which accelerated in 1979 due to decentralisation policies and market oriented reforms.

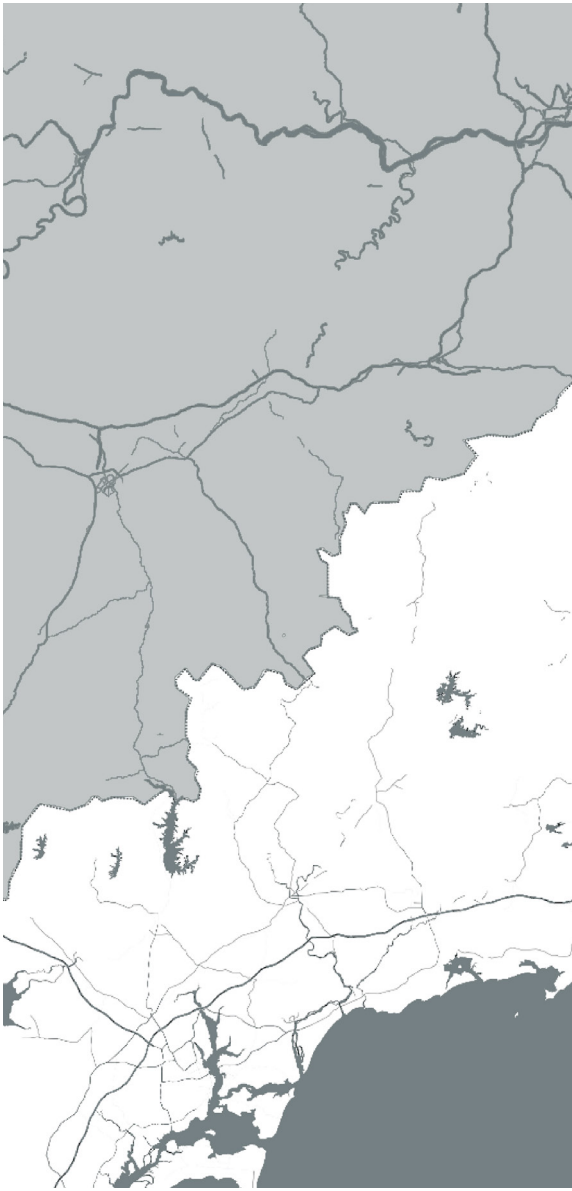
One example of PRD's explosive urbanisation is Shenzhen, that changed abruptly from fishing village to port of international significance in recent years. Furthermore, its population has escalated sharply since the 1980's, from 350.000 to 13 million today (Demographia, 2019). Due to the pace of its urbanisation, Shenzhen has now more than 1,000 ''Urban Villages'': spatial and social enclaves of the maximum possible urban density and the lowest living conditions.

Guangzhou, located in the mouth of the Delta, is the centre of governance, economy and transportation. However, as one of the delta cities of the region, Guangzhou is confronted with population crisis that is mainly driven by water issues and land scarcity, according to South China Morning Post (2007,2011).

Nonetheless, the land scarcity is most evident in the case of Hong Kong, where the urban fabric could be described as ''super-dense''. Its urban growth, that initiated 160 years ago, has been restricted by the rugged topography with few flat lands, resulting in a highly compact urban form. The average inhabitant of Hong Kong can barely enjoy 2 m2 of urban green space, when the European average is 25–125 m2/person (Jim and Chan, 2016).

Moreover, considerable obstacles provoke division and impede economic unity within the region. There are huge differences among the cities of PRD: the most developed ones are Macau, Hong Kong (USD43,742/person) and Shenzhen (USD25,206/person), at the other end of the spectrum there are Jiangmen (USD8,036/person) and Zhaoqin (USD7,706/person).

Overall, although pioneers in global economy, PRD cities are facing grave social and environmental challenges. How should urban designers secure sustainable development in the future?



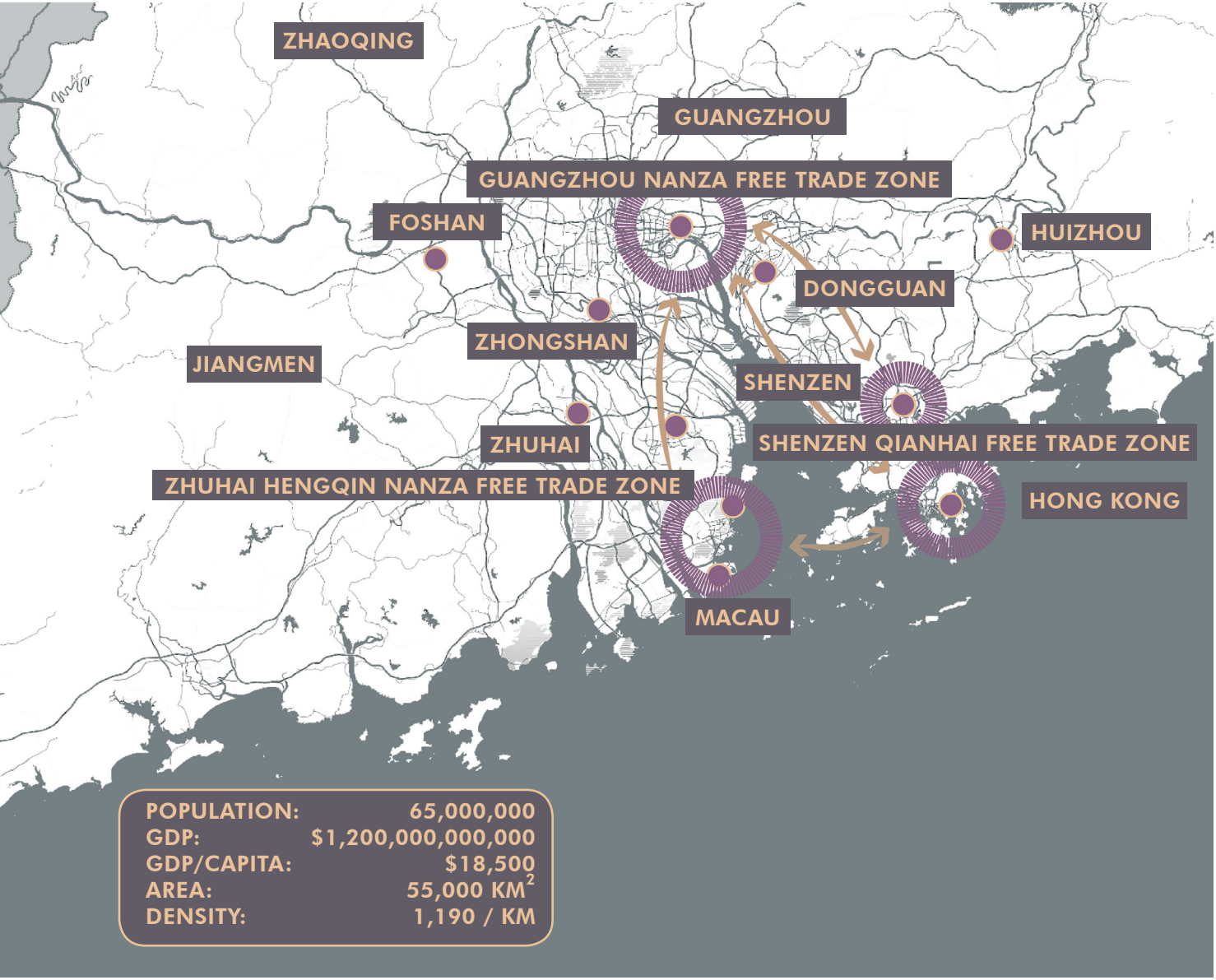


Fig. 1.1 - The Greater Bay Area. Source: *Geoshen; edited by authors*

1.1.2 PRD's evolution

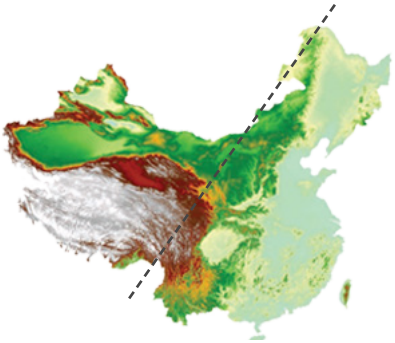


Fig. 1.2 - Elevation in China. Source: *Mao et al., 2012.*

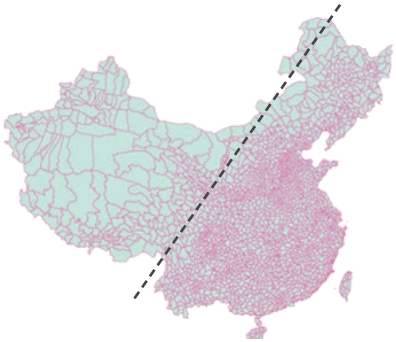


Fig. 1.3 - Regions in China. Source: *Mao et al., 2012.*

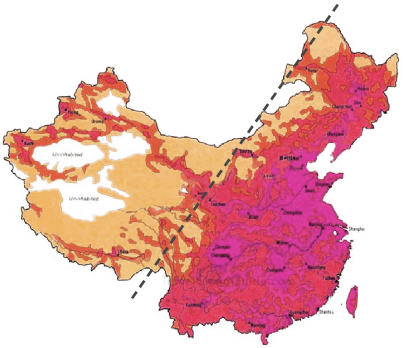


Fig. 1.4 - Population density in China. Source: *Bonadies G., 2010.*

Elementary research on urban development in the macro scale is essentials in order to further understand PRD. Generally, China's development has been defined mostly by natural preconditions, such as elevation. The geography has had direct impacts in the administrative regions and the country's urban density (fig. 1.10, 1.11, 1.12). Naturally, the urban population has been polarised according to the understood line that divides Northwest from Southeast.

PRD: Urban evolution, 1979-2009

Similarly to the country's urbanisation patterns, PRD development could also be considered as polarised towards the most fortunate preconditions. In this case specifically, towards the water edges.

According to NASA (2007), ''by 1979, China's Pearl River Delta had seen little urbanisation. The following year, however, the landscape began to change. In 1980, the People's Republic of China established a Special Economic Zone, Shenzhen.''

Demographics in the area changed radically ever since the creation of the Pearl River Delta Economic Zone. Back then, PRD mainly received profits from agriculture, and only 16% of the land was considered urban. During the 90's decade, arable land plummeted, and was replaced by urbanised land.

Nowadays, the population has reached 65 million people, with 80% inhabiting its delta. The megalopolis consists of 23 cities, among which 11 are considered major cities (Wu et al., 2014): Hong Kong, Macao, Guangzhou, Shenzhen, Zhuhai, Foshan, Zhongshan, Dongguan, Zhaoqing, Huizhou and Jiangmen.

In summary, the fast paced urbanisation has been driven by water economy (e.g. ports) and has been gathered near the water edges, which has lead to higher GDP numbers and thus greater positioning in the world economy. However, this has also effects on other dimensions of PRD, in and out of the urban areas: agricultural land is disappearing, while the living conditions remain poor for some parts of the population. Moreover, sustainability (in economy, environment and society) needs yet to be pioneered in the region.

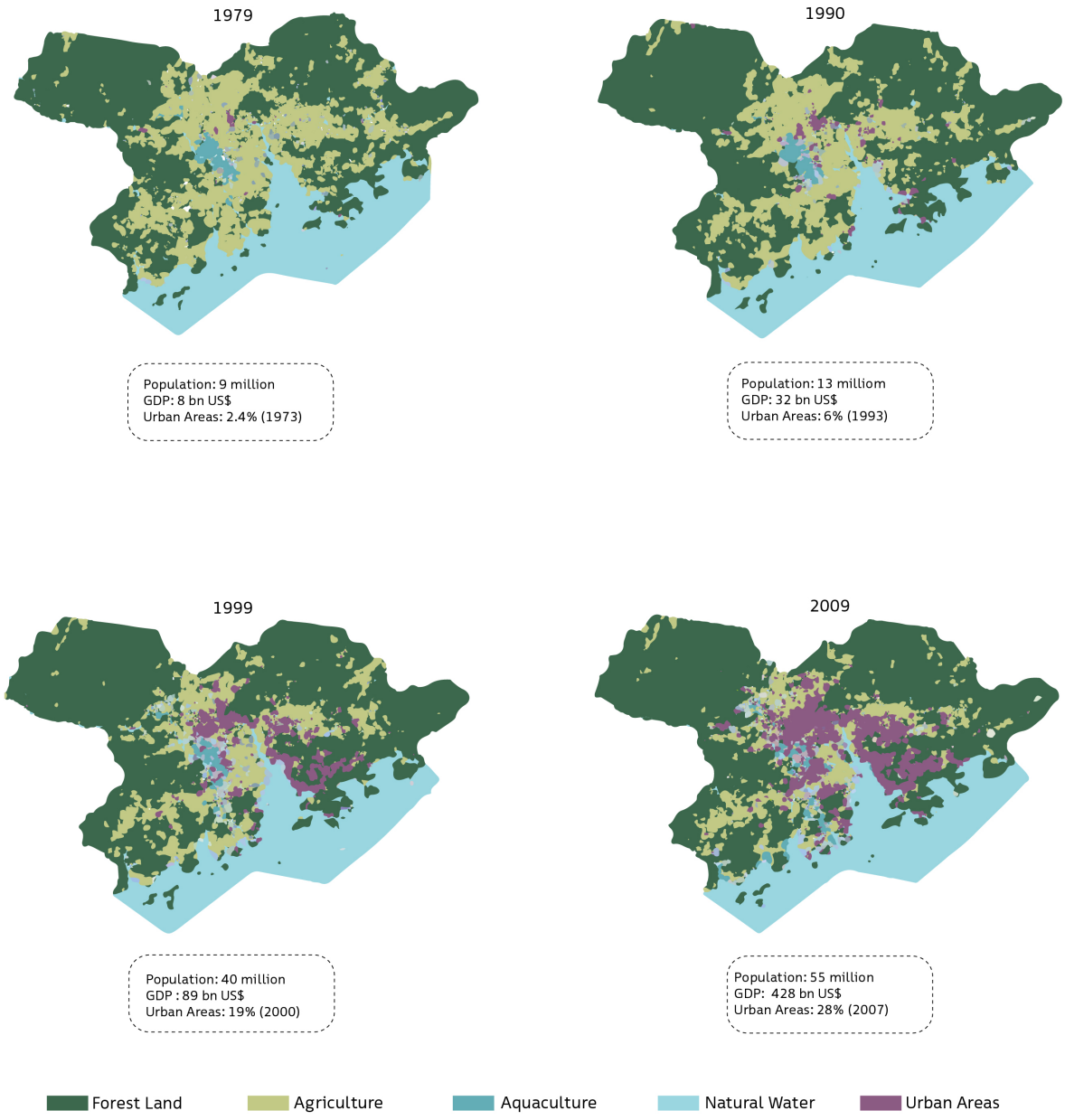


Fig. 1.5 - The expansion of PRD, 1979-2009. Source: (Zhijia et al., 2016).

1.2 THEORETICAL UNDERPINNING

Fig. 1.6 - Importers and exporters of the world. Source: *Visual-Capitalist; Resource Trade; edited by authors.*

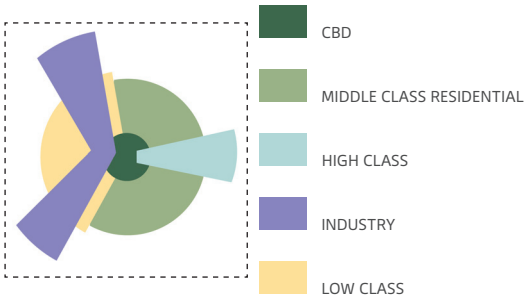


Fig. 1.7 - Diagram illustrating spatial division. Source: *Hoytt (1939); edited by authors.*

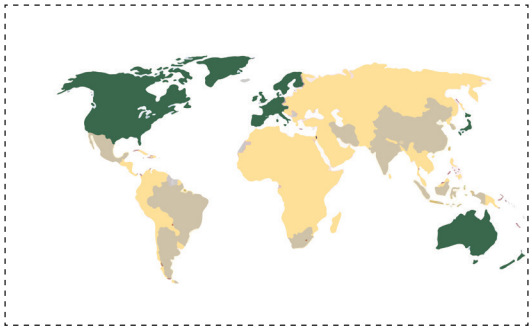


Fig. 1.8 - Core-periphery model. Source: *Wallerstein (1974); edited by authors.*

In the forthcoming sub-chapter we investigate the theory of physical and social, but also institutional fragmentation, by first understanding its relation to global phenomena, such as metropolisation. Which metropolis model conveys best the Pearl River Delta's (PRD) urban settlements? Then, we obtain possible insight on how can we battle the disintegrated metropolis on multiple scales in the future.

The economy is shaping the Global City

With this in mind, it is important to recognise that GBA, one of the world´s most prominent urban constellations, consists of 9 cities and 2 Special Administrative Regions (SAR) that respond to the global scale. Theorists such as Cohen (1981) and Walton (1982) came to the realisation that cities can be interpreted as the outcome of the shaping and reshaping of world economy. Following the same line, Friedmann (1985) described the world cities as the basin points for concentration and accumulation of global capital. According to him, the functionality of each node in the global economy network will be decisive for any structural changes occurring within the node.

The suitable Metropolis model

Which model describes PRD most appropriately? If the functional character, specifically in terms of economy, defines the form of the city, then one should first explore the influence of capitalism on the creation of urban prototypes. Soja (1985), suggests that geographically uneven development (GUD) is inherent in the capitalist society. In other words, conflicts and contrasts between social classes provoke hierarchies and priorities within the same urban structure. According to him, the core-periphery pattern that can be described as an outcome of GUD, is the specific spatial configuration which arises from ''the historical tendency toward polarization and opposition in spatial divisions of labour''. In relation to this, Hoyt's sector model, already published in 1939, describes the division between low, middle and high class, surrounding the core (CBD) area. (figure 1?). The formation of the Global City ''brings into focus the major contradictions of industrial capitalism - among them spatial and class polarisation'' (Friedmann, 1985).

Nevertheless, that model might not be adequate for the 21st century Global City and its future. Since dualism in the core-periphery model is caused by establishing finance capital and informational capital as dominant in the world economy, one should acknowledge the importance of other circuitries, such as human or land capital, with the view to find equilibrated models of global urbanisation. Indeed, Roy (2009) argues that ''the 21st century metropolis arbitrates the geography of multiplicity and differentiation''. Instead of viewing the Global City creation, or simply 'worlding', as black and white, she counter-proposes the 'chameleon' perspective: the metropolis 'shifts shape and size; margins become centres; centres become frontiers; regions become cities'.

This continuity of regional functional characters in flux could be represented best by the 'urban field' that Cardoso & Meijers (2019) described in their conference as the zonal model where '' socio-economic or environmental effects of urbanisation, both beneficial and detrimental, can be seen as fluctuations of intensity of 'agglomeration externality fields''. The assembly into one single metropolis requires, undoubtedly, the enabling spatial, cultural and political interaction of these diverse characters in city-regions.

Is PRD model consistent to the urban field theory?

The Fragmented Metropolis

Woo (1994) illustrates PRD in a polycentrism system, with multiple urban centres that are classified into three types of significance, according to their population (see figure 1.). In the diagram, the centres are interconnected by regional infrastructure and perform in hierarchy, but altogether their performance seems balanced.

Regardless, scholars like Jenks and Kozak (2013) argue that polycentrism can actually cause fragmentation than to reserve it. They continue by saying that ''fragmentation occurs both between the new centralities, and within them. This has both social and economic consequences of exclusion and inequalities''. Although spatial distance between two urban typologies has been diminished in the post-industrial city, the real proximity between the two social classes that inhabit them is still intangible (Kozak,2013).

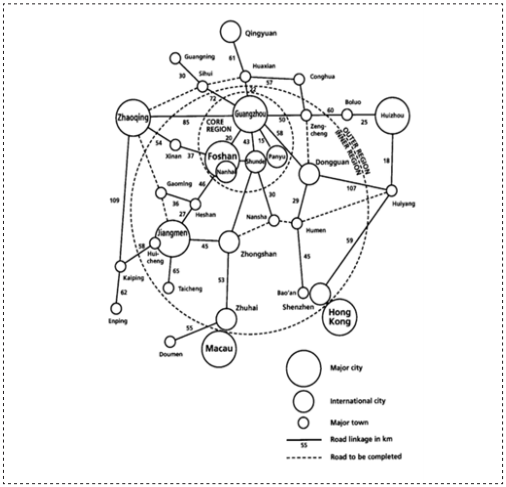


Fig. 1.9 - The Pearl River Delta megalopolis. Source: *Woo (1994).*

Fig. 1.10 - The Fragmented Field. Source: *Daily Overview; edited by authors.*

Fig. 1.11 - The urban fragments in Zhongshan, PRD. Source: Google Earth.

Fig. 1.12 - Overview of Urban Villages. Source: UN Photo Kibae Park.

Fig. 1.13 - Baishizhou Village in Shenzhen. Source: That's Shenzhen, 2017.

In China and certainly PRD, Urban Villages are one example of social segregation manifested in these fragments:

They are districts without planning regulations, spontaneously arranged by public intervention, social enclaves with problems like extremely high density of housing, and shortage of public facilities and public space.

Musterd and de Winter (1998) argue that one needs to consider structural processes in order to find explanations for fragmentation. They underline the following 3 key drivers:

1. Globalisation. The centralization of control, ownership and management functions, and the growing competition to attract these functions is an important attribute of globalisation

2. Neoliberalism. Governments moderate restrictions on private entry into infrastructure markets around the world and in various scales.

3. Rapid urbanisation. The third parameter, is also linked to globalisation. Currently, the explosive growth is occurring in the cities of the developing world.

The Pearl River Delta has pioneered in these 3 key processes with tremendous changes in recent years that have caused a significant loss of valuable natural land, previously dedicated to agricultural activities.

It is evident that infrastructure plays an important role in the rapid urbanisation process, by aspiring to support the connections within the Global City. The resulting urban landscape is one of disjointed and widely dispersed 'packaged' developments orientated more to infrastructural connections than to their immediate environment. (Graham & Marvin 2001).

China's road network is growing quickly; with a rapid expansion of expressways from 652 km in 1992 to 65,000 km by 2010. Transportation infrastructure has been a major focus of China's economic stimulus actions, with $88 billion being spent, or is planned to be spent, annually between 2005 and 2010. ''In this model, infrastructures [...] no longer pretend to create functioning wholes, but now spin off functional entities. Instead of network or organism, the new infrastructure creates enclave, separation, and impasse'' (Koolhaas, 1988).

In essence, although aspiring to enhance connectivity and thus economy, human-engineered infrastructure has split the landscape into isolated patches in the regional, intermediate and local scale. Ahern claims that ''in highly modified landscapes, and especially in urban environments, connectivity is greatly reduced, often resulting in fragmentation – the separation and isolation of landscape elements with significant impacts on the ecological processes that require connectivity''.

This phenomenon is particularly evident in metropolitan regions such as PRD.

There is an urgent need to control such development patterns so that further harmful and fragmented development in the region can be sustained.

How could the landscape form part of the solution to multi-scalar fragmentation?

The ecology infrastructure: Reversing the problem

When the existing landscape is already fragmented, and core areas already limited in area and isolated, a defensive strategy is often applied. This strategy seeks to arrest /control the negative processes of fragmentation or urbanization. (Ahern, 2006)

What is Ecology Infrastructure?

Green infrastructure is an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations. Green infrastructure is the ecological framework needed for environmental, social and economic sustainability (Benedict and McMahon, 2002).

Connectivity is a property of landscapes that illustrates the relationship between landscape structure and function. In general, connectivity refers to the degree to which a landscape facilitates or impedes the flow of energy, materials, nutrients, species, and people across a landscape. Connectivity is an emergent property of landscapes that results from the interaction of landscape structure and function. The concept of connectivity applies directly to water flow, arguably the most important flow in any landscape, particularly in human-dominated and urban environments. (Ahern, 2007)

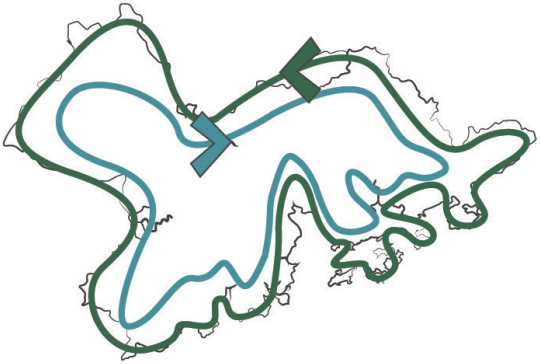


Fig. 1.14 - The Green and Blue network as binding structure in PRD. Illustration by authors.

Blue Infrastructure

Water is an element that needs to be highlighted in the future development of delta cities.

In this case, the delta pre-conditions have defined the economy, social activities and culture of PRD. For instance, as Tai (2018) mentions, ''Guangzhou has always been an important trading port for China'' (see figure 1?) and even today ranks among the top ten largest container ports in the world (World Shipping Council, 2016). Water has diverse attached values for economy, environment and society that allow the opportunity to achieve ecologically sustainable development. WSUD represents a significant shift in the way water resources and water infrastructures are considered in planning and design, so that opportunities for land use planning, urban design, ecology, and stormwater management are intrinsically linked (Wong, 2006).

Conclusion

Given that the Ecology Infrastructure is expanded in a continuous system, the region will actually embrace development, but under circumstances alternative to the current ones. Natural preservation will now be the dominant value, along with equilibrated economy growth. Then, the metropolis will shift to the compact urban field that works according to polycentrism, where grey, green and blue infrastructure battle fragmentation and its further implications, such as social exclusion. Jens and Kozak (2013) suggest that ''the claims are that compact urban forms are spatially sustainable, environmentally sound, efficient for transport, socially beneficial and economically viable.''

Fig. 1.15 - Guangzhou Port in the 1800's. Source: *Tai, Y. (2018)*

Fig. 1.16 - Production along water in housing district, Redhill,Singapore. Source: *Archdaily.*

Fig. 1.17 - Guangzhou's water ponds. Source: *Foshan News.*

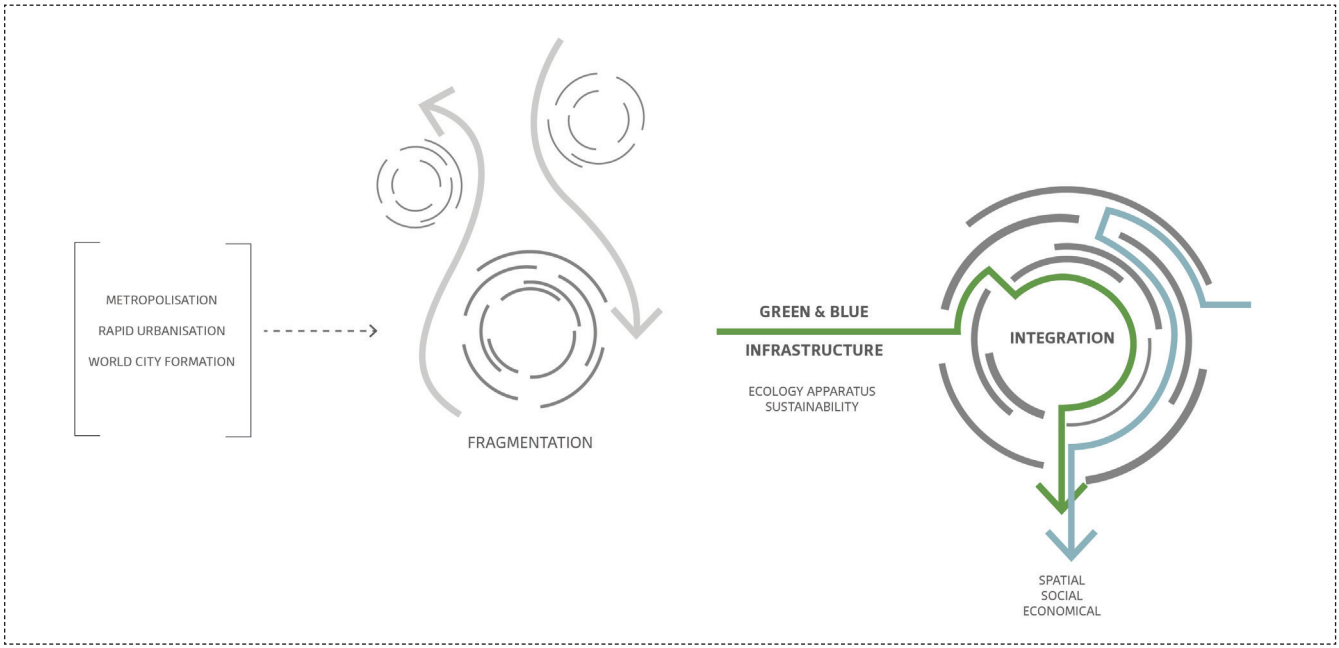


Fig. 1.18 - Schematic diagram, summary of the theoretical underpinning. Illustration by authors.

Working Hypothesis

If the current development model of Pearl River Delta Region is transformed to strengthen its existing economic nodes by interweaving the of the Green and Blue infrastructure, then PRD will achieve socio-spatial integration through adaptation.

1.3 BALANCED DEVELOPMENT

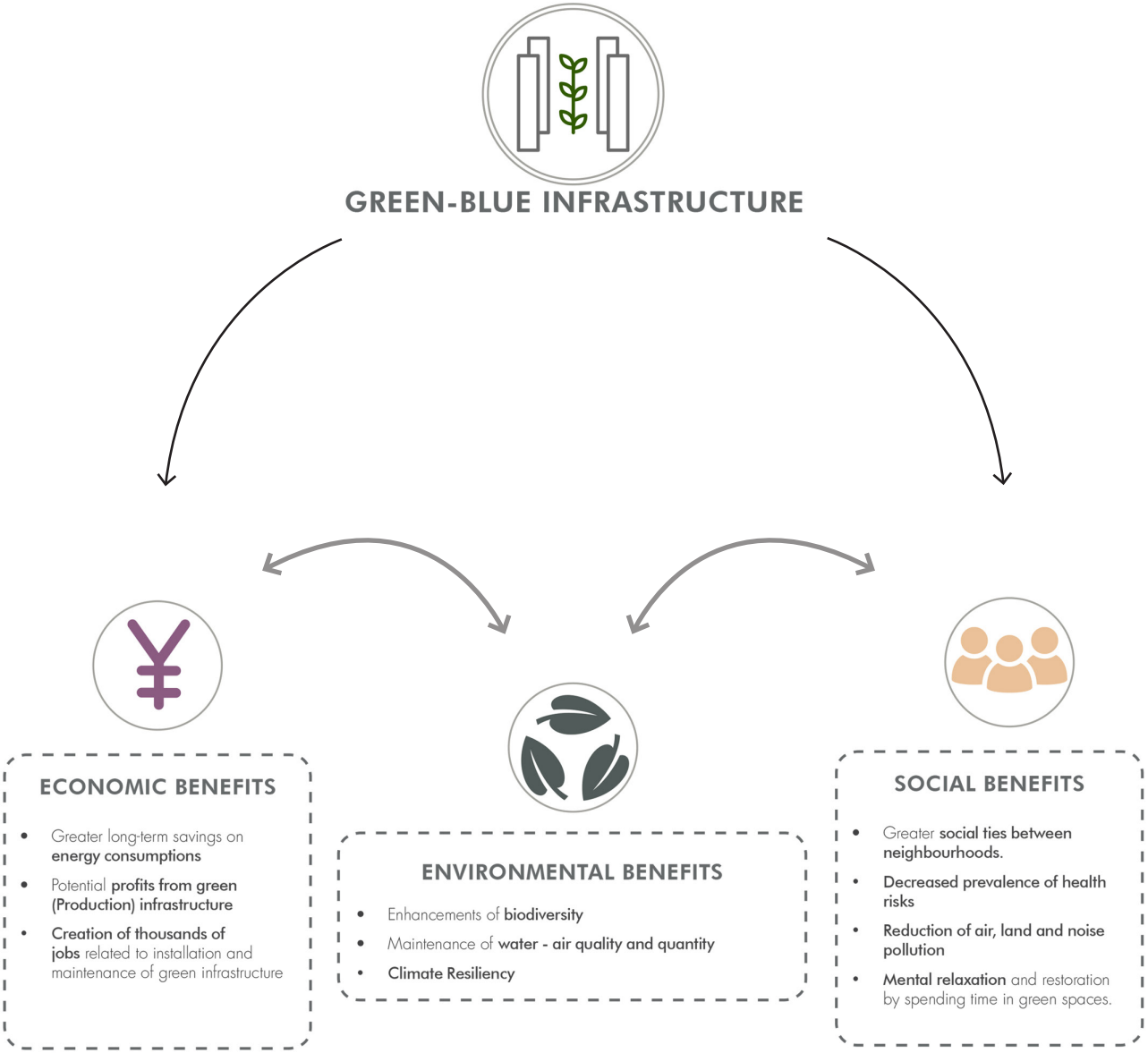
On which terms should integration happen, and which spheres should be involved in the process? Indeed, If Green and Blue infrastructure is intended as powerful influence for future development, then it should exceed the limitations of purely environmental urban planning. On the other hand, it should also avoid the exclusion of certain social groups due to increased value or spatial inaccessibility. For this, environment, economy and society need to be balanced, leading to an overall sustainable development.

In other words, the economy should not be separated from the ecological and the social aspects of urbanity. Economic growth that damages ecology and society is ultimately un-economic growth- one that is unsustainable in the long term.

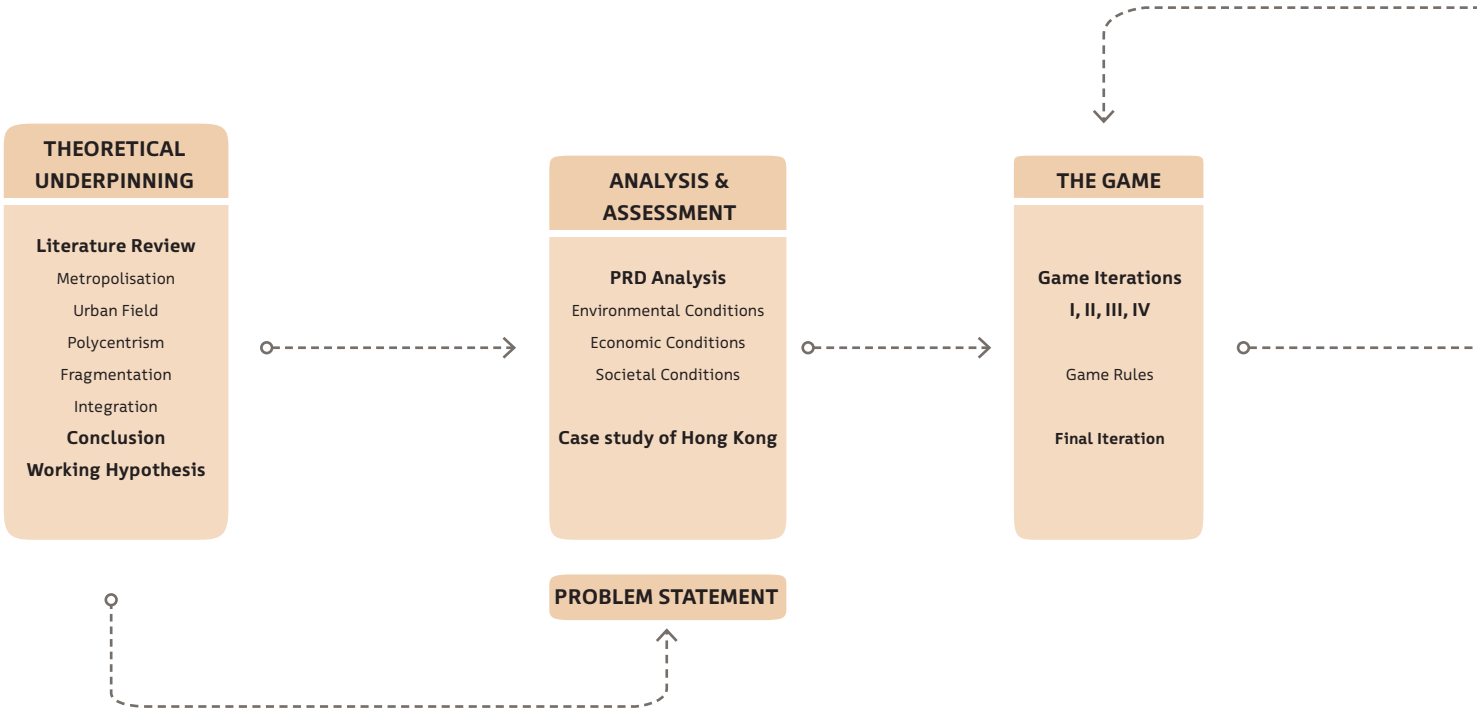
It is, in fact, the limits of natural capital, rather than those of industrial and technological innovation, that are becoming the true limits to prosperity. What is critical here is not just the depletion of natural resources, but the loss of the service these resources supply in helping to sustain urban environments.

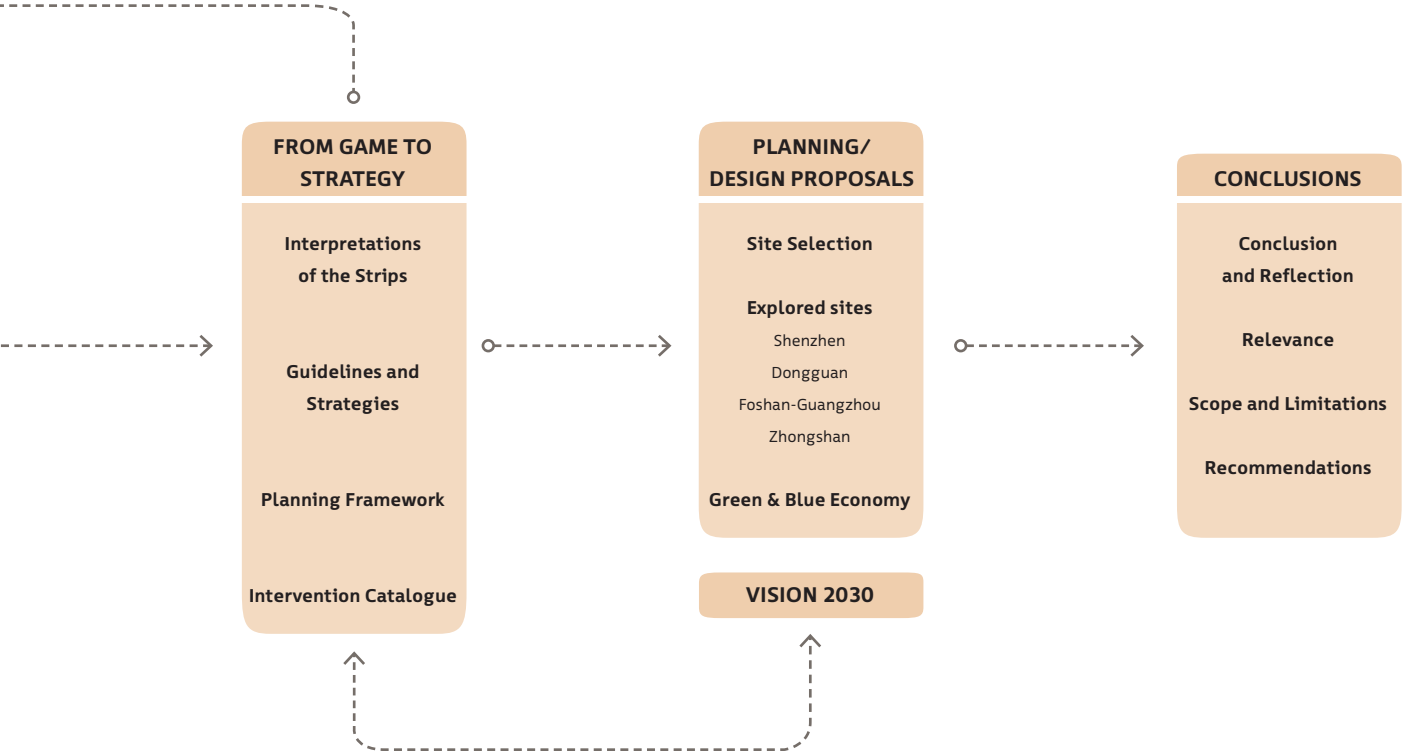
Over the last 20 years, this attempt to highlight the financial potential of green and blue structures has been given the term “ecological economics” (Costanza et al., 1997). This abstract idea can, however, be manipulated according to the political objectives of given public or private players.

In sum, the project attempts to establish social and environmental constraints within which economic development should take place and not the other way around. The highest principle is to establish how the local inhabitants can be best benefited from ecology infrastructures, and then how that can pay contribution to the local and regional economy.


GREEN-BLUE INFRASTRUCTURE
ECONOMIC BENEFITS
Greater long-term savings on energy consumptions
Potential profits from green (Production) infrastructure
Creation of thousands of jobs related to installation and maintenance of green infrastructure
ENVIRONMENTAL BENEFITS
Enhancements of biodiversity
Maintenance of water - air quality and quantity
Climate Resiliency
SOCIAL BENEFITS
Greater social ties between neighbourhoods.
Decreased prevalence of health risks
Reduction of air, land and noise pollution
Mental relaxation and restoration by spending time in green spaces.

1.4 METHODOLOGY




FROM GAME TO STRATEGY
Interpretations of the Strips
Guidelines and Strategies
Planning Framework
Intervention Catalogue
PLANNING/ DESIGN PROPOSALS
Site Selection
Explored sites
Shenzhen
Dongguan
Foshan-Guangzhou
Zhongshan
Green & Blue Economy
VISION 2030
CONCLUSIONS
Conclusion and Reflection
Relevance
Scope and Limitations
Recommendations

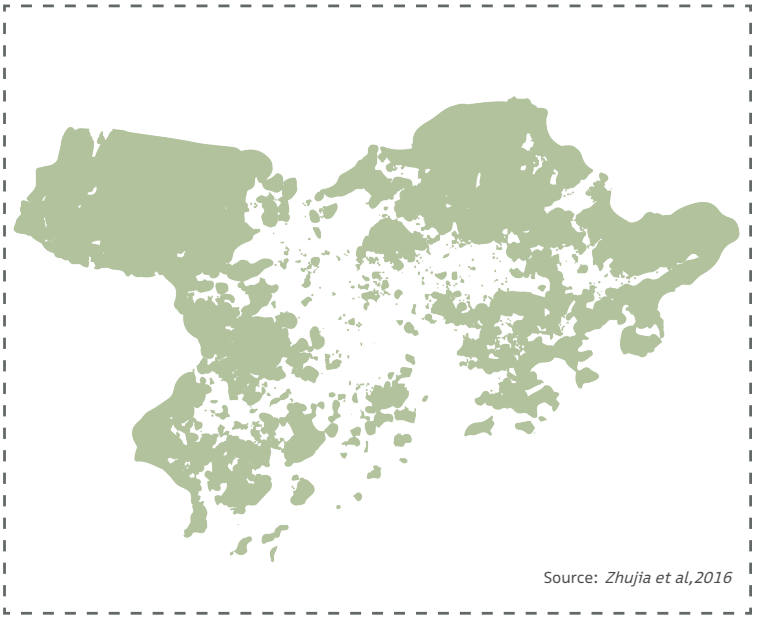
2

ANALYTICAL FRAMEWORK

The analysis in this following chapter has been streamlined and influenced by the direction of the theoretical underpinnings and hypothesis developed in the previous chapter.

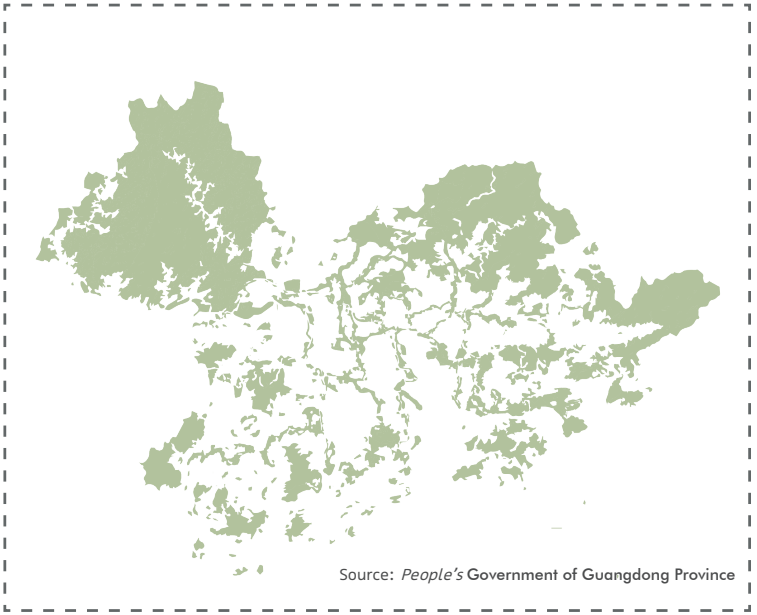
The mappings are done to help us to better understand the existing situation of the Pearl River Delta while also using one case study, in Hong Kong. The Special Administrative Region of Hong Kong was chosen firstly because it foreshadows a direction some cities might venture in pursuit of development. While it is the financial powerhouse of the region, the quality of life differs dramatically among the society. Secondly, Hong Kong was chosen because, as the analysis will prove, it is an interesting case where although the green and blue elements are abundant, they not easily accessible from the urban environment.

Proposed regional green-way network master plan for the Pearl River Delta proposed by the Government of Guangdong Province



Source: *Zhujia et al,2016*

The remaining forest land area in 1979.



Source: *People's* Government of Guangdong Province

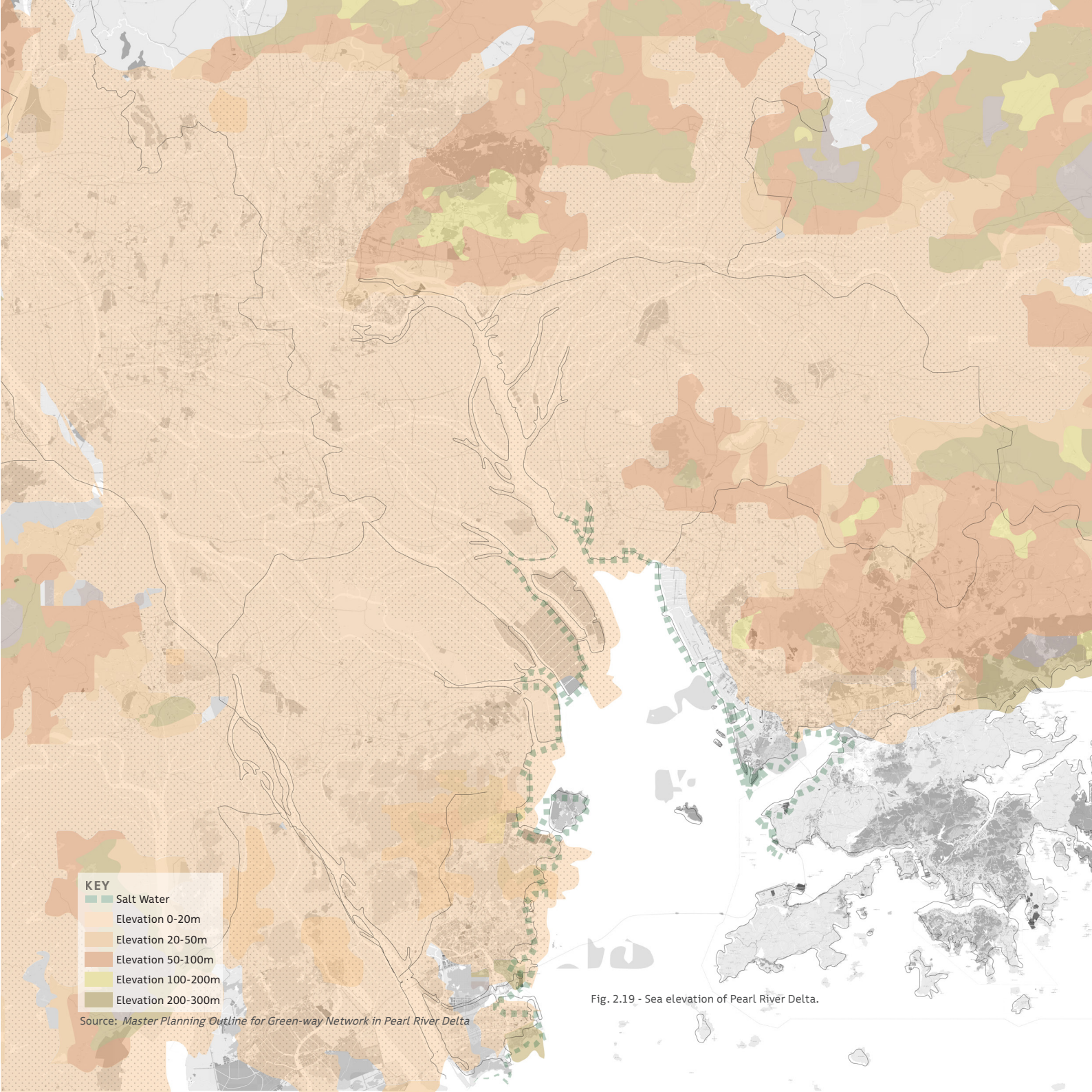
Proposed regional greenway network masterplan for the Pearl River Delta proposed by the Government of Guangdong Province

2.1 PRD ANALYSIS

2.1.1 Green Fragmentation

Green areas have been shrinking and stripped to service spaces for infrastructures, urban living and industries; all in support of economic growth. The depletion of green space results to depleted the quality of all living life in the area. Such areas are also at a disadvantage as the ecosystem services such as carbon sequestration and climate regulation that were once provided by their environment are erased.

Upon seeing the impact the shrinking green space and understanding the benefits of an interconnected green spaces, the People's Government of Guangdong Province has made a master plan proposal the Pearl River Delta greenway network. Intended to protect ecological corridors through the establishment of green corridors and have bicycle paths that goes thought ecological corridor enhancing the interaction between people and green areas, to expose them to nature and persuade them to protect their natural landscape. Although it has not been fully realised, it serves as an important step forward.



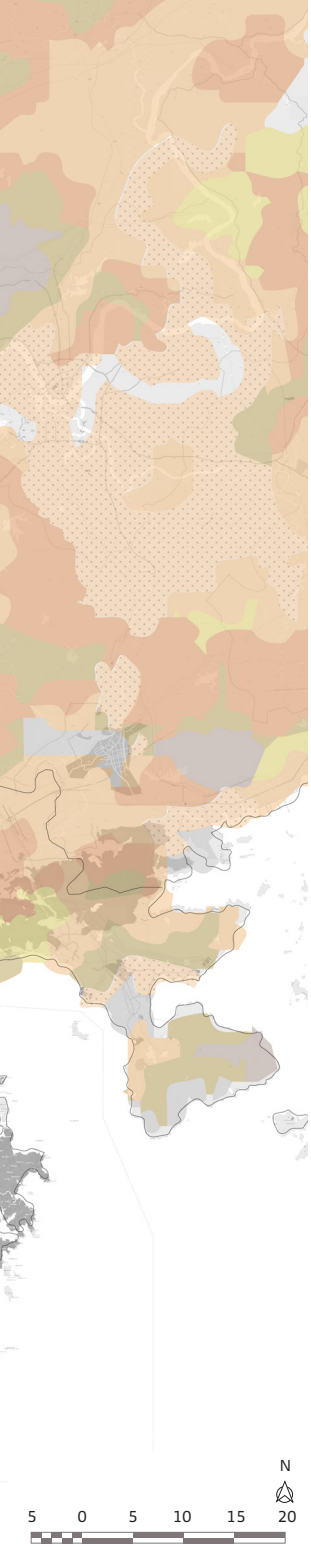
Source: *Master Planning Outline for Green-way Network in Pearl River Delta*

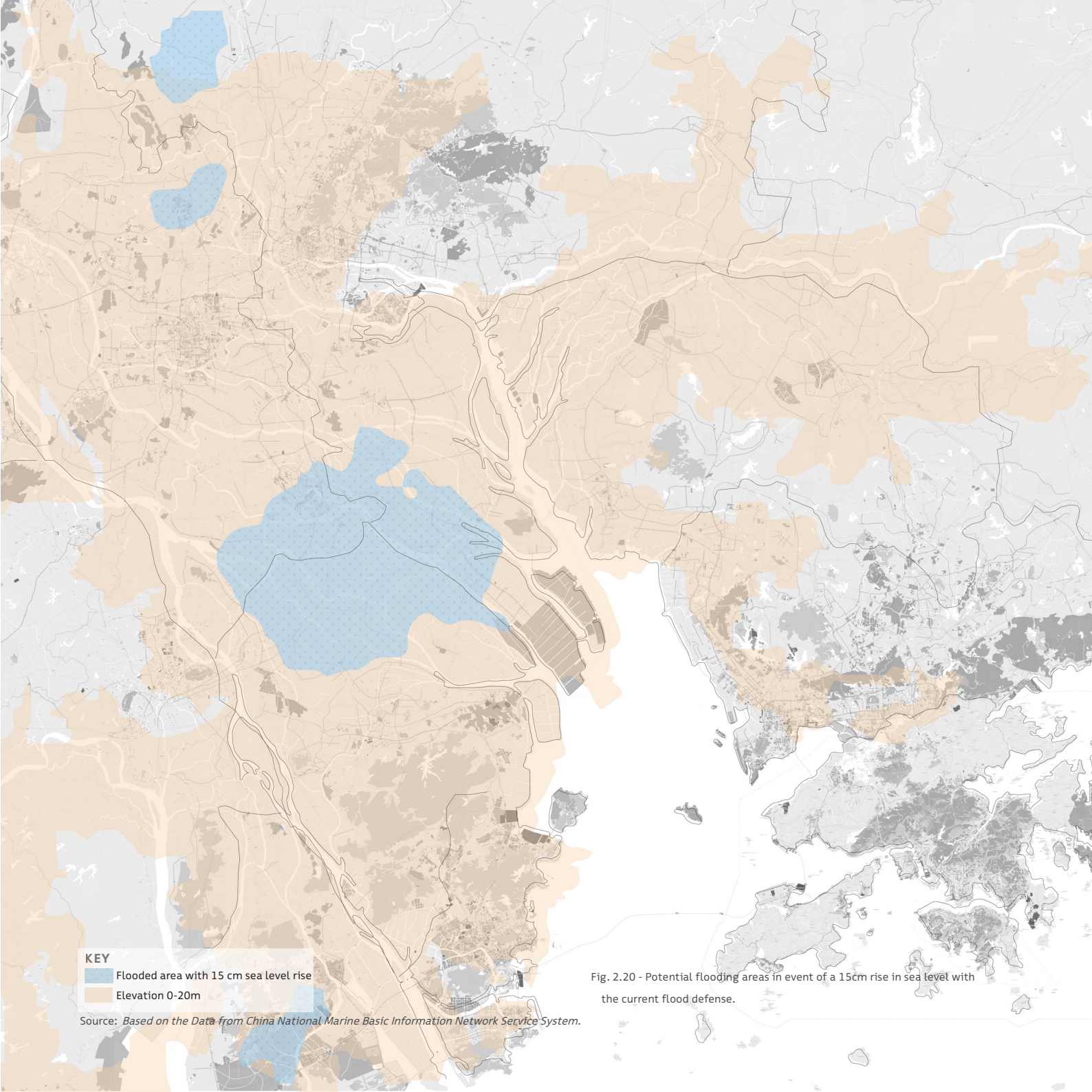
Fig. 2.19 - Sea elevation of Pearl River Delta.

PRD ANALYSIS

2.1.2 Delta Elevation

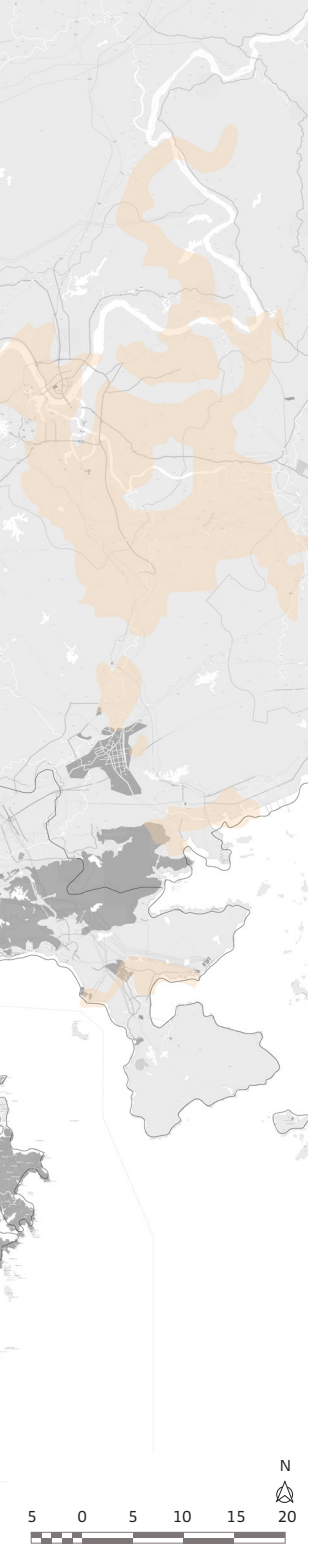
Much of the Greater Bay area lie between 0-20m above sea level. The north, west and east rivers from the mainlands feeds the delta with 340 billion cubic meter of rainwater yearly. The delta supports one of the most diversified agricultural areas in the world, with agriculture ranging from paddy, sugarcane and fruit horticulture, and dike-pond agriculture-aquaculture. But this fertile low laying area is also home to one of the most densely urbanized regions in the world.





Source: *Based on the Data from China National Marine Basic Information Network Service System.*

Fig. 2.20 - Potential flooding areas in event of a 15cm rise in sea level with the current flood defense.



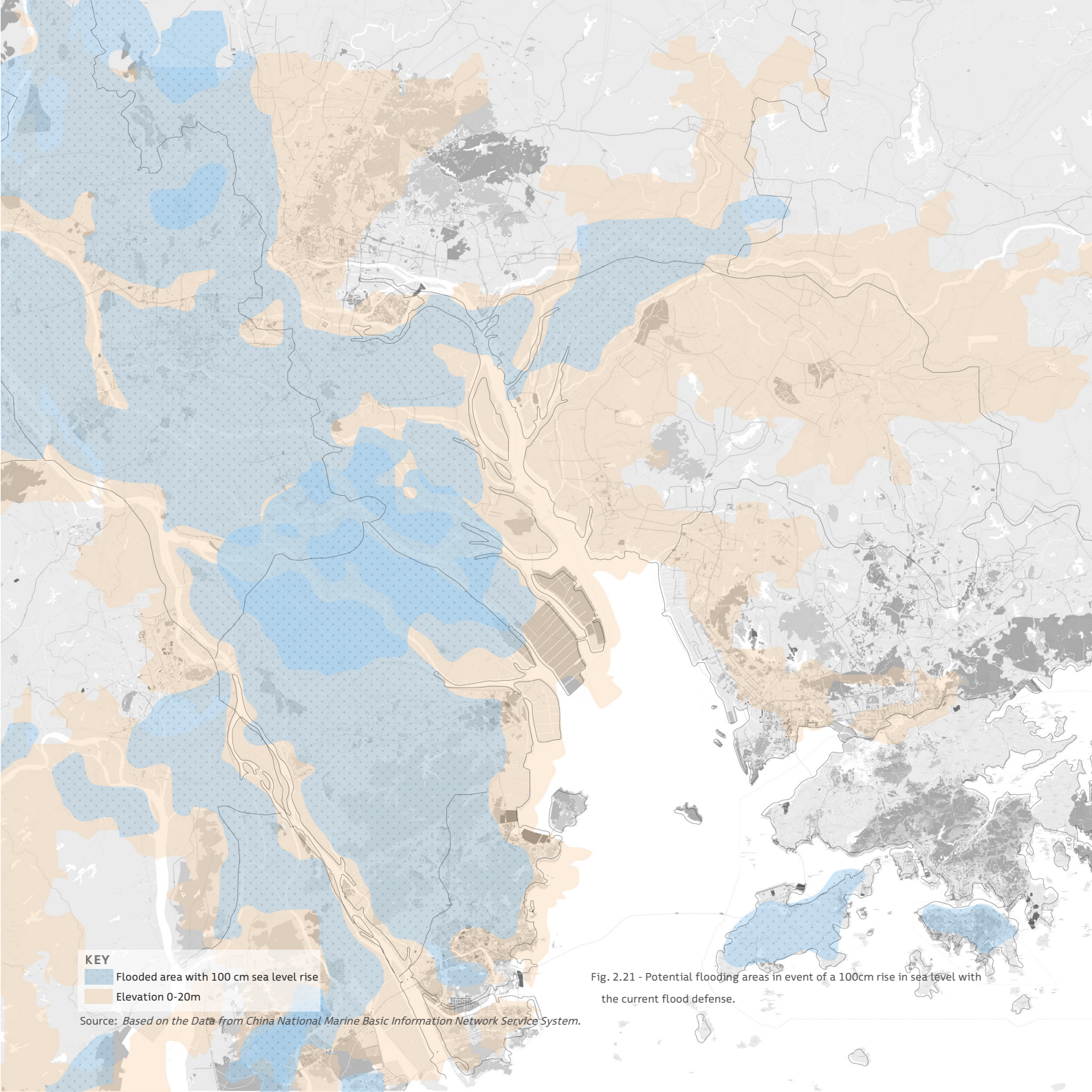
Fragments of parcel in the midst of an urbanized areas and a river.

PRD ANALYSIS

2.1.3 Potential flooding areas in event of a 15cm rise in sea level with the current flood defense.

The Greater Bay Area is located in the low-lying area of the Pearl River estuary. Water and sedimentation from the rivers up north and on the west side constantly moving this low-lying region, making the soil fertile and suitable for agriculture. As the different cities shifted from agriculture to heavy industries, the urbanisation process shifted the fluvial flooding to pluvial flooding in these cities. Along with the rise of climate change and the decline of natural coastal defences, coastal flooding has also become an urgent issue in need of tackling by the government and people living in the area.

The flooding seen in an event of 15cm sea level rise will affect potentially 1642km2 of area, majority in the low-lying area of Foshan and Zhoshan.



Source: *Based on the Data from China National Marine Basic Information Network Service System.*

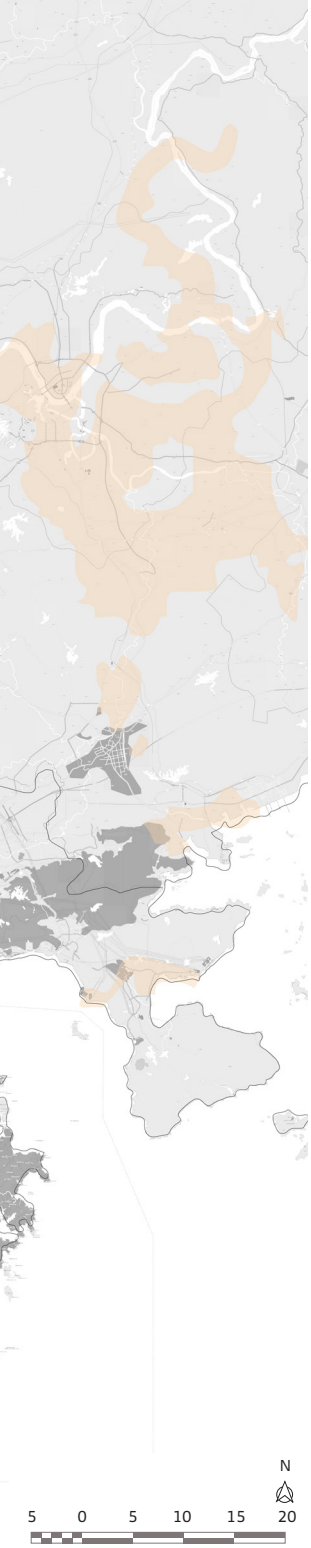
Fig. 2.21 - Potential flooding areas in event of a 100cm rise in sea level with the current flood defense.

PRD ANALYSIS

2.1.4 Potential flooding areas in event of a 100cm rise in sea level with the current flood defense.

Oxford dictionary definition of flood - an overflow of a large amount of water beyond its normal limits, especially over what is normally dry land. This common definition by dictionaries and of people is very much an anthropological view on how we humans think nature should behave. Prior to major human settlement in this area, the porosity of land allowed water and sediments to constantly shift, making the area constantly wet and dynamic. Water flows in the delta region like the blood in our capillaries.

With the lost of permeable surfaces, water bodies and network and natural defence against the impact of climate change if there is an 100cm rise in sea level, approximately 7823km2 of area will be affected.



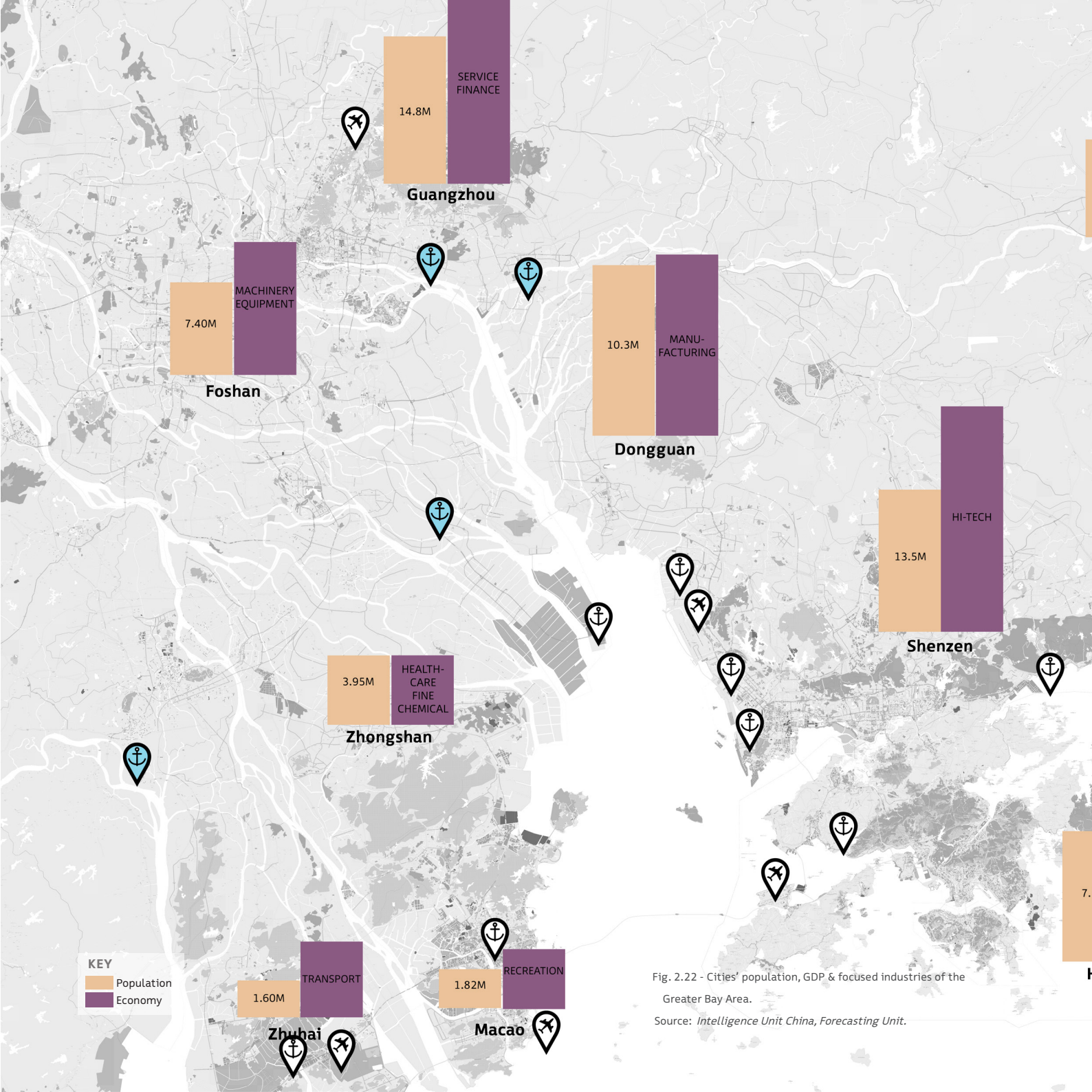


Fig. 2.22 - Cities' population, GDP & focused industries of the Greater Bay Area.

Source: *Intelligence Unit China, Forecasting Unit.*

PRD ANALYSIS

2.1.5 Cities' population, GDP & focused industries of the Greater Bay Area

Concerning its size, the Greater Bay Area is one of the most important city clusters in the world, and – due to favourable economic prospects – it is expected to strengthen further. The most important question from the region's aspect is how successfully the integration of the cities can be deepened. Factors that support cooperation include the different specialisation of the cities, the significant infrastructural investments and political will, while challenges to be overcome are posed by strong internal division, differences among the cities and the deficiencies of the Chinese legal system that all create obstacles in the way of the free flow of services, workforce, capital and information.

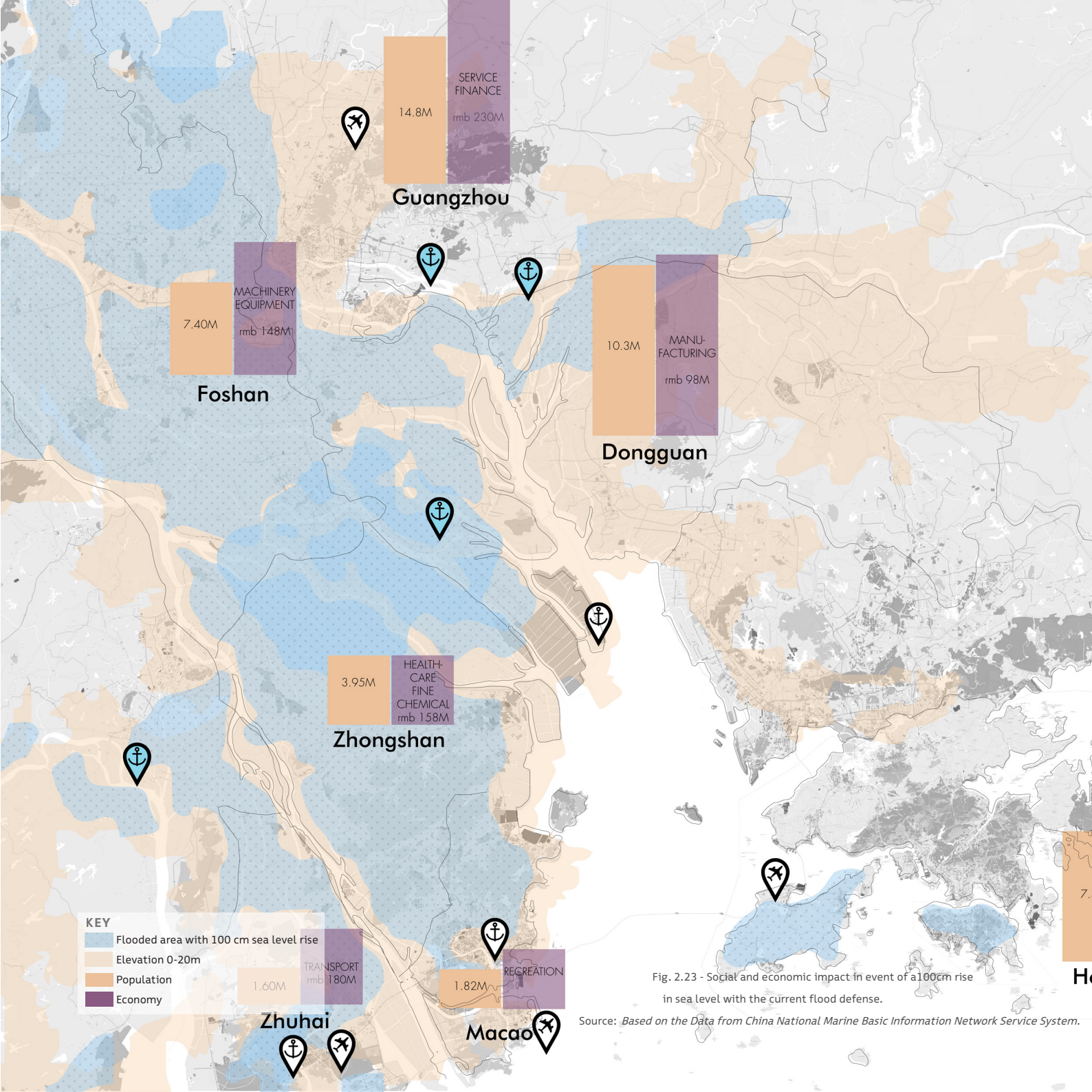


Fig. 2.23 - Social and economic impact in event of a100cm rise in sea level with the current flood defense.

Source: *Based on the Data from China National Marine Basic Information Network Service System.*

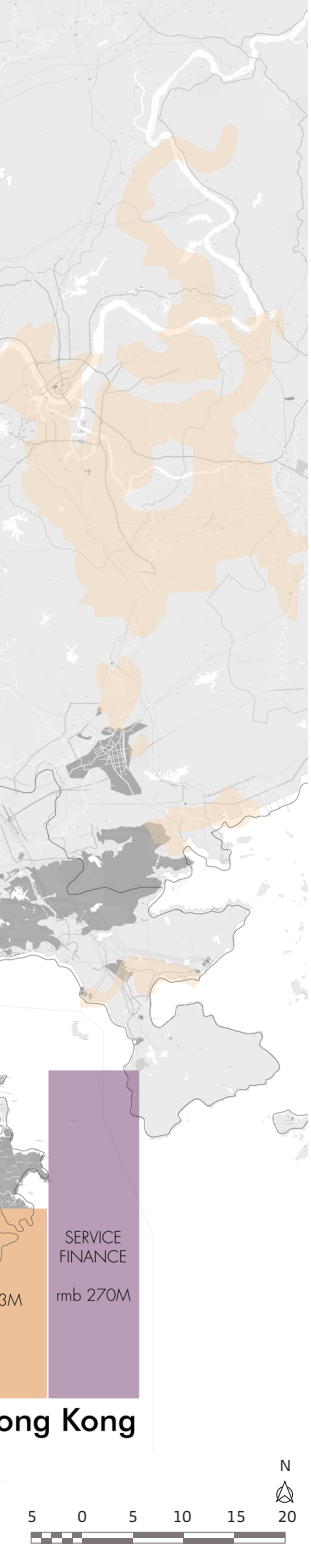
PRD ANALYSIS

2.1.6 Affect population and industries in event of a 100cm rise in sea level with the current flood defense.

The increase of human activities in the delta region unfortunately hinders the dynamism of the water and the disruption of flow results in water occupying area not welcome by people and development.

While the previous map show the rising economical and labour potential of all the different cities in the Greater Bay Area, this one lays out a rough figure of potentially how many lives and livelihood that will be affected in the event of 100cm water level rise in the current situation.

Do we fight go against the flow of nature or do we go along with it? If we go along with the flow, how do we do it without the loss of lives and livelihood and while mutually benefiting from it?



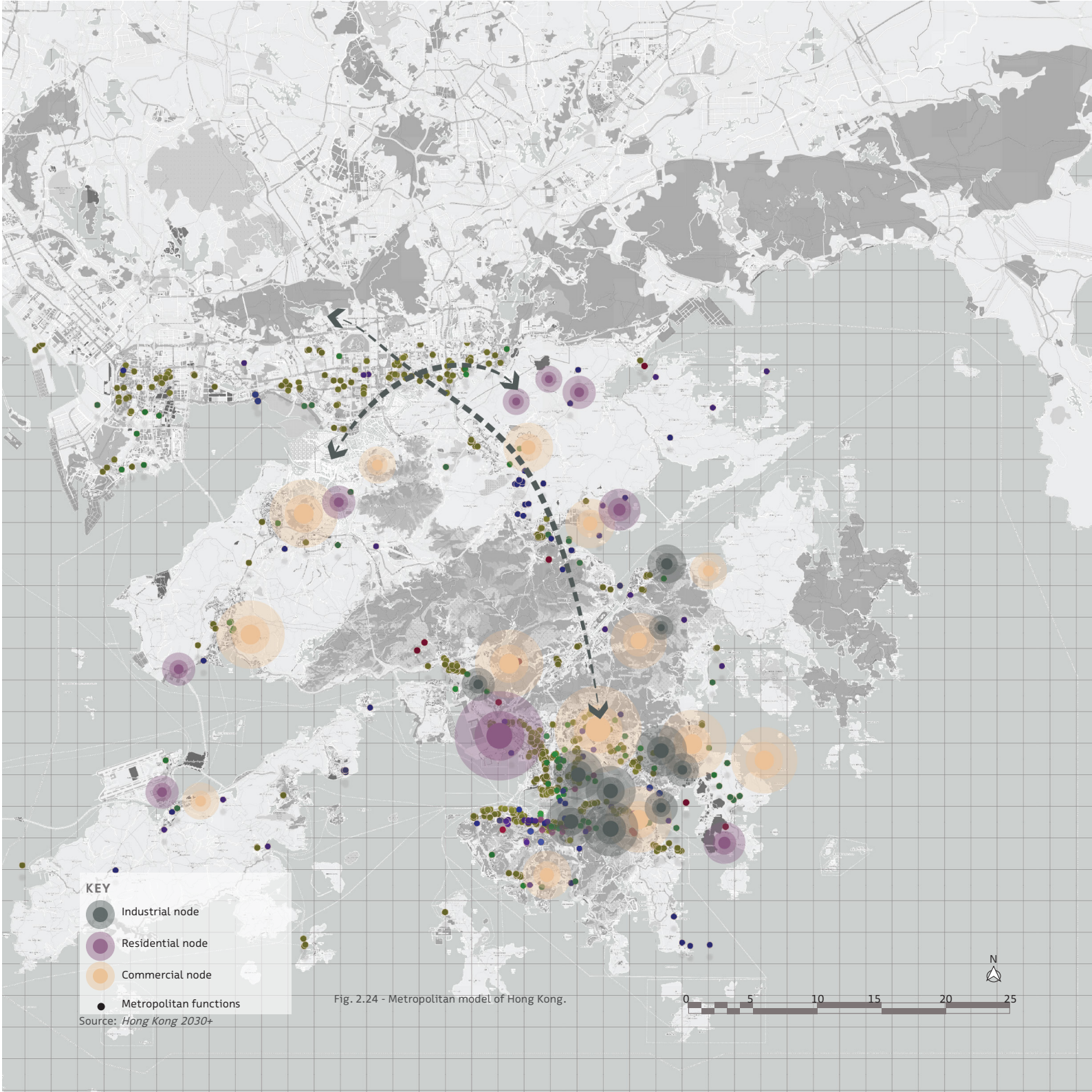
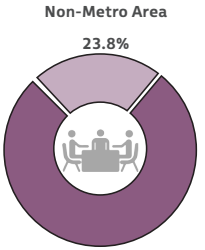


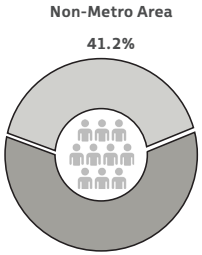
Fig. 2.24 - Metropolitan model of Hong Kong.

Source: *Hong Kong 2030+*

2.2 CASE OF HONG KONG

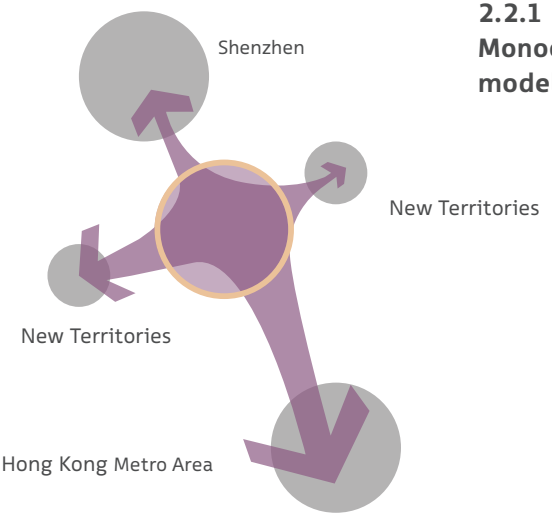
2.2.1 Hong Kong Case Study: Monocentricity Economic model of Hong Kong

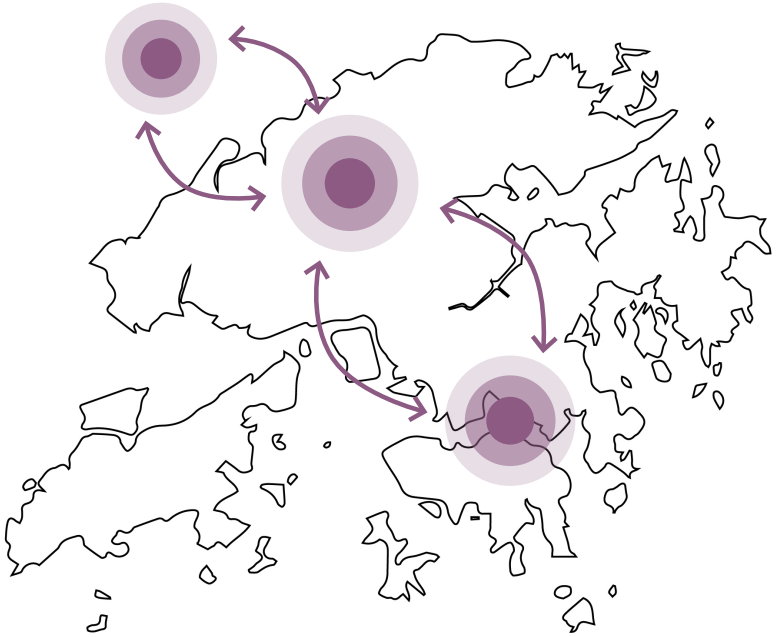




Total Population: 7.24M

Total Number of Jobs: 3.75M





If economic opportunities are distributed within a polycentric model across Hong Kong while implementing complementary metropolitan function, the new development will become a prominent node in the regional network.

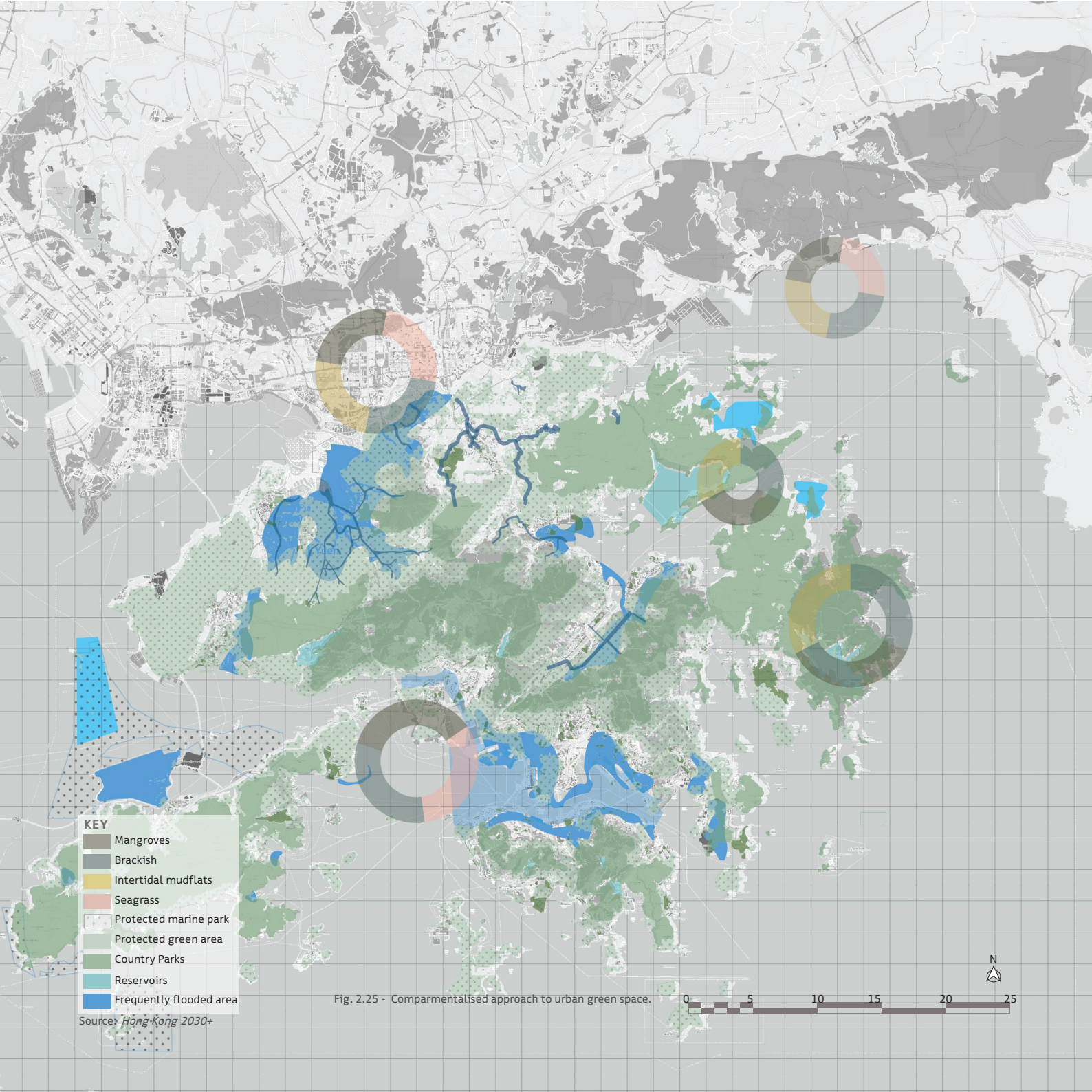
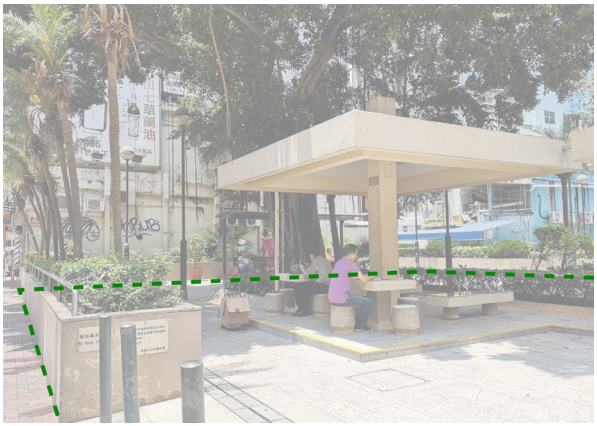


Fig. 2.25 - Comparmentalised approach to urban green space.

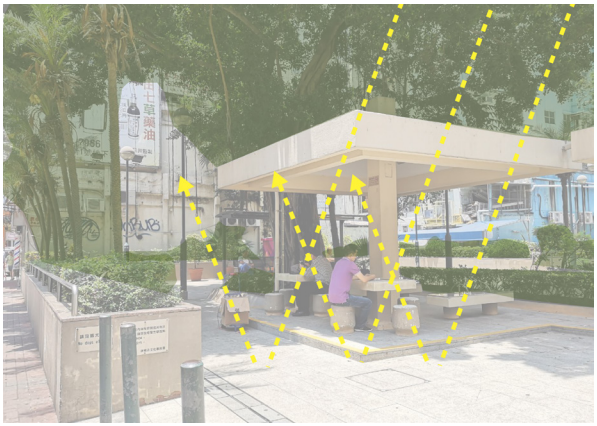
Source: *Hong Kong 2030+*

CASE OF HONG KONG

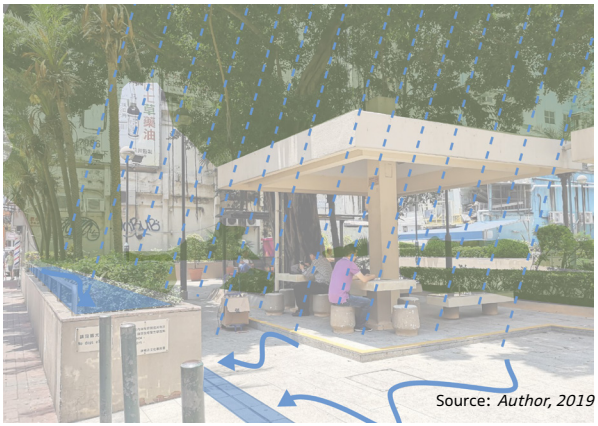
2.2.2 Hong Kong Case Study: Compartmentalised treatment of nature and urbanism in Hong Kong



Parks and open spaces mostly comprise of hard paved surfacs with peripheral greenery. or manicured greenery.



Hard surfaces in these parks and open spaces often absorb the heat from the sun and/or reflect it onto the surrounding area.



Source: *Author, 2019*

Spaces are mono-functional and design for efficiency of urbanised city. Rainwater is directly channelled into the drain after flowing away from the hard surface of the park to be emptied into the sea.

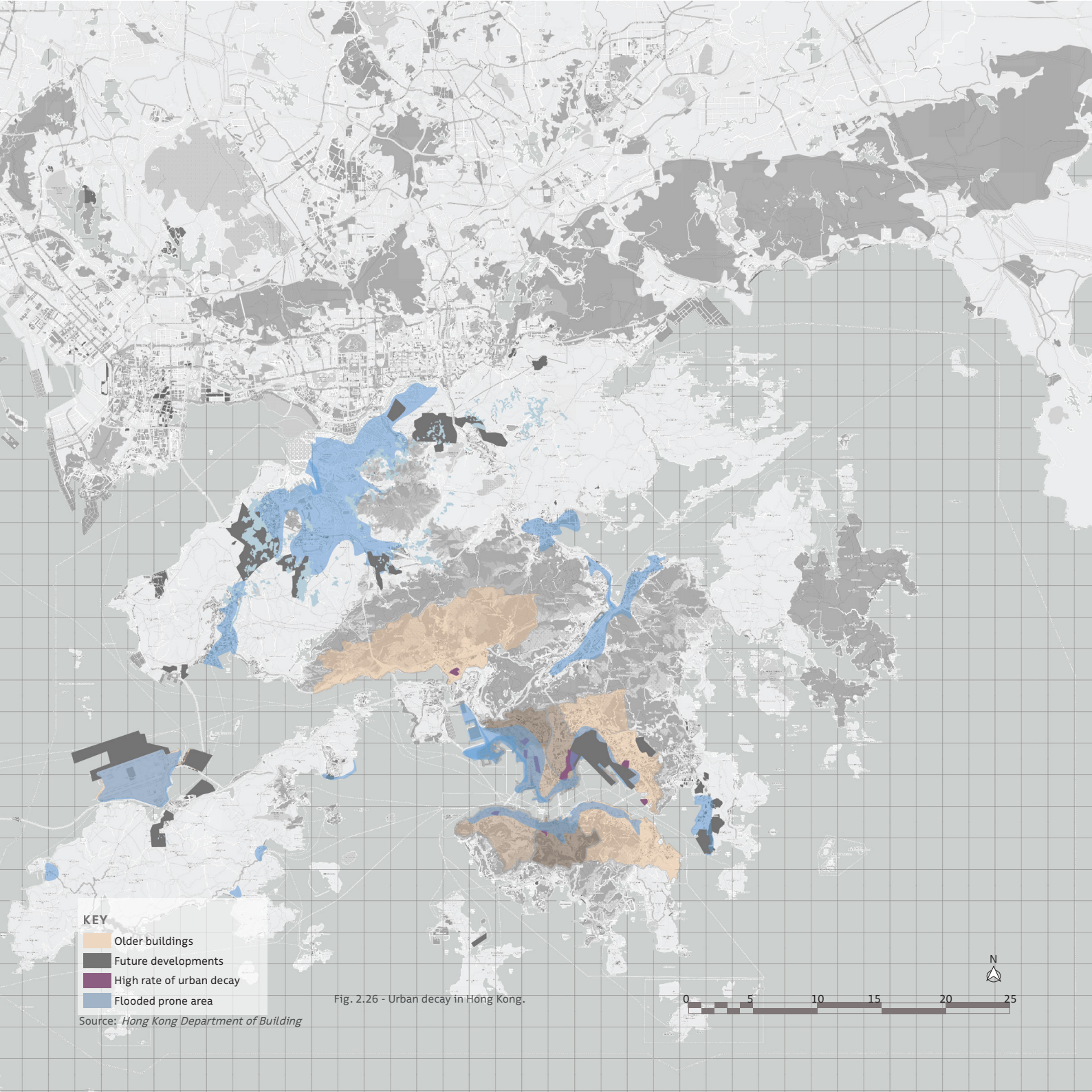
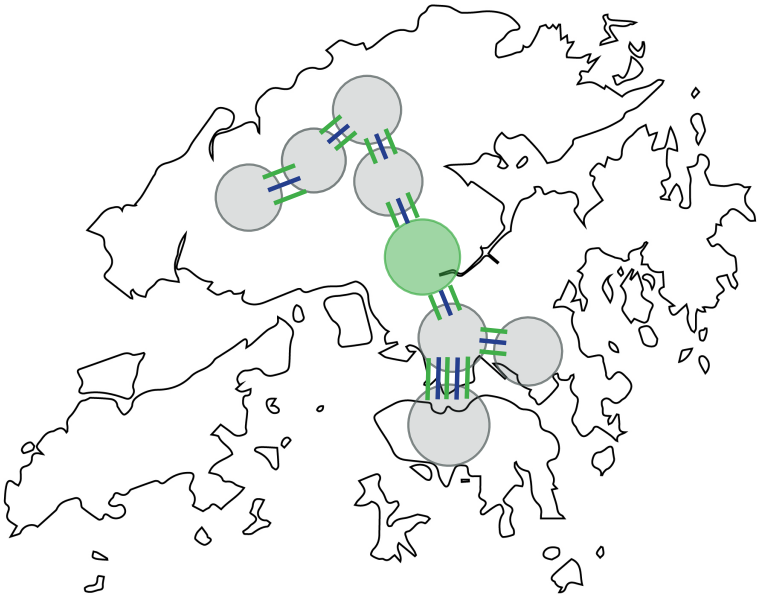


Fig. 2.26 - Urban decay in Hong Kong.

Source: *Hong Kong Department of Building*

Old and worn apartments block in Hong Kong.



If the green and blue (infra)structure intervenes with the urban fabric, it will be the connecting element that revives and counteracts urban fragmentation.

CASE OF HONG KONG

2.2.3 Hong Kong Case Study: Urban decay in buildings in Hong Kong

Effects of climate changes such as flooding and urban heat island effect have detrimental impacts to cities and people experiencing them. Many high rise apartments in Hong Kong are visibly worn. It is estimated by the Building Department of Hong Kong that number of buildings aged 40 years will increase by about 600 of them. Apart from being old and ill equipped to deal with the effects of climate change many of these apartment units are illegally subdivided.

New developments are underway and many are located in existing flood prone areas. Some of the areas where there are new developments and flood prone areas overlap were land previously agriculture and mostly aquaculture farmland that were sold off to developers as farming became economically unsustainable. So instead of managing impacts of climate change with band-aid remedies or completely ignoring it and letting the vulnerable suffer, can Hong Kong develop a development model that address the climate and environmental issues and the socio-economically predicament of the lower income.

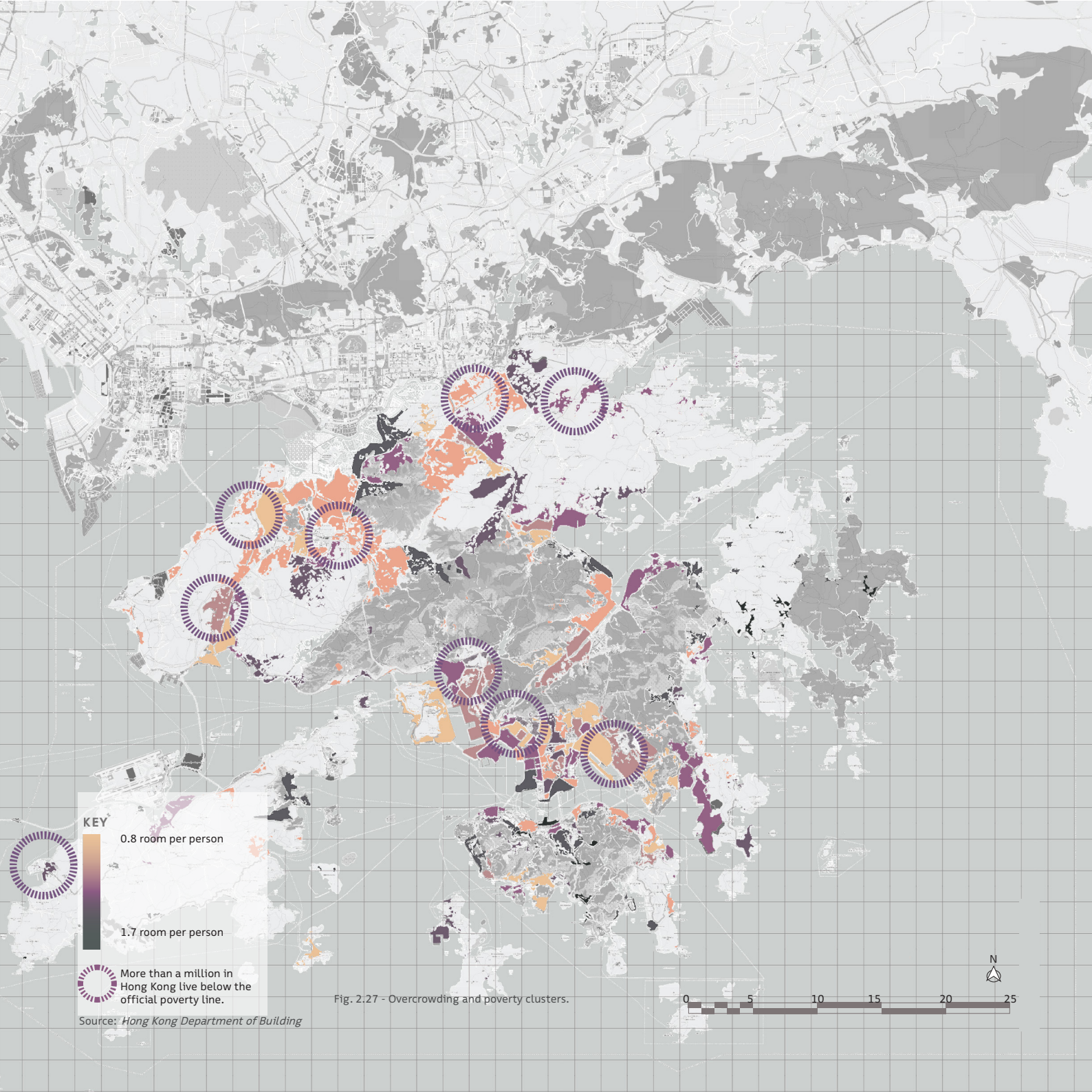


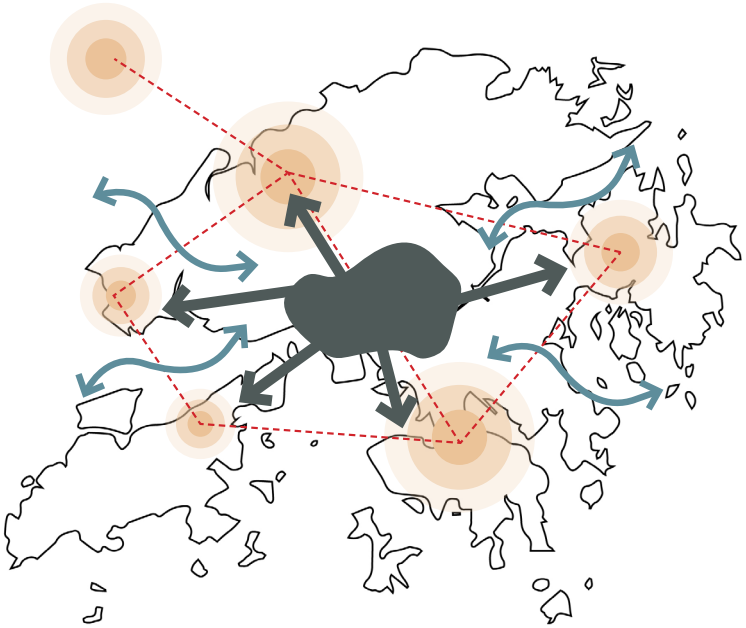
Fig. 2.27 - Overcrowding and poverty clusters.

Source: *Hong Kong Department of Building*

CASE OF HONG KONG

2.2.4 Overcrowding and Porverty

Apartments around the business district area not only are older, they also have higher number of occupancy, indicating the presence of the subdivided units. They are commonly found nearer to the business area as it is more economical to stay in these tiny homes than to stay in elsewhere and travel to place of employment. Although homes in the north are newer there are still occurrences of poverty. This is due to the monocentricity of the economy model of Hong Kong where 76% of jobs situated in the metro area.



If the current metropolis model is transformed to strengthen existing nodes, interweaving the green and the blue structure, then Hong Kong will achieve socio-spatial integration through adaptation.

2.3 PROBLEM STATEMENT

2.3.1 Current Development Trends

Metropolisation

The process of Metropolisation is evidently visible in the Pearl River Delta Region because of its qualitative transformation of the cities within the PRD, both functionally and morphologically in to big large continuous cities.

Due to the process of metropolisation certain large cities weigh large distribution of metropolitan functions as well as population.

The functional combinations of these large metropolitan cities generate re-composition in urban morphology. Apart from the issue of urban sprawl, metropolisation leads to formation of discontinuous and heterogeneous internal structure. The peripheral areas are generally low density and posses secondary centralities. The Combination of these processes lead to formation of fragmented urban sprawl.

Rapid Urbanisation

By 2050 more than two-third of the world's population is estimated to be living in urban areas (UN report, 2018) This rapid urbanisation will mainly happen in Asian and African countries. Although urbanisation generates more GDP, it comes with several challenges.

It is estimated that urban expansion will lead to formation od slums, economic disparities and unsanitary living conditions

Rapid urbanisation is also linked to several environmental concerns. With non-sustainable urbanisation of coastal cities, natural disaster risks such as storm, cyclones and floods have increased by many folds. (UNDP, 2019)

China's rapid urbanisation has also lead to serious environmental pollution. It is estimated that more than 80% of China's coastal water and about 70% of its rivers ad lakes are polluted with industrial waste, raw sewage and agricultural runoff. (Chinadialogue, 2019)

While the process of metropolisation and urbanisation is beneficial for economic prosperity of the region it has lead to several issues such as environmental population, economic polarisation and social segregation.


Largest agriculture exporters
Pollution
World's Factory
Environmental Degradation
Society Health Implication
Urban
Rural

PROBLEM STATEMENT

2.3.2 Mono-centricity in Economy

The Greater Bay Area (GBA), also known as Pearl River Delta (PRD), situated in Guangdong Province in southern China is one of the fastest growing region on the earth.

The free trade policies in SEZs o Hong Kong, Shenzhen and Maccau has lead to tremendous in-flow of economy, increasing GDP of the region. With repaid urbanization and fast changing technology, the economic centers are fomrning clusters within the zones where trading is easier. These policies have lead to polarisation of economy.

While the economic implication of policies has lead to polarisation, there is also a prominent spatial characteristic visible due to this phenomenon. The economic clusters are now located in special mono-centric zones of development. These zones have become the focus for income generation and hence connectivity to them is highly crucial.

With almost 76% of Hong Kong population travelling to the Central District for jobs, there is a pressing need to look into distribution of these jobs and income generation centers. The conditions of other cities with the PRD is no different. Hence the new model for development needs to look into mono-centricity and polarization of economy.

The Hong Kong Metro area accounts for 76% of the employment, while New Territories only 24%

(Hong Kong Planning Department, 2016).

Source: *Finance Feeds,2016, Graphic by Authors*

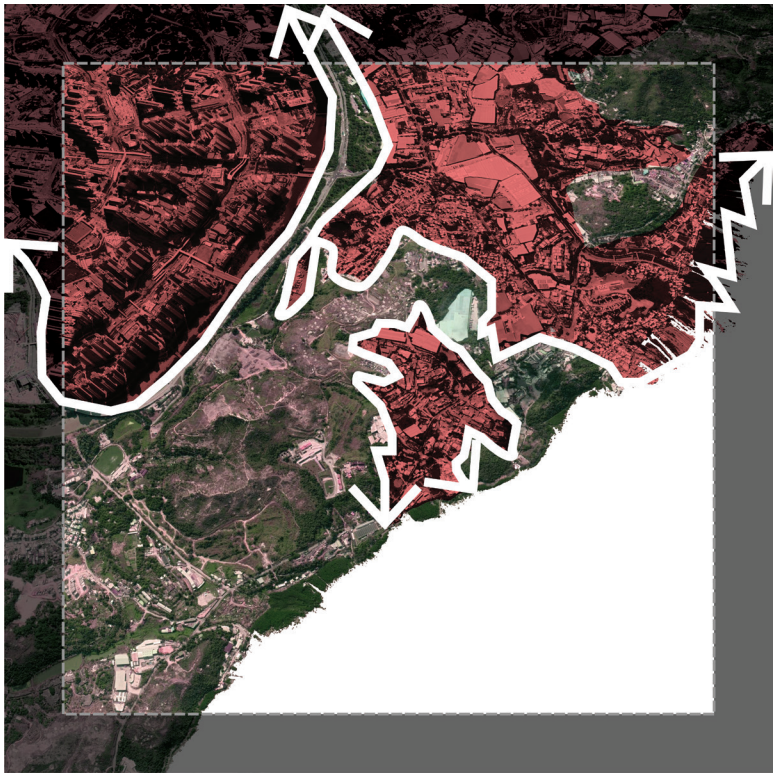
PROBLEM STATEMENT

2.3.3 Urban - Natural Juxtaposition

In the last several decades, unprecedented rapid urbanization has been evident worldwide, characterized by demographic concentration and urban area sprawl (Sato and Yamamoto, 2005). With the expansion of the urbanized areas there has been a trend of fragmentation in the exurban and peri-urban regions.). Globally, the proportion of the urban population has increased from 30% in 1950 to 54% in 2014, and is projected to reach 66% by 2050 (United Nations, 2014).

As understood form the previous analysis, rapid urbanisation has lead to fragmented growth of cities in the Pearl River Delta Region. This fragmented growth and topographical conditions has resulted in to fragment green areas with the region. These fragmented greens are either inaccessible or are not assigned any particular use.

With high amount of fragmented and inaccessible green the urban green within the region is below world standards of 9m^2 per person. This low amount of green leads not only to discontinuous bio-diversity network but also increases social risks like physical health, mental health and lack of community with the society.



Super-dense urban fabric is contrasted with the landscape.

Source: *Google Earth, Graphic by Authors*

PROBLEM STATEMENT

2.3.4 Social Segregation

Chinese metropolis today are experiencing strong social and spatial diversity. There is an evident duality visible in the character of the urban society. On one hand there exists a huge amount of migrant workers who have great difficulty finding housing in the slum like “urban village” and on the other there exists large amount off gated communities of the wealthy group along the periphery of these metropolitan cities.

Urban villages existing as clusters within the urban fabric are faced with challenges as they are a short term response to the housing market with poor planning. With increasing disparity and economic difference with these social groups, bringing this socio-spatial segregation become highly crucial.

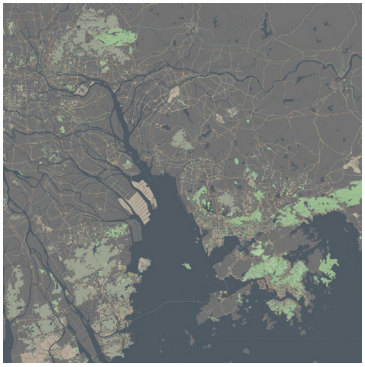
Residences, which are built on the edges of cities and even in the centre, as in Guangdong, remain closed in on themselves, clearly demarcated by boundary walls or railings, and even have video surveillance systems or guards. (J. Doulet, 2008) Poor liveable areas with incredibly dense and stacked residential complexes are faced with conditions of urban decay and poor liveability.

Thus green - blue integration with these neighbourhoods shall help in development of common grounds between various social groups , leading to harmony within the community.

The Urban Villages could be described as social heterotopias, secluded from their surroundings.

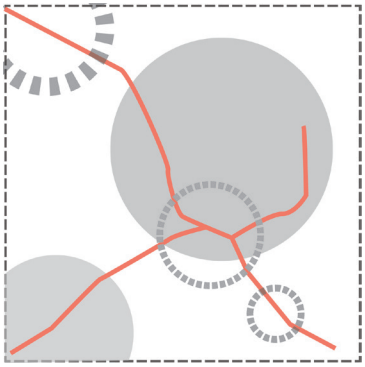
Source: *Maurice Veeken, Graphic by Authors*

2.4 DEVELOPMENT APPROACH

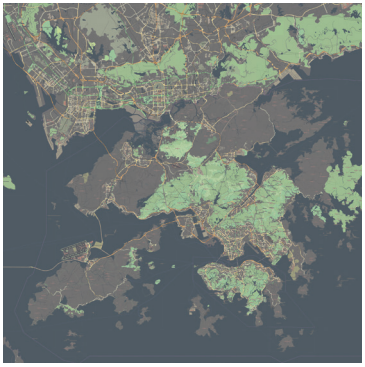


The Greater Bay Area

- Adapting poly-centricity at different scales
- Creating highly connected network of nodes

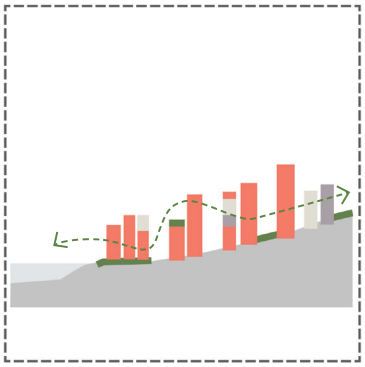


The future development with the region aims to achieve integration in economic, social and spatial aspects. For this with approach the issue with integration of green and blue infrastructure to bind the



City Scale

- Integration of Green-Blue Network with dense development.



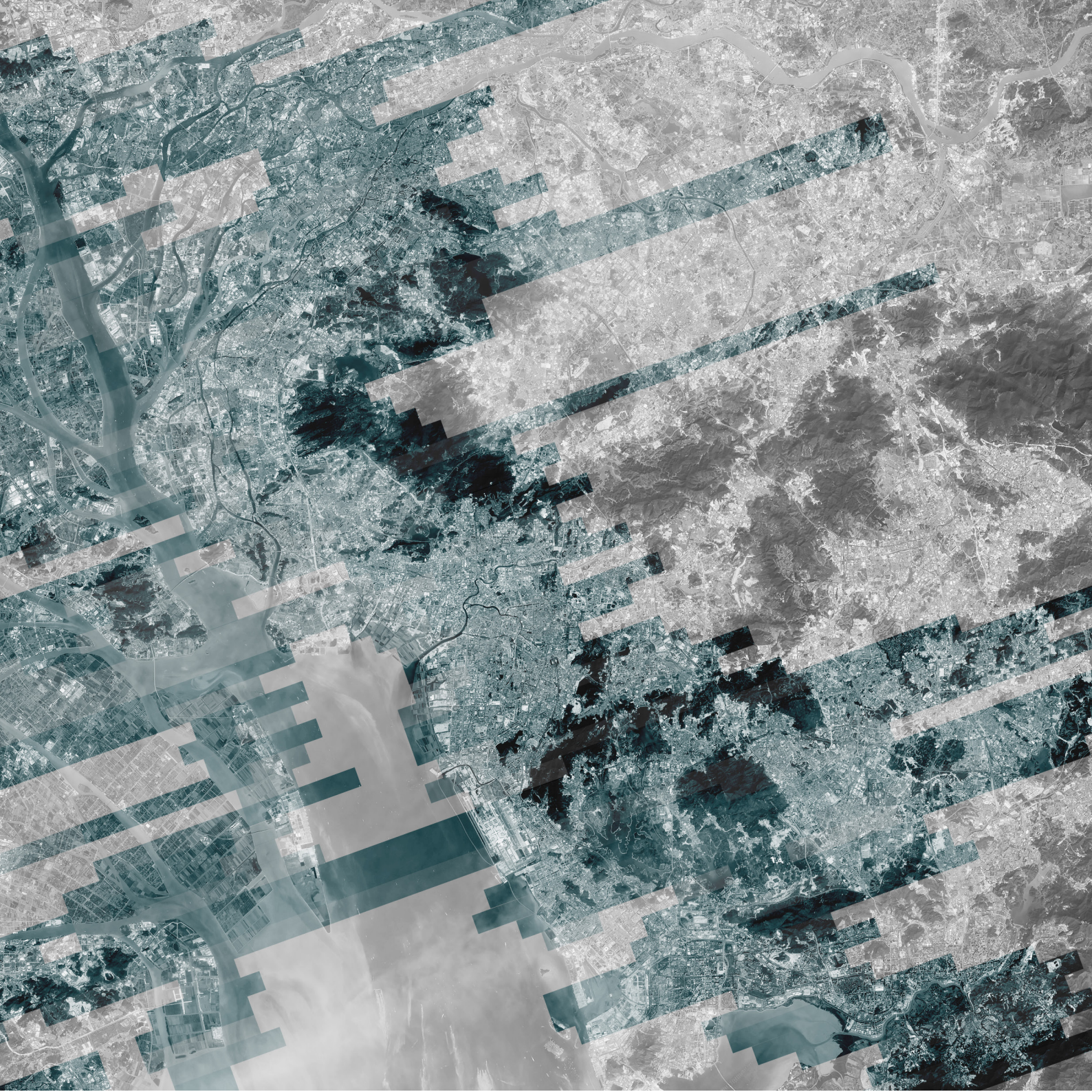
fragmented element at different scales

At regional scale we aim to create several economical clusters with ecological-industrialisation.

Neighbourhood Scale

- Socio-spatial Integration

At the intermediate and local scale the focus remains connecting green-blue networks for ecological and social connects with community centres and pocket parks.



3

THE GAME

This part of the project was mainly produced in collaboration with professors and students from the Polytechnic University of Hong Kong (PolyU), during the Greater Bay Area (ex) Spring School. The theme of this chapter is the strategic game that was unfolded in 5 steps (or Iterations) during the experience in PolyU. The Game playing was an alternative way to represent relational concepts, where both relevant and complimentary elements were mapped.

In this case, the morphological tool of strips was used, as the best medium to convey integration of functional, spatial, social fragments.

Understanding the challenges of PRD during the workshop helped form the final iteration. For this, the analysis presented in the previous chapter proved to be essential.

3.1 GAME ITERATIONS

3.1.1 Game Iteration I

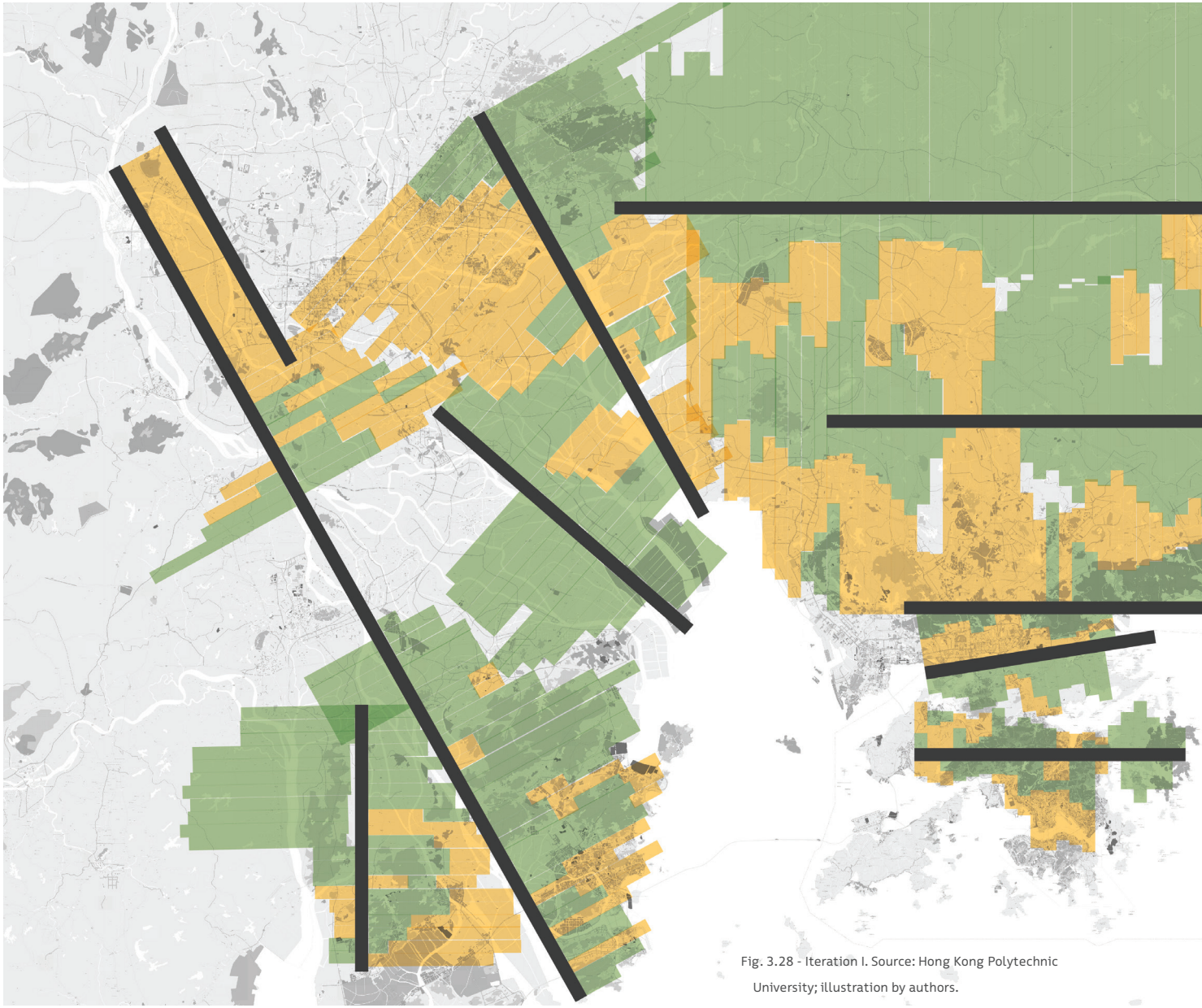
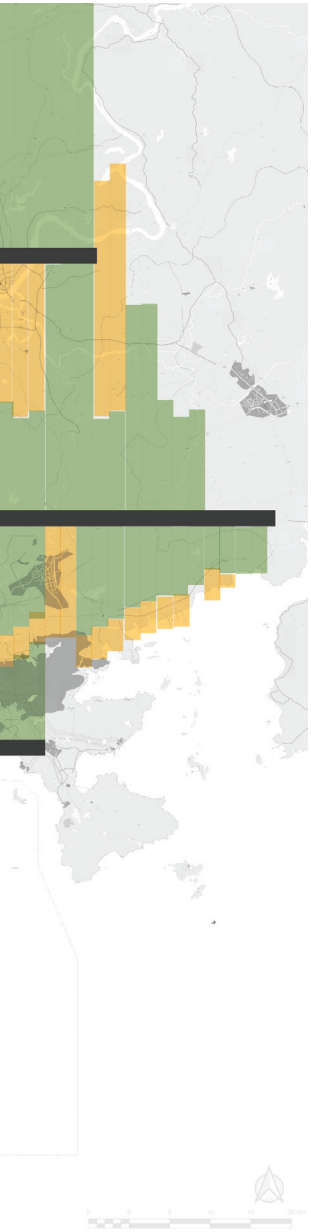


Fig. 3.28 - Iteration I. Source: Hong Kong Polytechnic University; illustration by authors.



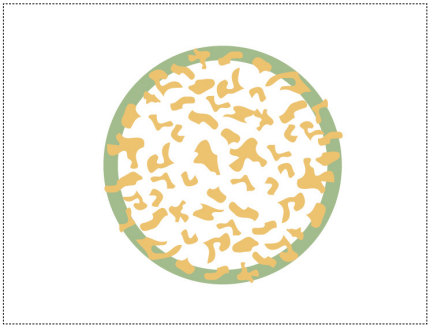


Fig. 3.29 - Urban-natural juxtaposition.

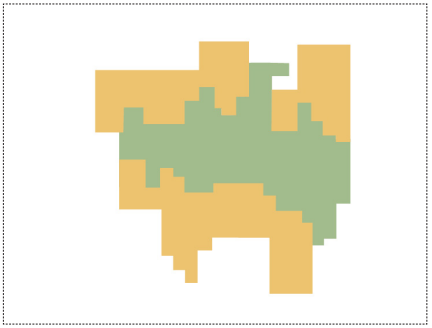


Fig. 3.30 - Secluded Green

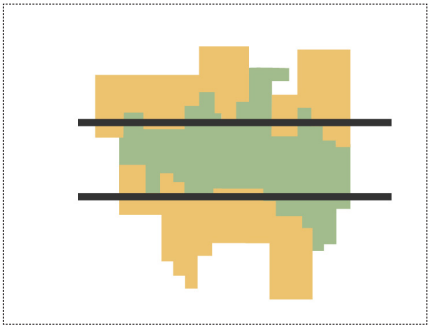


Fig. 3.31 - Understanding borders.

In the first iteration, the team analysed the urban and natural elements in the macro scale. From the concluding map (see Fig. 3.19) it is evident that the two elements are juxtaposed, and there are certain understood borders between them. This is because each one of these elements cluster in remarkable sizes, without being involved with the other one, in most cases. Green with regional relevance appears secluded from the urban areas and is thus probably hardly accessible by the inhabitants (See Fig. 3.21).

The edges between the two are windows of opportunity for socio-spatial integration.

3.1.2 Game Iteration II

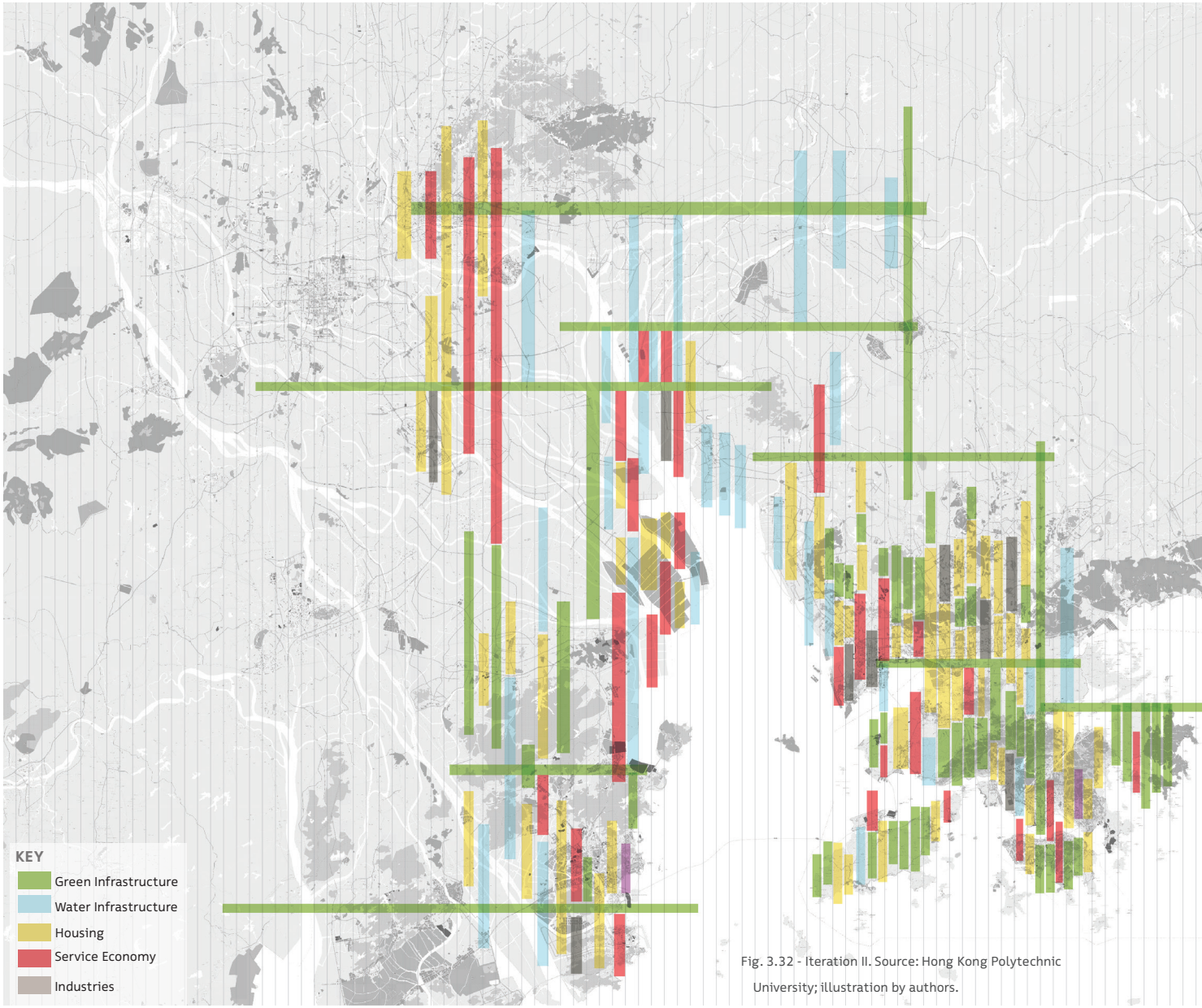


Fig. 3.32 - Iteration II. Source: Hong Kong Polytechnic University; illustration by authors.

Fig. 3.33 - Balanced metropolitan functions.

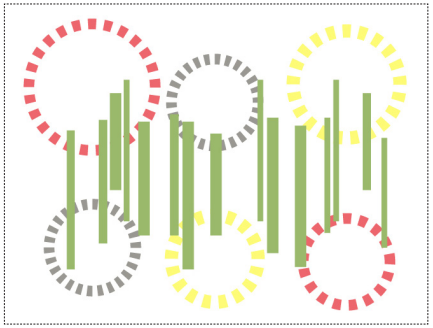


Fig. 3.34 - Green/Blue as development backbone.

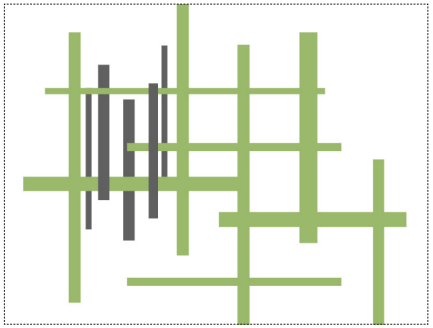


Fig. 3.35 - Interweaving Green in two scales.

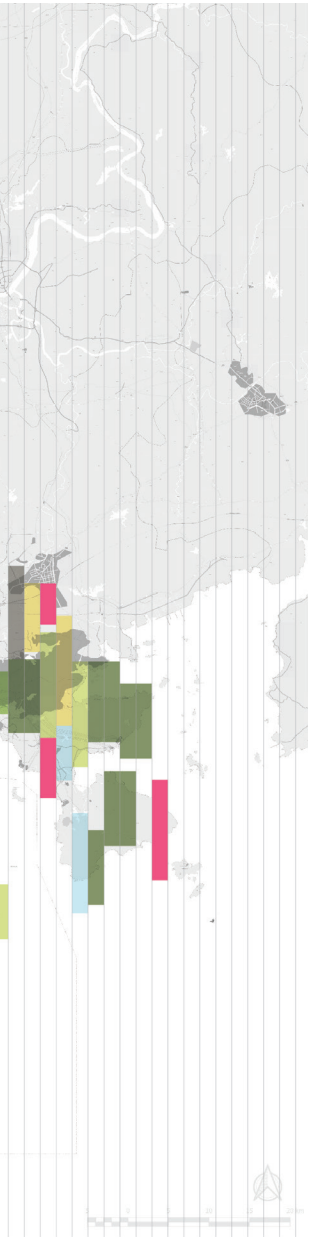
In this stage, 2 main actions are taking place: Establishing the functional forms and using green as connecting element.

The three main urban cores (Guangzhou, Hong Kong- Shenzhen and Macao) are multi-functional forms that balance the development in the region (see Fig. 3.24). The green infrastructure is used as driver and backbone for the development. That means that green functions support existing metropolitan functions but also create new ones (see Fig. 3.25).

The cores interact with the green in two scales: in the regional scale the green infrastructure connects the cores and in the meso scale helps to dissolve the borders that were mentioned in the previous step (see Fig. 3.26).

3.1.3 Game Iteration III

Fig. 3.36 - Iteration III. Source: Hong Kong Polytechnic University; illustration by authors.



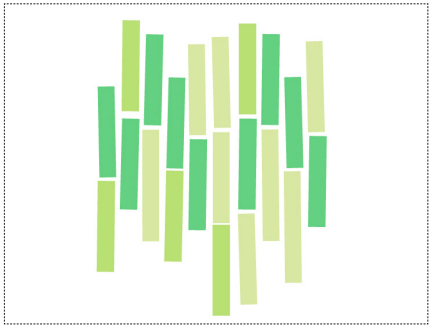


Fig. 3.37 - Exploring the potentials of Green Infrastructure.

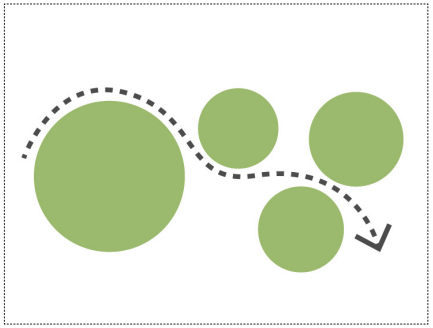


Fig. 3.38 - Focus on the urban cores.

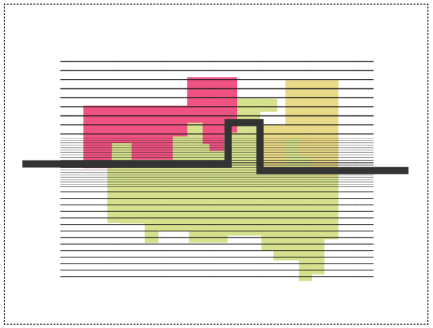


Fig. 3.39 - Diffusing the borders on the meso scale.

In this Iteration, the Green Infrastructure is analysed in three types: Protected, Recreational and Productive, in order to achieve better spatial and functional integration (see Fig. 3.28). In detail, Protected is the landscape that remains intact from urban development, but yet needs to be easily accessible. The landscape is Recreational mostly near urban urban areas and is also used as buffer zone. Lastly, productive is the landscape that contributes to economy with large and small scale activities, such as aquaculture but also urban farming.

Here, the game playing is focused only in the urban cores, where the fragmentation problem is most evident, and has the highest impact, due to the amount of population that is affected (see Fig. 3.29, 3.30).

3.1.4 Game Iteration IV

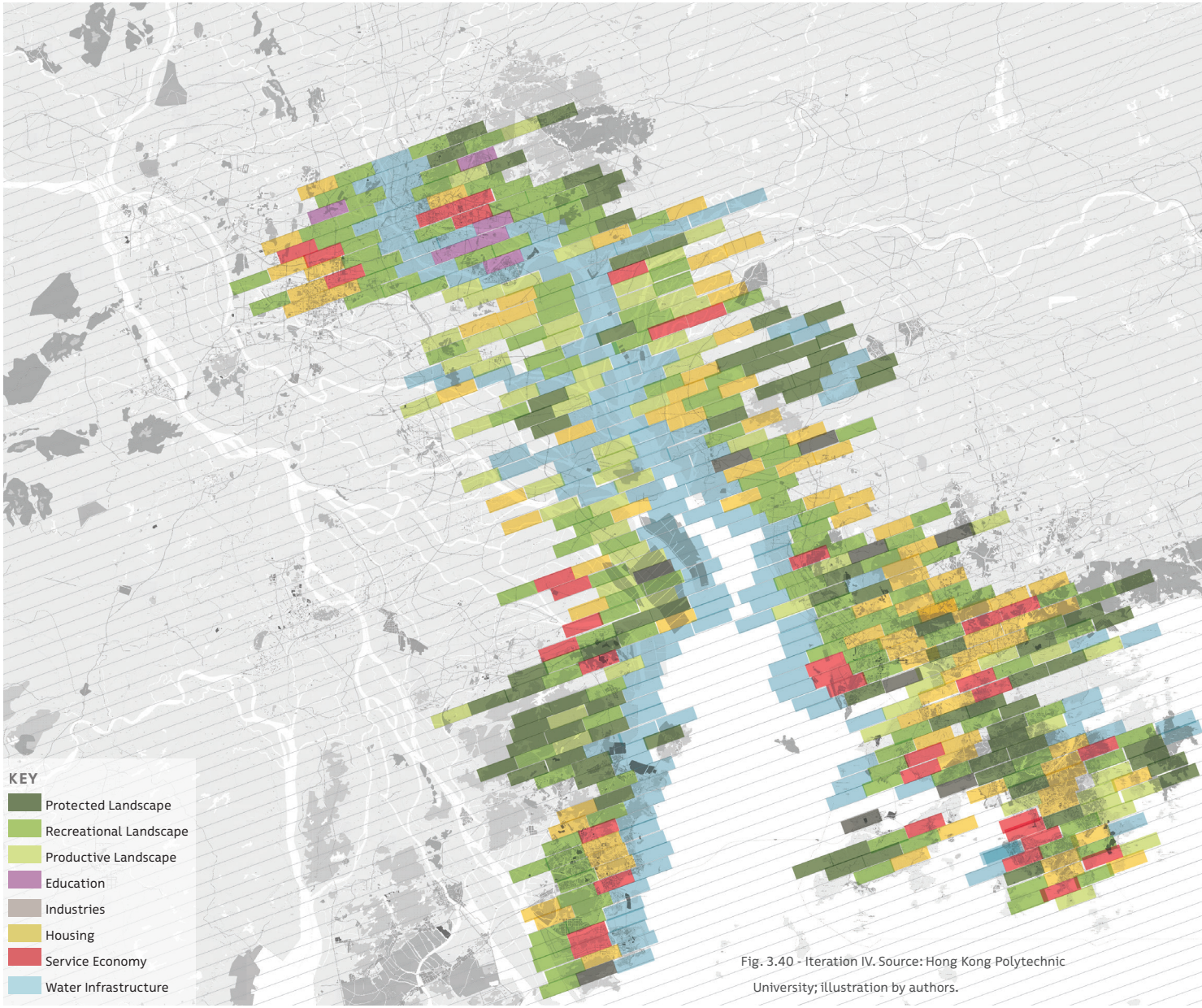


Fig. 3.40 - Iteration IV. Source: Hong Kong Polytechnic University; illustration by authors.

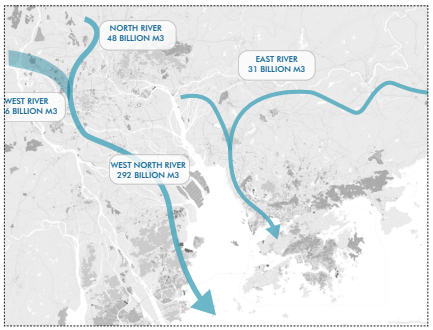


Fig. 3.41 - Rainwater runoff that comes into the delta region.

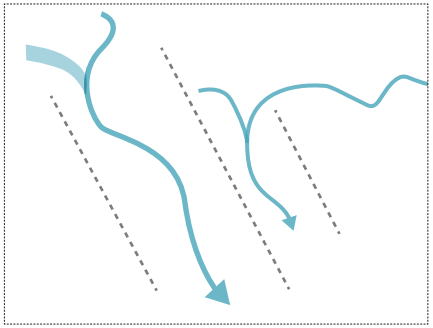


Fig. 3.42 - The flow of water determines activities.

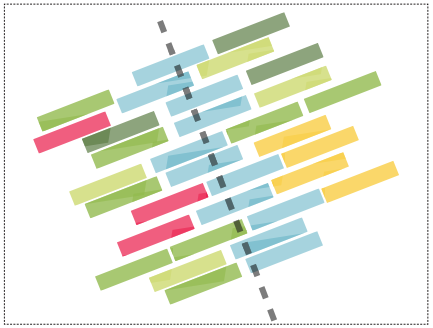


Fig. 3.43 - The metropolitan functions become water sensitive.

In this iteration, the team acknowledged that Green and Blue should be both equally prominent elements in the Game. The delta pre-conditions now become the underlying layer that influences the functional character of the region, but also drives the development, towards water-sensitive strategies in general.

The map mainly focuses on the water edges and also emphasises Guangzhou, Dongguan, Shenzhen and Hong Kong, that together form the currently economically strong belt. The continuous Blue Infrastructure along the water represents either recreational or productive water activities and environmentally resilient practices.

3.2 GAME RULES

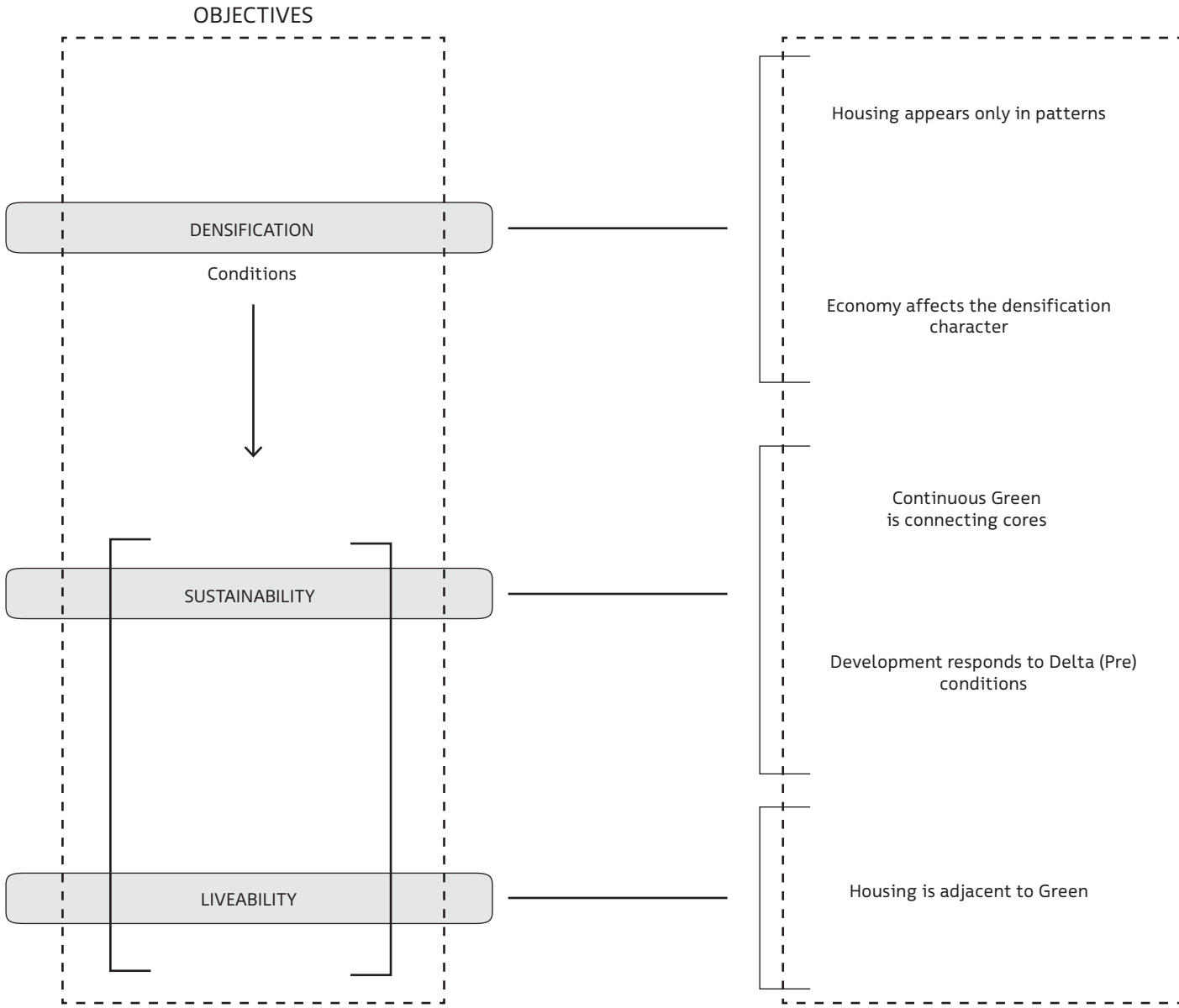
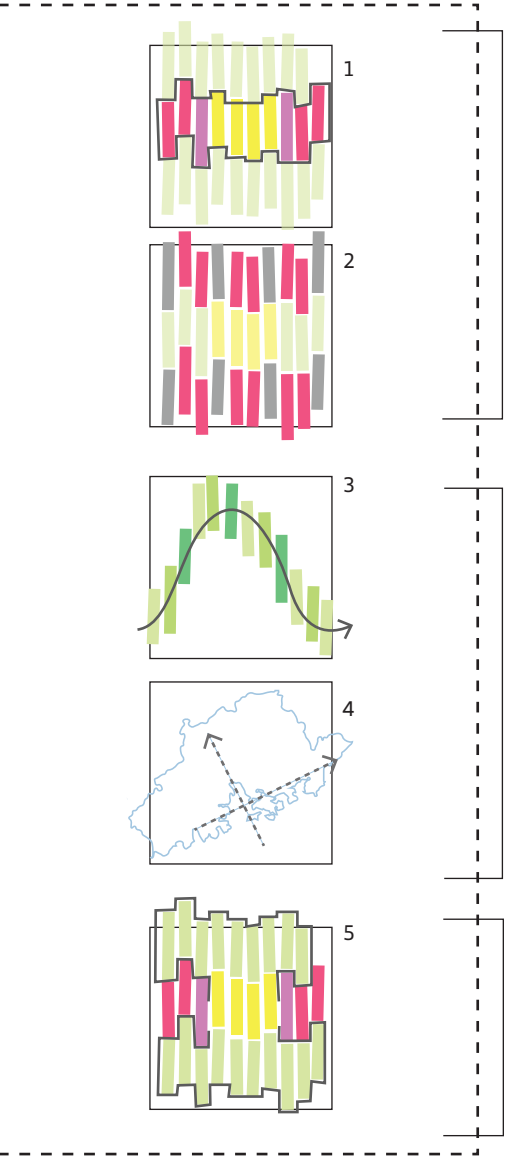


Fig. 3.44 - Game rules, based on 3 main objectives. Illustration by authors



In this transitional stage, we realised the importance of establishing rules that can facilitate playing and later consolidating of the game. The rules define the fixed strips but also leave space for the interplay among the remaining strips.

First step is to clearly stipulate the objectives of the game, and later the GBA vision: Sustainable Development that puts Liveability in the front-line.

Densification

Here, two rules stand out.

Housing appears only in patterns (1):

This means that the region should present complexity, or, simply, multi-functionality.

and

Economy affects the densification character (2):

According to the economic activities that interact with housing, new housing typologies emerge. In other words, economy is the driver for the character of living spaces.

Sustainability

Massive problems regarding water resources have been overshadowed by the much more positive attention paid to the PRD's GDP index. Sustainability could bring the paradigm shift that the region needs and also motivate political coordination among the municipalities.

Continuous Green is connecting cores (3):

The Green network is continuous, and involves all three types of productive, recreational and protected landscape.

Development responds to Delta (Pre) conditions (4):

The orientation of the strips is facing the water edge, indicating that development should be adjusted to the water network, and the water resources should be improved in quantity and quality.

Liveability

Housing is adjacent to Green (5):

In order to increase liveability, urban quality of living should be reassessed first. Green Infrastructure is easily accessible by inhabitants, or adjacent to housing areas.

The following final iteration is consistently based on these rules.

3.3 FINAL ITERATION

3.3.1 Principles

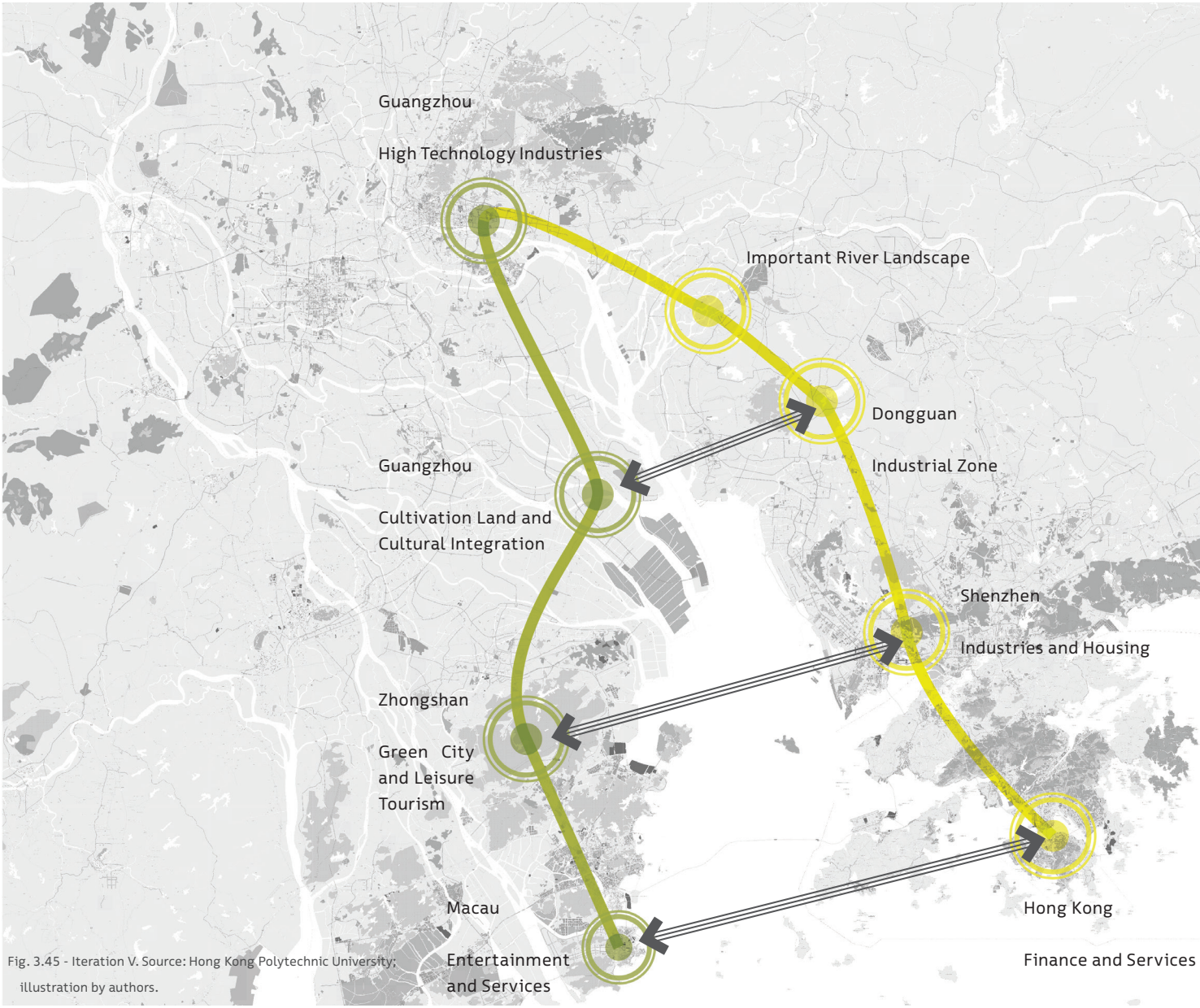


Fig. 3.45 - Iteration V. Source: Hong Kong Polytechnic University; illustration by authors.

Fig. 3.46 - Embracing two sides of development.

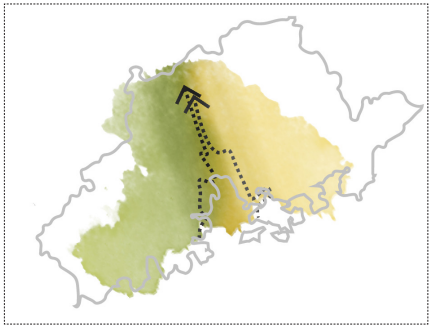


Fig. 3.47 - Integration where the two sides meet.

In the first step of the final iteration, the team established the importance of balancing the two sides of development (see Fig. 1.19) that form the new economic belt.

The west side, with districts like Huangpuzhen in Zhongshan, and Nansha in Guangzhou, has intense productive landscape that gains regional importance in economy but also in leisure activities.

The east side, with cities like Shenzhen and Dongguan, is responding to the global trend of de-industrialisation: fragments of the past provide the housing of the future or gradually converted from manufacturing to high tech industries.

The two sides should interact, with people, material, services flows (see Fig. 1.20).

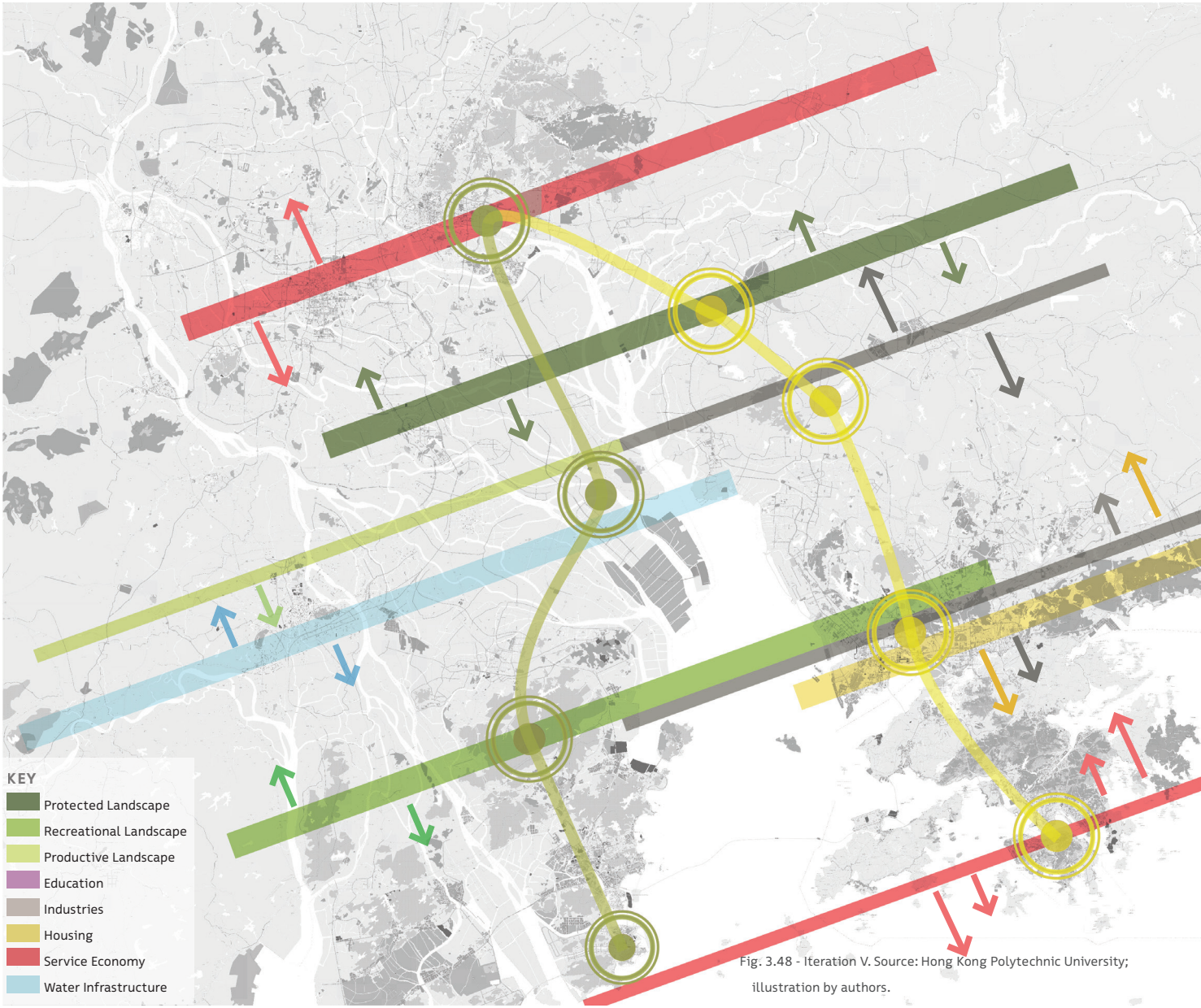
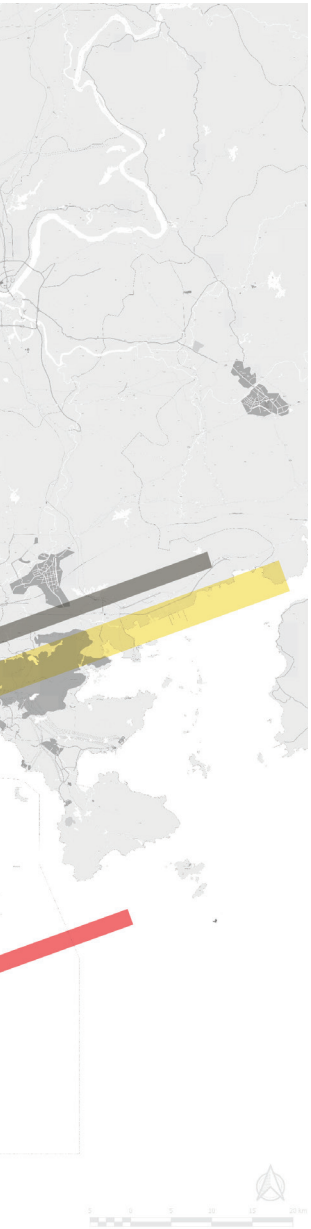


Fig. 3.48 - Iteration V. Source: Hong Kong Polytechnic University; illustration by authors.



How are these characters integrated along each side of development and between the two? Here, the concept of regional character is introduced by using two elements: the regional strips and the bands within the strips.

The regional strips are not spatial elements, but an abstract representation of the main functional character for each city that also is the bridging character across cities.

From the map it is evident that service economy is mainly highlighted at the two ends of PRD, Guangzhou and Macao-Hong Kong, whereas the strongest influence of the three types of Green infrastructure and the Blue infrastructure is situated the heart of PRD.

Shenzhen and Hong Kong area will compete with Guangzhou as the metropolitan hubs of the future. Thus, not only economy, but also housing regeneration and development are issues that need to be addressed.

Each band is defined by the two regional strips that appear on the map and is combing both of their functional characters.

3.3.2 Game map

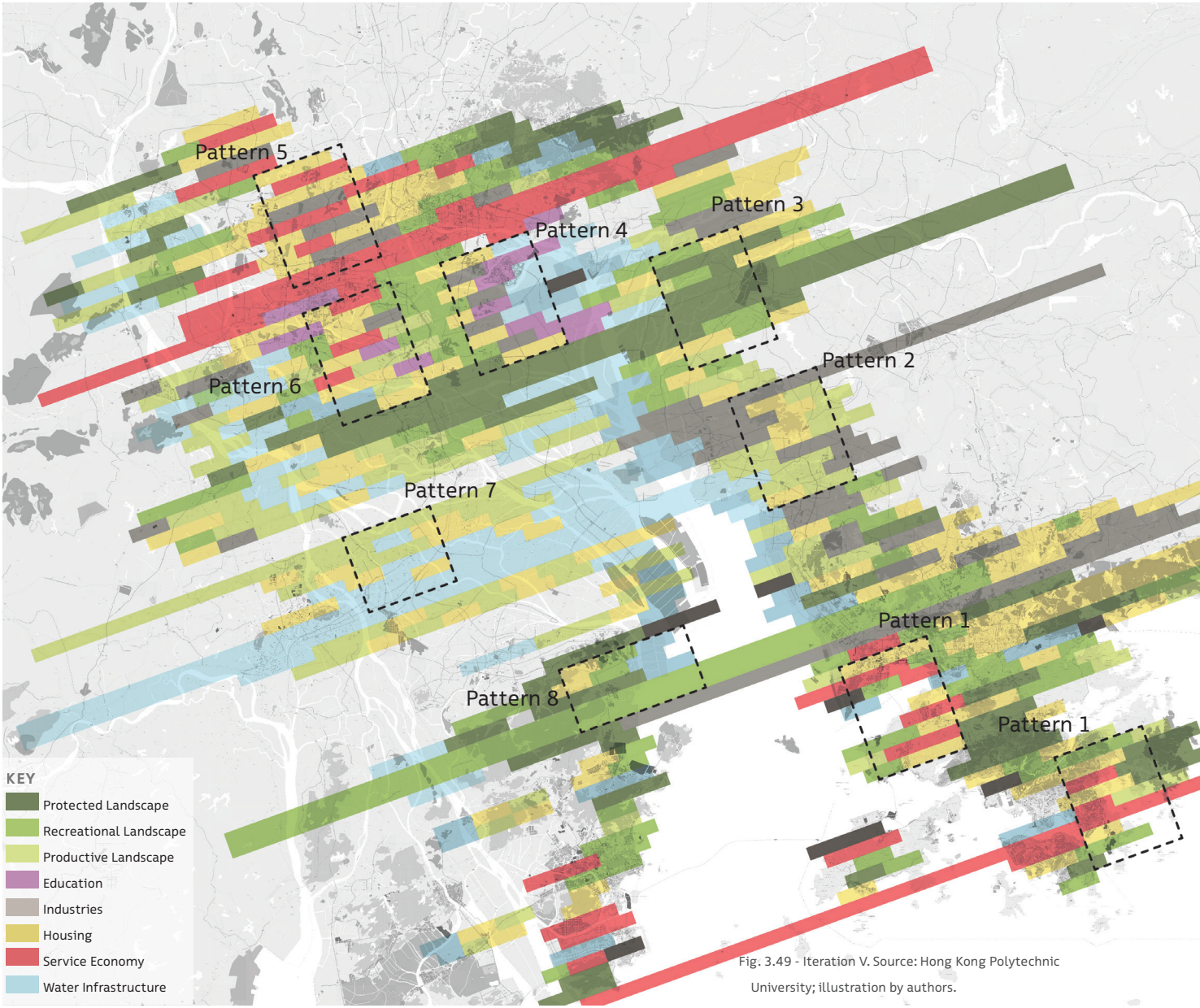
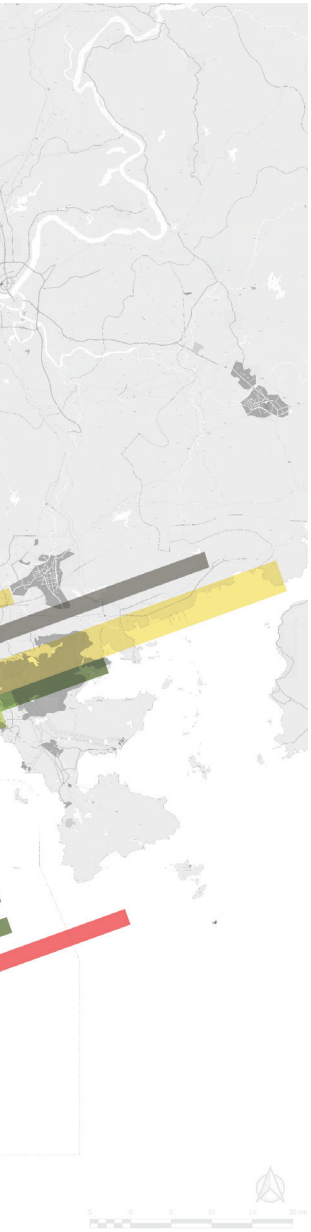


Fig. 3.49 - Iteration V. Source: Hong Kong Polytechnic University; illustration by authors.



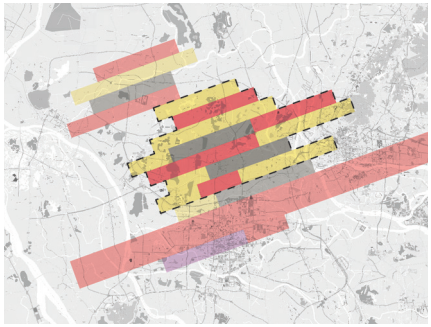


Fig. 3.50 - Foshan-Guangzhou pattern.

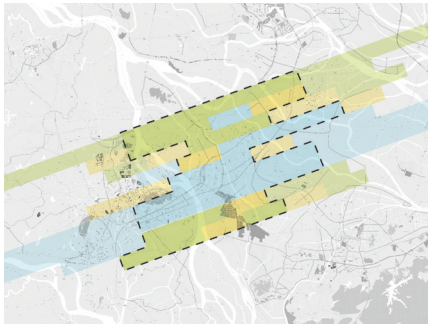


Fig. 3.51 - Zhongshan pattern.

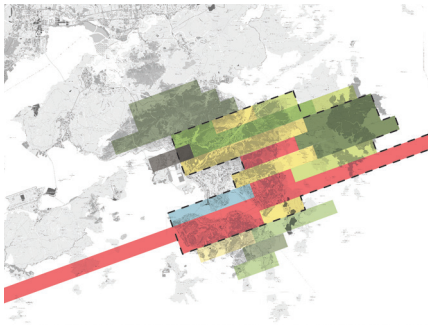


Fig. 3.52 - Hong Kong pattern.

In the final map, the functional configurations are spread across the region in the form of a field. The small scaled strips achieve gradual transition from each regional strip to the next one.

In summary, 8 patterns emerge as most interesting outcome of the Game playing, namely in Hong Kong (1), Shenzhen (2), Dongguan (3), Foshan Guangzhou (4,5,6), Zhonghan (7) and Macao (8).

4

PLANNING FRAMEWORK

How does the Game become regional strategy? This chapter explains the process of transition from abstract representations to the reality of urban planning. Firstly, the attempt to interpret reality of the strips is laid out. This has in 3 different aspects: multiscalarity, functionality and density. Then, the regional guidelines for the patterns are set: what are the programmes that interact within each strip and according to the pattern in which that strip belongs? Moreover, the actors that should be involved in the making of the future GBA are schematised in 3 scales of influence. Lastly, the chapter ends with spatial strategies that facilitate the Green and Blue integration in the local scale.

4.1 INTERPRETATION OF THE STRIPS

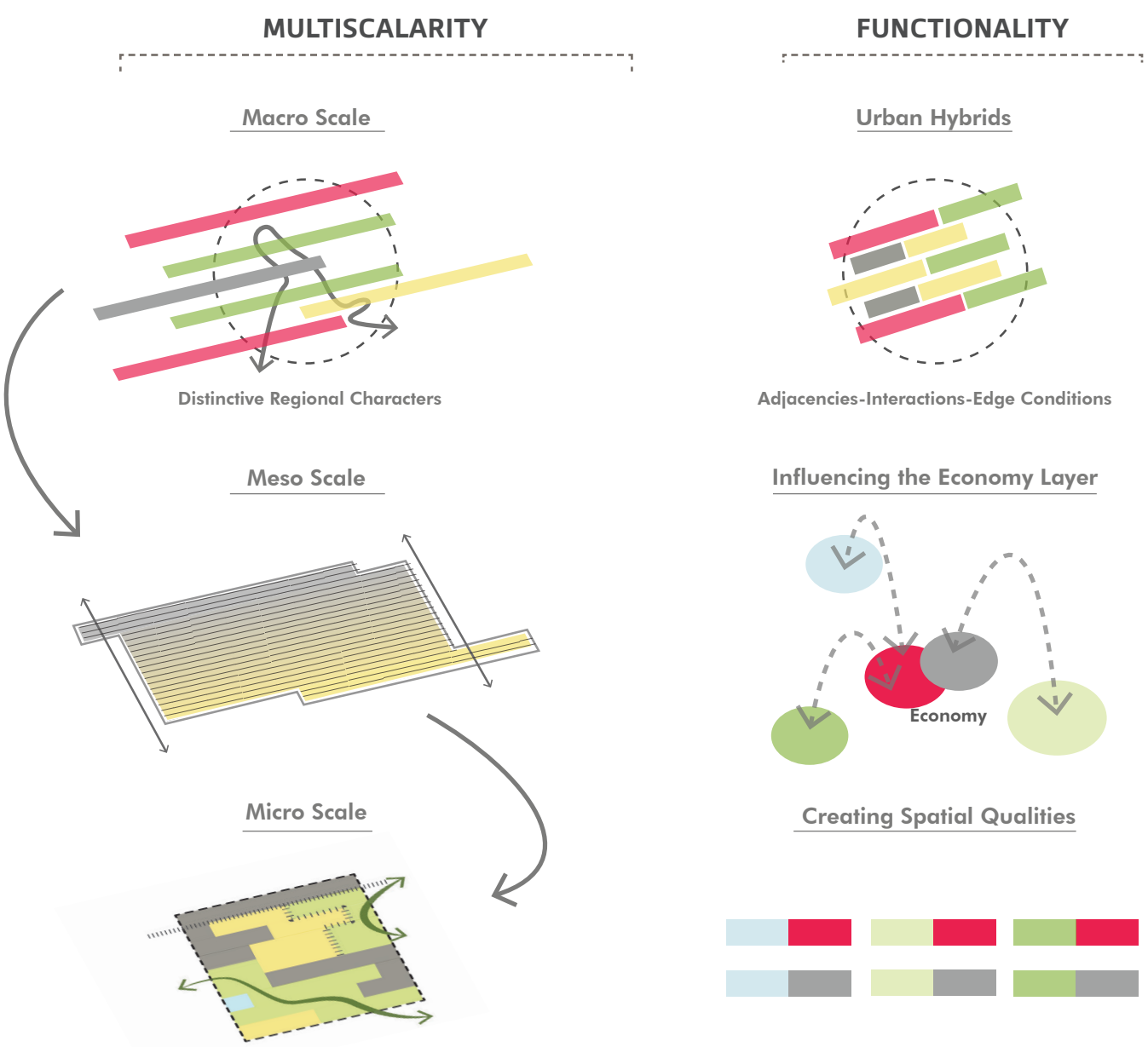
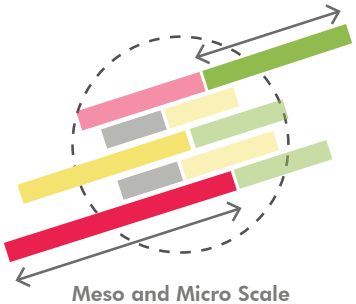


Fig. 4.53 - The interpretations of the Game strips. Illustration by authors.

DENSITY

Length defining density



Meso and Micro Scale

Housing intensity patterns

Rethinking industrial fragments

Delta intensity

Multiscalarity

The concept of multiscalarity is explored in three scales: macro, meso and micro. The macro scale reports on the region, the meso on the cities and the micro on the districts.

The project responds to each scale differently: in the macro scale, defines the functional characters that together constitute the future PRD; in the meso scale, defines the grading and mixture of two regional strips; and in the micro scale, defines adjacencies, interactions and edge conditions within each city pattern.

Functionality

The strips represent mainly functionalities, that have 3 principles. Firstly, the patterns are urban hybrids, that contribute to the multi-functional aspect of the future PRD and work as patterns in all scales. Secondly, the Green and Blue Infrastructure always contribute to the economy layer, meaning that all its components are functional, and have direct or indirect influence on the prosperity of the region. Thirdly, the one-on-one strips combinations create certain spatial qualities that are visible in the small scale.

Density

The interpretation of density is important in order to have well-rounded understanding of the development typology and intensity.

Firstly, length of the each strip in defining the density of each function in relation to other complimentary functions on the same strip. Moreover, the length is defining the regional influence of that particular function.

Then, the housing patterns are more intense around existing industrial areas, which refers to strategies such as industry retrofitting and housing-industry hybrids.

Lastly, the Delta intensity is most evident near the water edges, where resilience issues and water-related activities should be considered.

4.2 PROGRAMMATIC INTERPRETATION OF PATTERNS

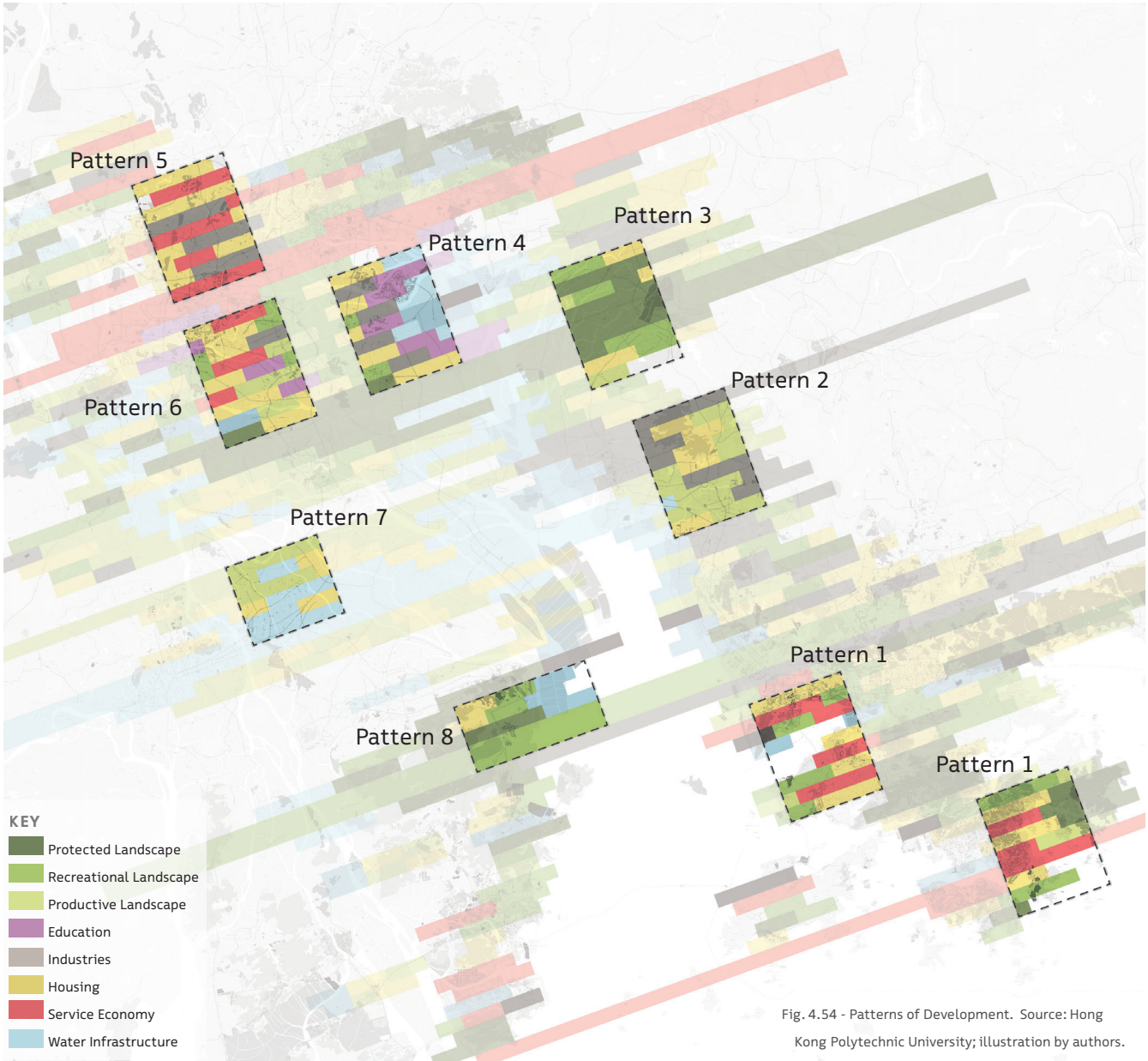


Fig. 4.54 - Patterns of Development. Source: Hong Kong Polytechnic University; illustration by authors.

Development Catalogue

HOUSING


Densification


Retrofitting


Regeneration


Reconstruction

INDUSTRIAL


Retrofitting


Change of Use

GREEN INFRASTRUCTURE


Protection of Important Landscape


Activation


Regeneration


Production

SERVICE ECONOMY


Finance Clusters


Mix Use Development


Small Independent Development

WATER INFRASTRUCTURE


Activation


Regeneration

EDUCATIONAL

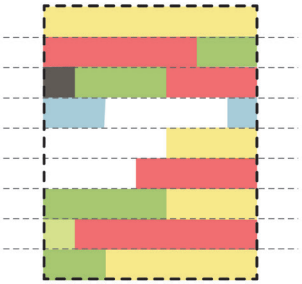

University


Community

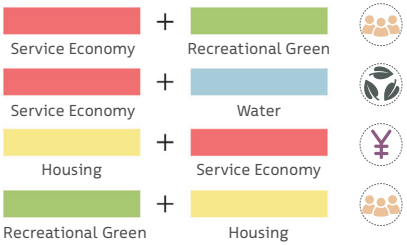

Business Incubators

4.2.1 Pattern 1 : Hong Kong - Shezhen

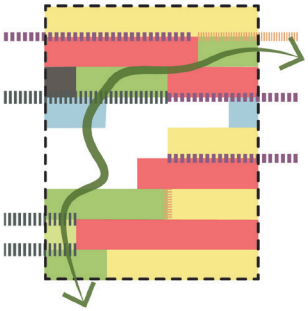
Adjacencies



Understanding Relationships



Integration of Edges



Hong Kong and Shenzhen are interlinked with infrastructure that supports integration of economy and human flows. Nonetheless, as the two cities should be further merged into one metropolitan hub, with recreational activities. Thus protected landscape needs to become more accessible to the public.

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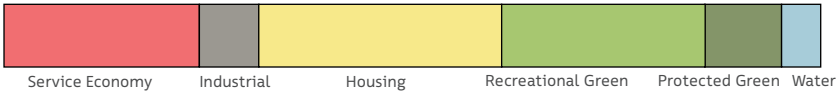
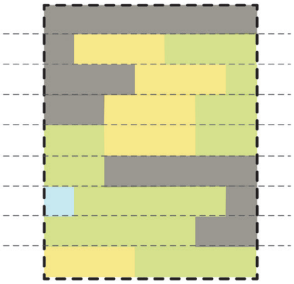
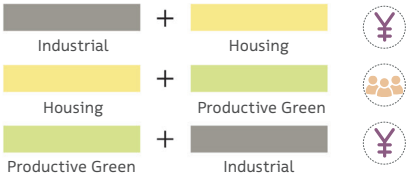


4.2.2 Pattern 2: Donggoun

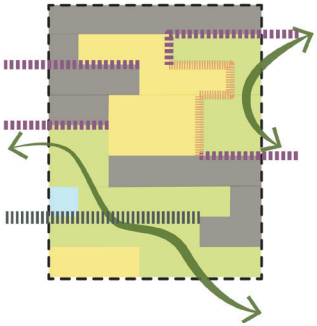
Adjacencies



Understanding Relationships



Integration of Edges



Dongguan's functional character will balance industries and new housing into one hybrid with intensity variations between the two. Moreover, buffer zones will be used as recreational areas by the water, an alleviation point for the inhabitants that work in the industries of the area.

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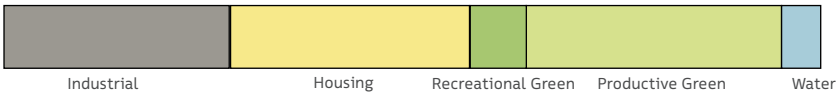
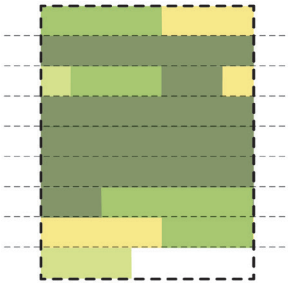
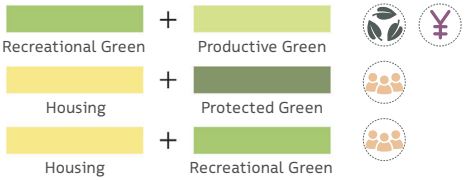


4.2.3 Pattern 3 : Guangzhou (West)

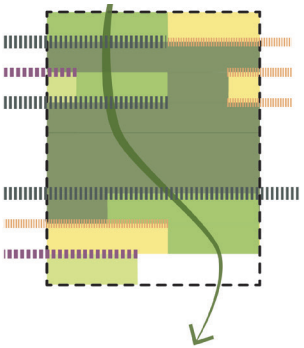
Adjacencies



Understanding Relationships



Integration of Edges



The Guangzhou west region consist of several dense yet fragmented green structures. These green areas are of high ecological importance and hence needs to be protected. To establish social and economic relationship with housing, the green is further designed to become recreational and productive green.

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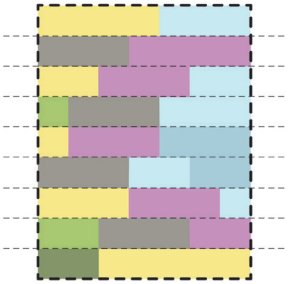
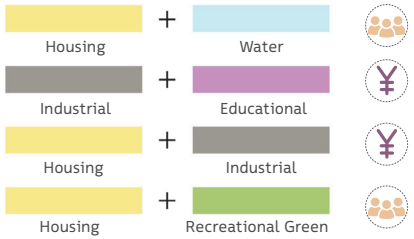
4.2.4 Pattern 4 : Guangzhou (Central)

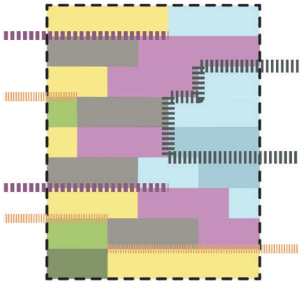
Adjacencies



Understanding Relationships

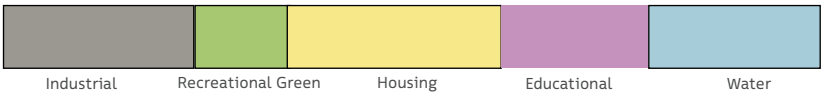


Integration of Edges



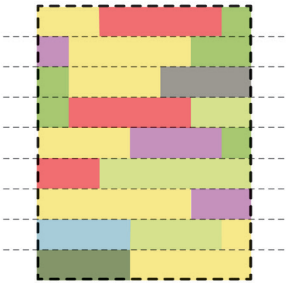
The central area of Guangzhou was historically influenced by water and is still defined by water. Hence functions should respond to water issues such as quality, scarcity and resilience while allowing the waterfront to become the vibrant corridor with educational institutes.

Program Bar

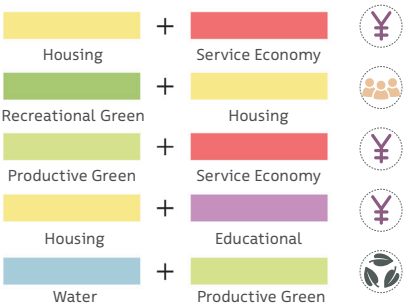


4.2.5 Pattern 5 : Guangzhou - Foshan

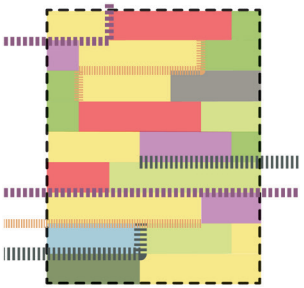
Adjacencies



Understanding Relationships



Integration of Edges



The area is interesting due to the institutional integration between Foshan and Guangzhou that is gradually being achieved through the years. Guangzhou, with an educational and financial hub of region and Foshan, with agricultural and industrial clusters are intergrated to form new hybrid neighbourhoods.

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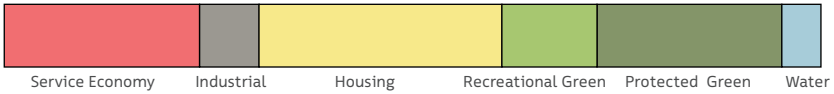
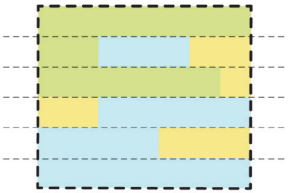
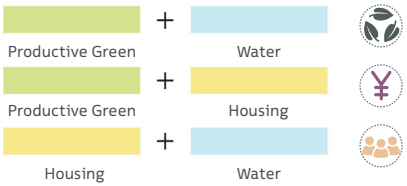


4.2.6 Pattern 7 : Zhongshan

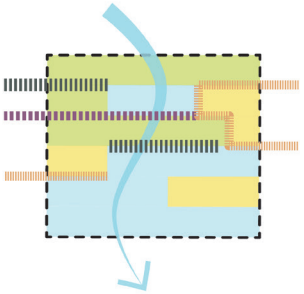
Adjacencies



Understanding Relationships



Integration of Edges

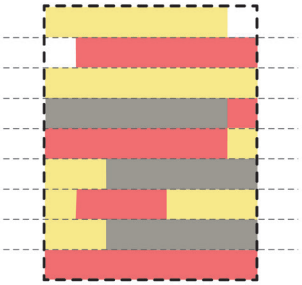


Zhongshan is a popular tourist destination due to its convenient water connections with Hong Kong. Now dominated by factories and other industrial buildings that render waterways inaccessible, Zhongshan is potentially the new ecological tourism hub.

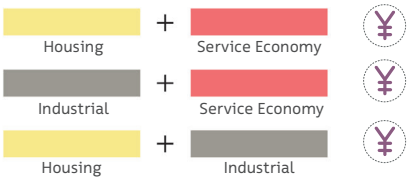
Program Bar

4.2.7 Pattern 6 : Guangzhou - Foshan

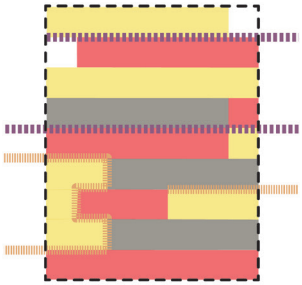
Adjacencies



Understanding Relationships

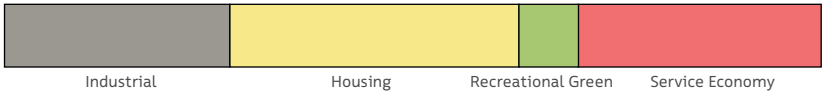


Integration of Edges



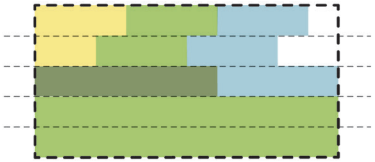
The cities of Guangzhou-Foshan aim to become twin cities with new combined center. The new center will focus on creating a lifestyle of living with working. The will take advantage of the context of educational zone to excel in high-tech service industries and manufacturing industries.

Program Bar



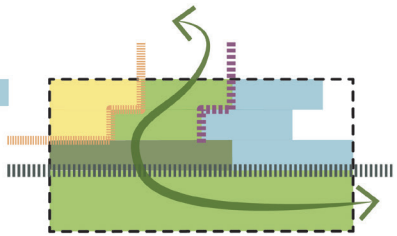
4.2.8 Pattern 8 : Zhongshan - Zhuhai

Adjacencies



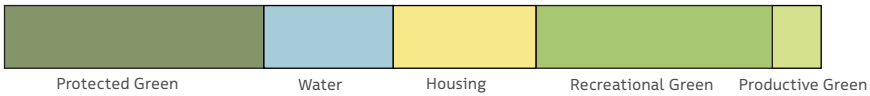
Understanding Relationships

Integration of Edges



Since this pattern is located within 5 klm radius from Macao, the programmes here should support the recreational activities in the city with natural attractions nearby, and create one integrated recreational hub.

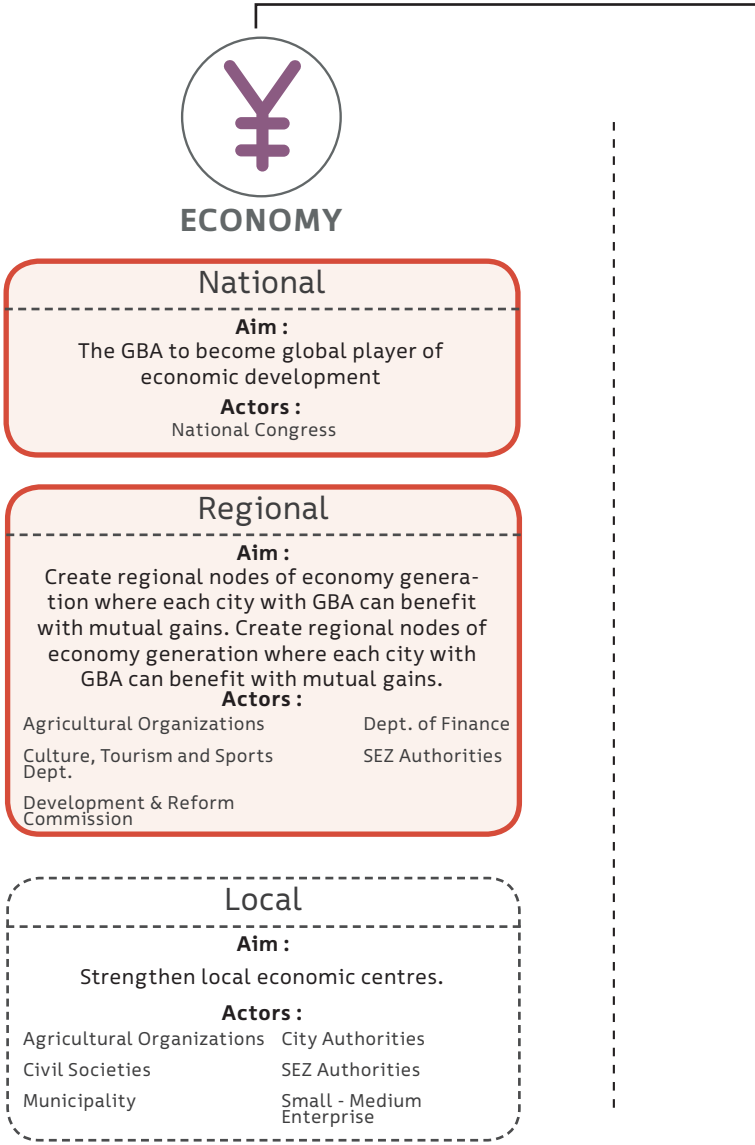
Program Bar



4.3 PLANNING FRAMEWORK

Which actors should be involved beforehand, during the strategy making process, as well as during the implementation of the project itself? In order to understand the governance of projects that account for similar magnitude, it is crucial to ensure multi-disciplinary and multi-scalar approaches are applied.

The stakeholder analysis is structured according to the 3 pillars that guide the whole course of this proposal. For economy, environment and society individually, there are certain aims that we address in the national, regional and local scale. The initially recognised problems, such as scarce liveability due to fragmentation (Chapter 1, 2), are not battled fully in all 3 scales, but they are prioritised. Accordingly, each player belongs and contributes best into one level of hierarchy, where they respond to certain problems.



ADAPTIVE DEVELOPMENT

Integration of bio-physical infrastructure and economical development

ENVIRONMENT

National

Aim :

GBA to showcase pioneering skills in sustainability

Actors :

National Congress

Regional

Aim :

Connecting and strengthening existing green and blue networks to enhance ecology.

Actors :

- Environmental Department
- Natural Resource Department
- Marine Department
- Forestry Department

Local

Aim :

Strengthen local economic centres.

Actors :

- Agricultural Organizations
- Universities
- NGO
- Citizens

SOCIETY

Local

Aim :

Create liveable communities and achieve social integration

Actors :

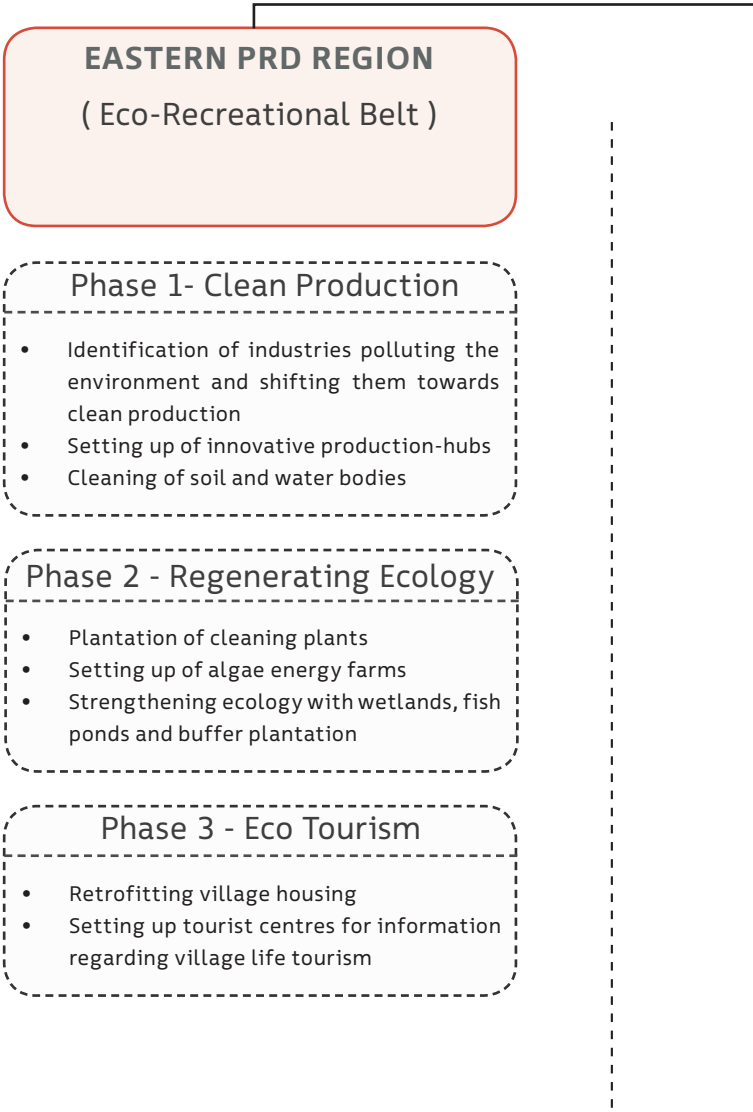
- Human Resource and Social Security Department
- Association for women and Children
- Citizens
- Neighbourhood Committee
- NGO
- Street Office

4.4 PROJECT PHASING

The outline of the process of execution and feasibility of the project is laid out into three types of landscape according to the function they are given. Firstly, the eastern part of the region is where the economy belt that is themed by recreation with ecological features. Phase 1 is preparation phase, when analysis and treatment of the polluted landscape is carried out. In phase 2, landscape is regenerated: pre-existing elements such as fish ponds are maintained and revived. Phase 3 is mainly focused in Urban Village interventions and public orientation towards rural tourism.

Secondly, the central region becomes high-tech provider while sustaining its position as educational hub. In phase 1 of the execution, the synergy between educational institutes and high tech research is promoted. Phase 2 is when Urban Villages and community spaces are redefined. Finally, the young and skilled are encouraged to engage with high tech industry.

Lastly, in the west part of the region one continuous finance belt connects the urban cores, where housing is also provided. The phasing here concerns the creation of high dense but liveable environments and ecological industrialisation.



GREATER BAY AREA DEVELOPMENT

Integration of bio-physical infrastructure and economical development

CENTRAL PRD REGION

(High-Tech Innovation)
and
Educational Hub

Phase 1- Innovation

- Promoting educational institutes towards research in new technology
- Setting up innovation centres for new start-ups and young talent

Phase 2 - Housing

- Retrofitting of urban villages with recreational spaces
- Setting up community spaces for social, educational and economic activities.

Phase 3 - High-Tech Industries

- Establishing new high-tech industries with free trade policies
- Encouraging young talent form universities to establish technical industries

WESTERN PRD REGION

(Finance Service)
High-Tech Innovation
Housing

Phase 1 - De-industrialisation and Retrofitting

- Identifying potential industrial sites for development
- Retrofitting urban villages with recreational green

Phase 2 - Densification

- Focusing on densification of housing near already developed metro lines
- Reconstruction of depleting urban villages with dense green housing

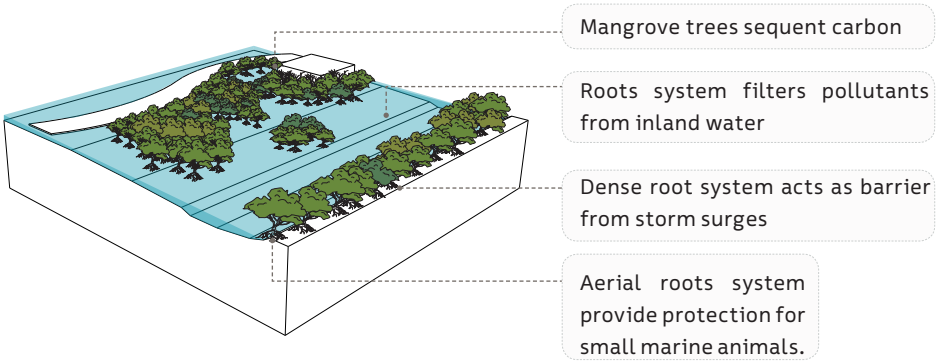
Phase 3 - Innovation / Finance

- Establishing new high-tech industries with free trade policies
- Encouraging young talent by providing liveable communities

4.5 GREEN -BLUE STRATEGY CATALOGUE

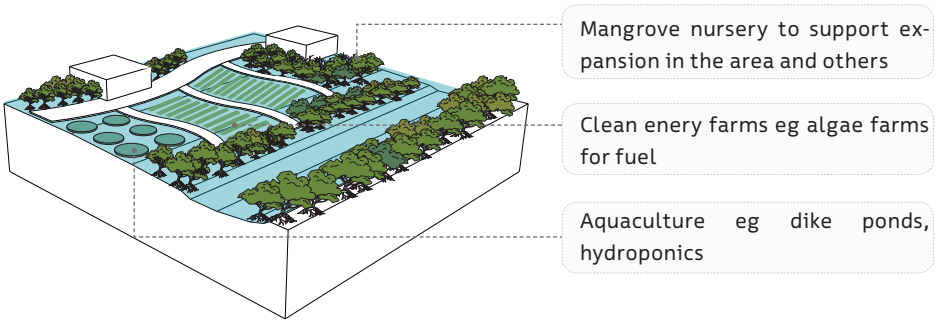
4.5.1 Large Scale Strategies

(L1) Maximize Creation or Restoration of Wetlands



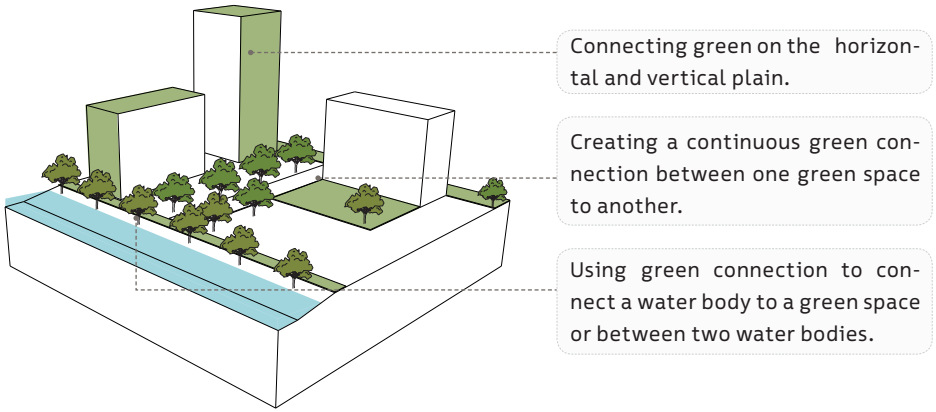
Wetlands areas such as mangrove forests are important to estuary ecosystem such as coral reef and also to commercial fisheries. The intricate aerial root systems of mangrove forests host a safe habitat for smaller animals and hence attracts preys. The dense root system absorbs impacts of storm surges and typhoon, protecting the surrounding areas from coastal damages and further land erosion and trap sediments flowing down rivers and off the land.

(L2) Site Specific Ecological Sensitive Economy



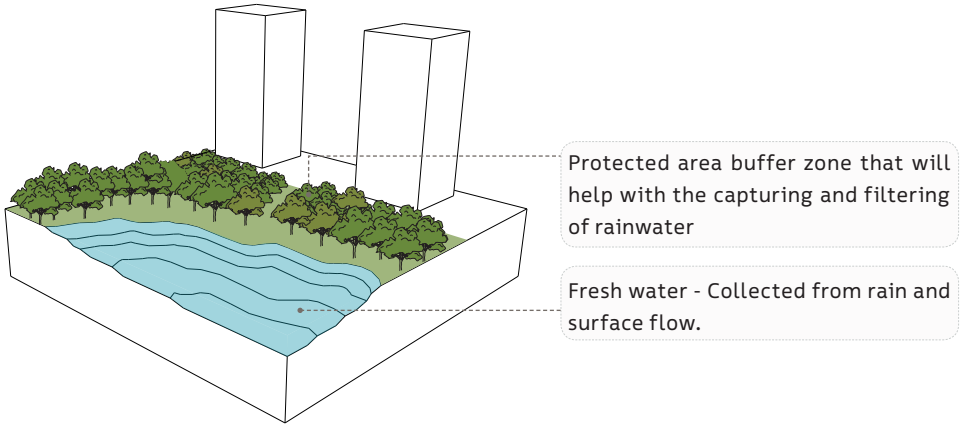
Muilt-functional use of the wetland with complementary activities that mutually benefit the environment, biodiversity, economy and society.

(L3) Connection of Green to Green to Blue



These linear green-way mitigates the fragmentation of green patches, providing opportunity for the safe passage for movement of mammals from one green space to another, increasing species diversity. The green-way provides users to travel from one green area via an uninterrupted greenery. The supplementary of various ecosystem services will benefit in these green and blue network will be highly beneficial to the overall environment and society.

(L4) Protection or/and Creation of Water Catchment Areas

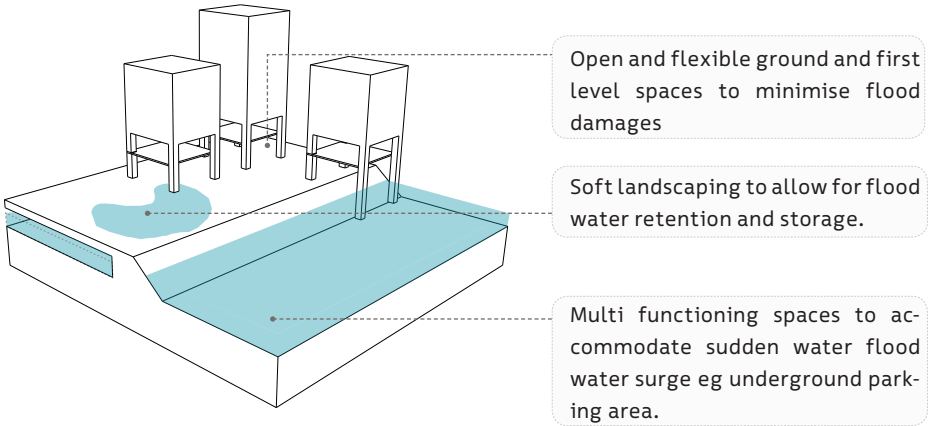


Fresh water collected and storage in a protect and undisturb area to mitigate water shortages. Water collected will also replenish overused groundwater.

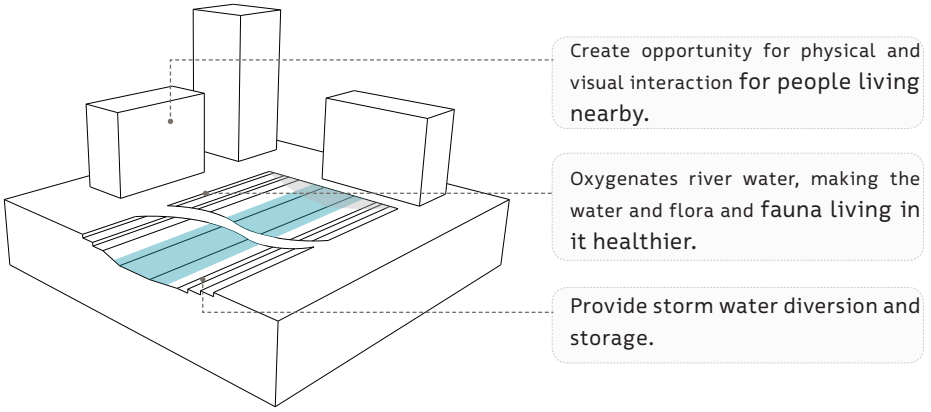
GREEN -BLUE STRATEGY CATALOGUE

4.5.2 Medium Scale Strategies

(M1) Destinated Floodable Urban Area

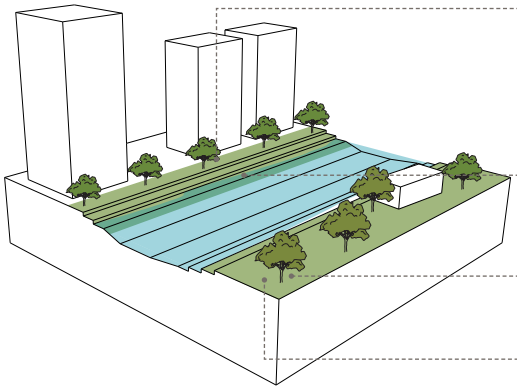


(M2) Daylighting Water Channel



When waterways are unearthed, they transform from liabilities into assets. An attractive waterway creates a neighbourhood amenity that provides opportunities for recreation and physical activity and increases property values. Open streams are highly effective in removing pollution. They encourage the transformation of excessive nutrients such as nitrogen and phosphorus, which improves habitats for fish and other wildlife. Open rivers and streams also contribute to more effective stormwater management by diverting stormwater from the sewage system.

(M3) Green Buffers



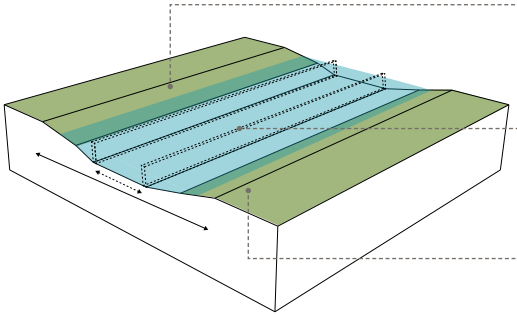
Provide the opportunity for the provision of protected green space.

Allows for water run-off to be retained,filtered and cleanse before entering the following water body.

Permeable surface in an area.

Increase biodiversity in an area.

(M4) Enlarging Area for Flood Plains



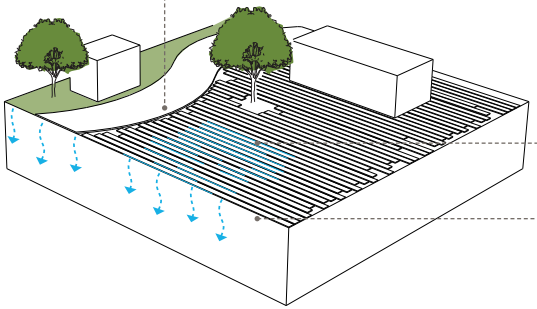
Space for recreational functions, usable during low session. eg Picnic area, play area.

Occurrence of flooding is reduced as there is flexible space for water to occupy and flow.

Provision of additional space to move will allow water speed to dissipate, making it less dangerous.

4.5.3 Small Scale Strategies

(S1) Permeable Surfaces

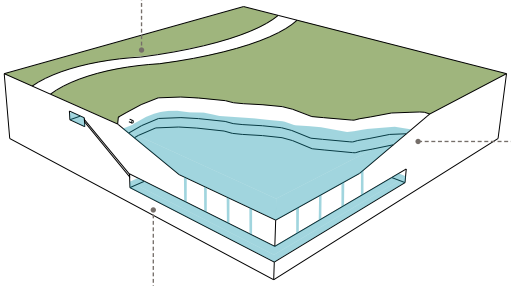


Space for recreational functions, usable during low session. eg Picnic area, play area.

Occurrence of flooding reduced as there is flexible space for water to occupy and flow.

Provision of additional space to move will allow water speed to dissipate, making it less dangerous.

(S2) Water Retention Storages



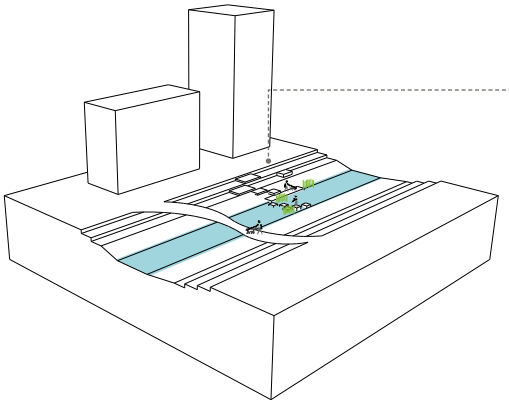
Road and pathways drains and culverts linked to swales before going into retention tanks for storage.

Layers of sedimentation above the retention tanks captures bigger particles and filter pollutants.

Water in tanks can be slowly release into water channel during drier period or reused for other purposed.

Permeable surfaces not only filtrate pollutants found in urban surface run-off during rain or storms, they also provide capacity for water retention during high water. Excess water is absorbed into the ground and release when water level elsewhere has subside or recharged into aquifers.

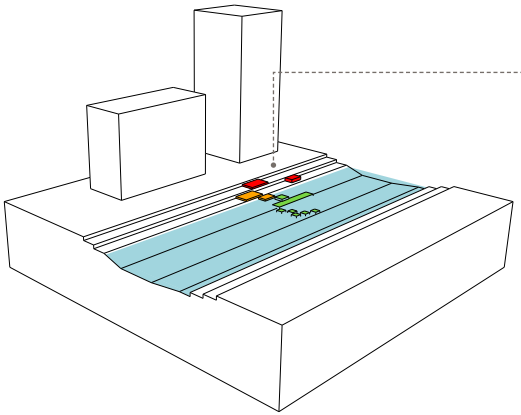
(S3) Public Accessibility



Physical interact between people and the green and blue will expose them to the recreational, aesthetic and other benefial values of nature which will lead to appreciation and protect of the environment.

Simple and attractive visual indicators, informing people around the changes (tide, salinality, water quality) of the environment.

(S4) Exposing Dynamic Environmental Processes



Simple and attractive visual indicators, informing people around the changes (tide, salinality, water quality) of the environment.

Letting the public access to waterways and other nature space, not only improves peoples' well being but it also improves the peoples' ecological intelligence of the spaces they live in. And with the knowlegde and exposure, empathy and a sense of ownership towards their surrounding can be inculcate into the society

5

EXPLORED SITES

This chapter primarily focuses on the translation of the game board methodology to understand the spatial relationships of the strips and the interactions within the clusters at the meso and micro scale.

It explores the possibility of the green and blue back bone in certain strategic prototype locations. With these prototypes, it aims to give an idea of the possibilities of urban regeneration, new developments and densification adhering to the envisioned GBA and also explores the benefits of the new biophysical back bone in terms of spatial qualities and improving livability.

5.1 LINES of common ground

SHENZHEN

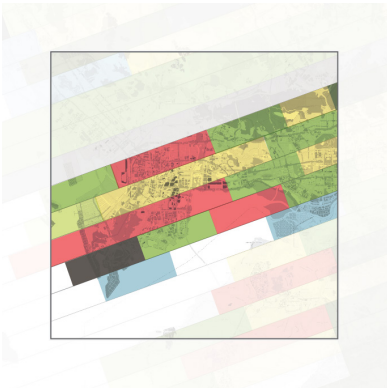
The first case focuses on the area of Shenzhen, a dense urban city bordering Hong Kong to the south. One of the key positions of development of Shenzhen is the geographical location of the city close to the global metropolis - Hong Kong.

Largely regarded as an arrival city, Shenzhen's population growth in the past was drastic following the establishment of the SEZs. These were primarily focussed on attracting migrant blue collar and labour intensive workers. This led to the rapid urbanisation and the formation of large urban villages to accommodate the population growth.

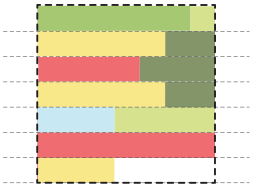
The city's recent transformation towards high tech service economy has led to the establishment of headquarters of various internationally successful Chinese companies. This has led to a dip in the population growth as result of increasing migrant labour costs. But this saw a consequence in a different direction that saw the city taking up the process of [de]industrialisation and thus leaving behind spatial fragments of industries and urban villages and thus leading to strong social segregation with cases of highly contrasting urban fabrics juxtaposed one next to another.

LINES of common ground

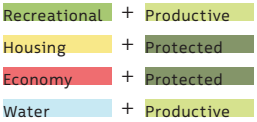
INTERACTIONS



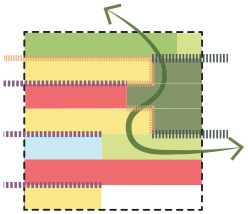
Adjacencies



Understanding Relationships



Edges integration

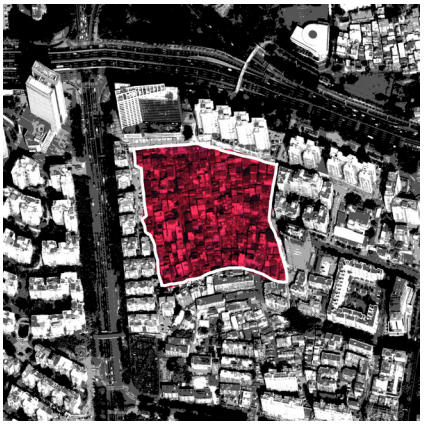


LINES of common ground

CHARACTER

Dense urban blocks

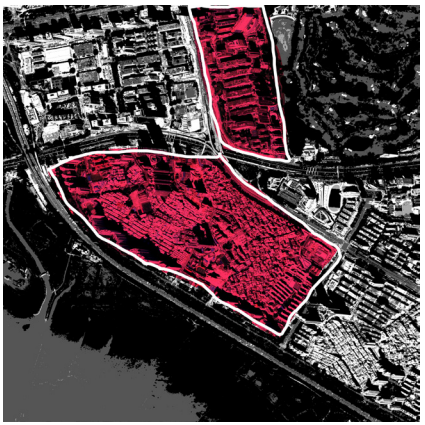
Water edge



Urban villages with poor livability

CHALLENGES

Fragmented green patches



Drastic contrast in urban grain

Low lying area

LINES of common ground

5.1.1 Vision meso scale - Shenzhen

Fig. 5.55 - Developing new green corridors and connections

New green corridors

Exploring the possible connections of all existing green patches.

The new green corridors responding to the water condition and the infrastructure line cutting across contrasting settings of dense urban fabric and dense green fabric.

Fig. 5.56 - The axes and programmatic response of the corridors

Framing the axes of connections

Multiple green axes cutting across the corridors, further responding to the water.

Programmatic response of the new corridors according to existing clusters of functions.

LINES of common ground
Vision meso scale - Shenzhen

The border of Shenzhen and Hong Kong

Shenzhen's Baishizhou 'urban village'

Shenzhen CBD, emerging global hub of innovation

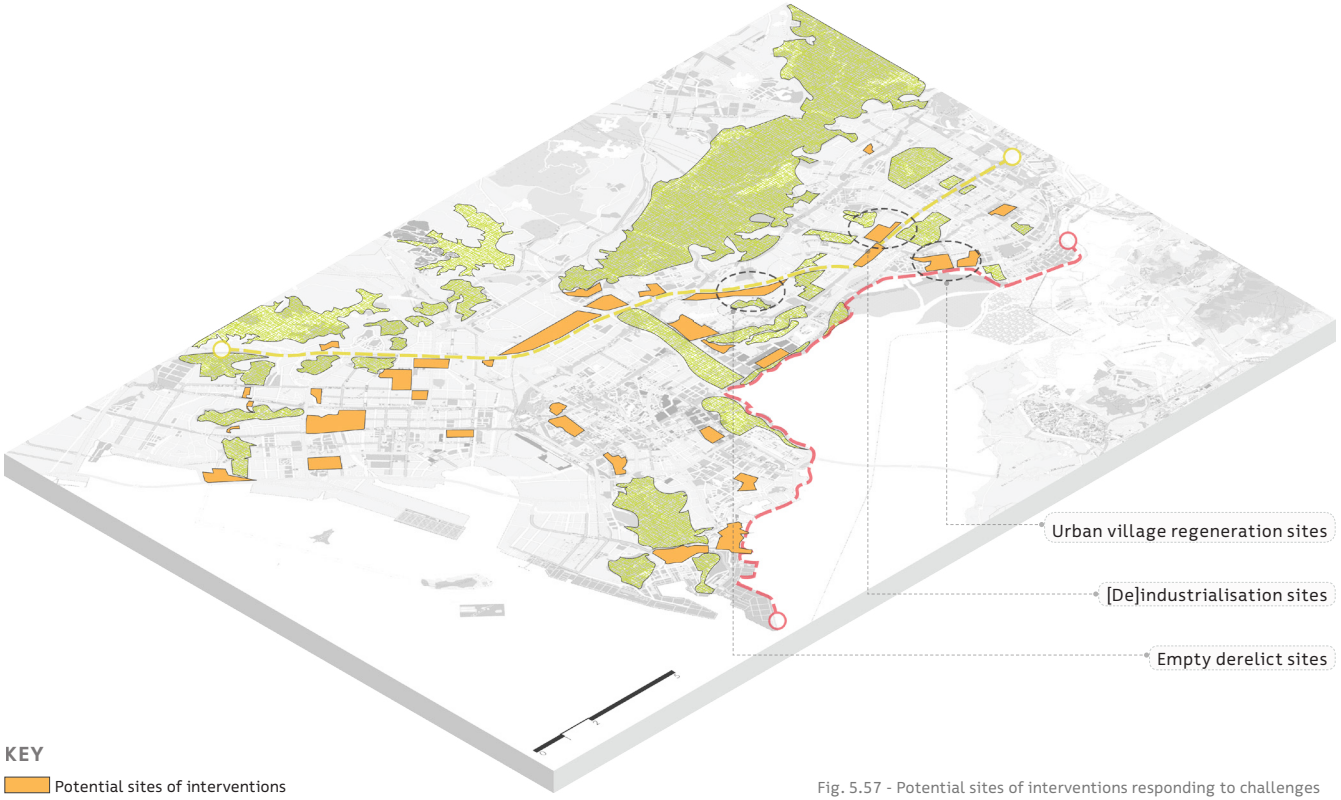


Fig. 5.57 - Potential sites of interventions responding to challenges

LINES of common ground
Vision meso scale - Shenzhen

Spatial framework - Shenzhen

The spatial framework of Shenzhen focuses on falling in line with the proposed regional biophysical backbone, new green corridors are proposed. Furthermore these corridors have a superimposed programmatic response - the housing corridor and the economic (high tech service economy) corridor.

Taking a step further the potential sites of interventions are mapped responding to the challenges faced in this area and then given priorities of densification based on their proximities to the existing infrastructure nodes. And lastly the programmatic response of these intervention sites of higher priorities are defined based on the defined housing and economic corridors.

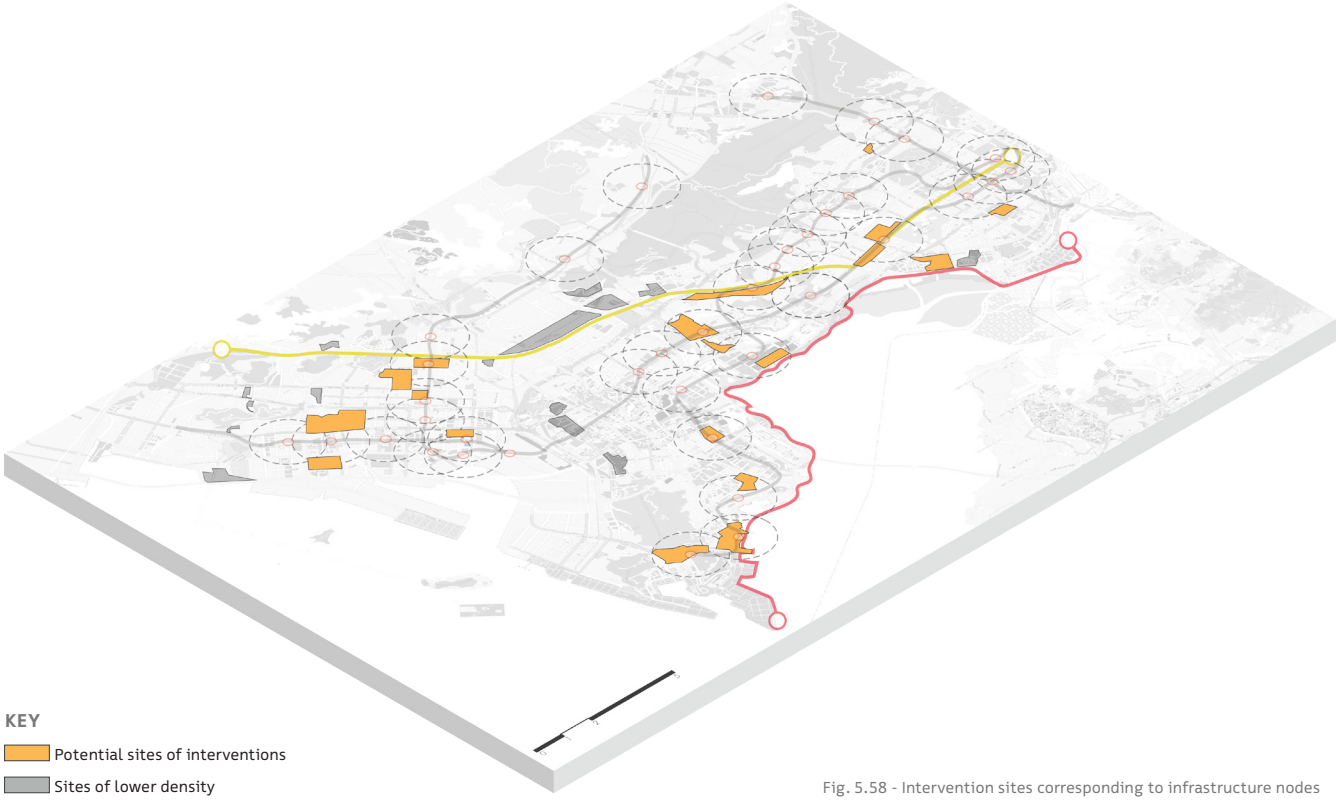


Fig. 5.58 - Intervention sites corresponding to infrastructure nodes

LINES of common ground
Vision meso scale - Shenzhen

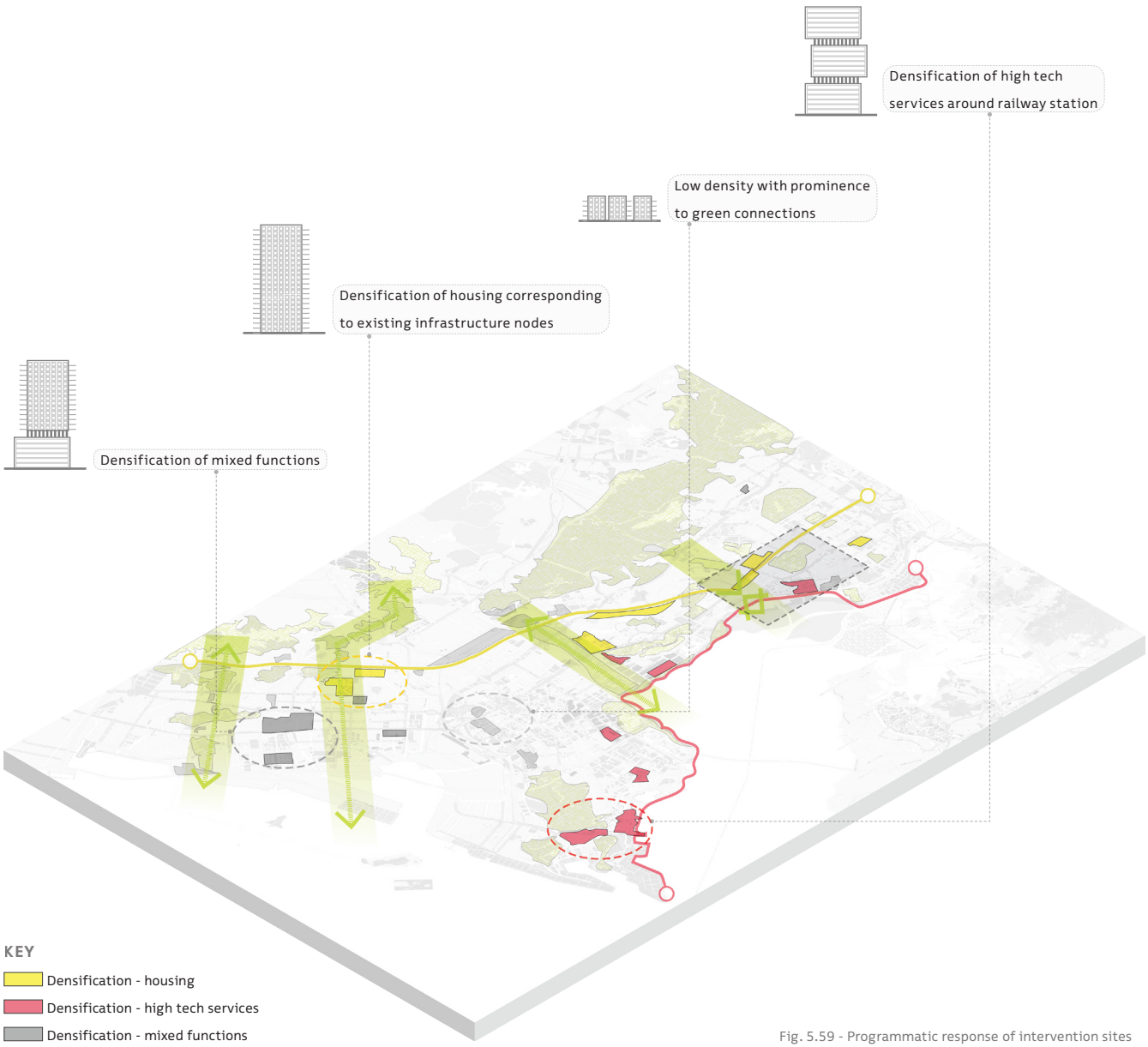


Fig. 5.59 - Programmatic response of intervention sites

LINES of common ground

5.1.2 Vision micro scale - Shenzhen

Zooming in further to the micro scale, the chosen site falls at the point of intersection of the two corridors of housing and high tech service economy.

The design of the site has to tackle fragmentation and the challenges of [de] industrialisation and regeneration of urban living environments.

The proposed design for the site focuses on designing a line of common ground that weaves together all the spatial and social fragments.

This is done by defining a continuous pedestrian path that connects the two existing ecological fabrics.

It functions as a place of coming together with the introduction of commercial spaces following the podium model along this continuous line. This activates the path making it a common ground.

Fig. 5.60 - Existing site - micro scale

LINES of common ground
Vision micro scale - Shenzhen

Fig. 5.61 - Line of common ground - micro scale

LINES of common ground
Impression - Shenzhen

Major highway cutting the connection and accessibility to the water

Image of street view showing existing spatial quality

LINES of common ground
Impression - Shenzhen

Nature and people existing side by side

Mangrove extending into the city waterways

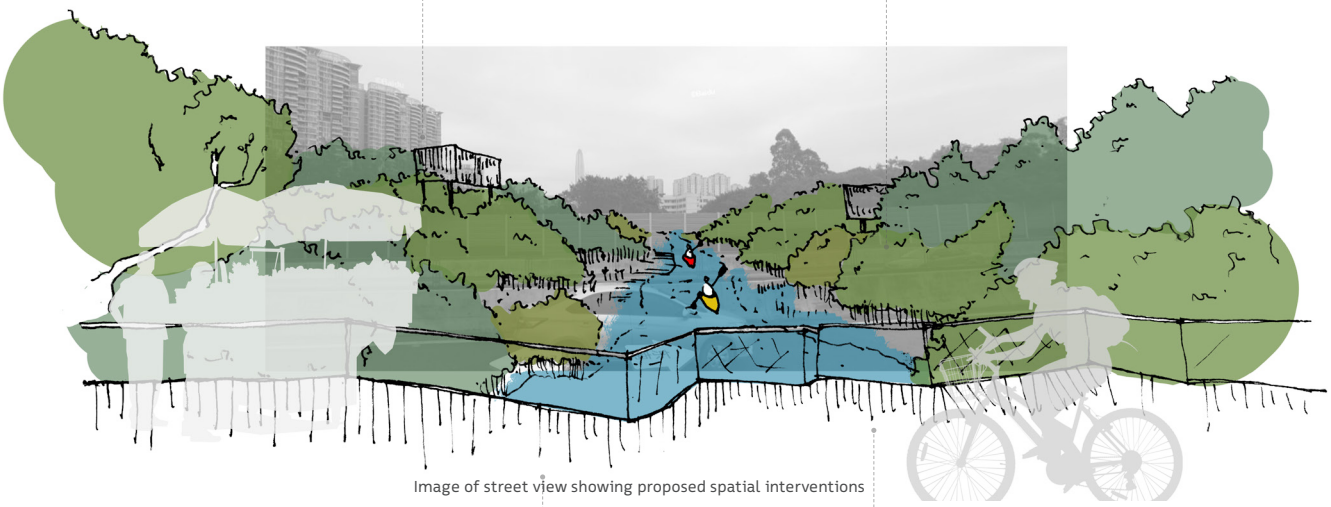


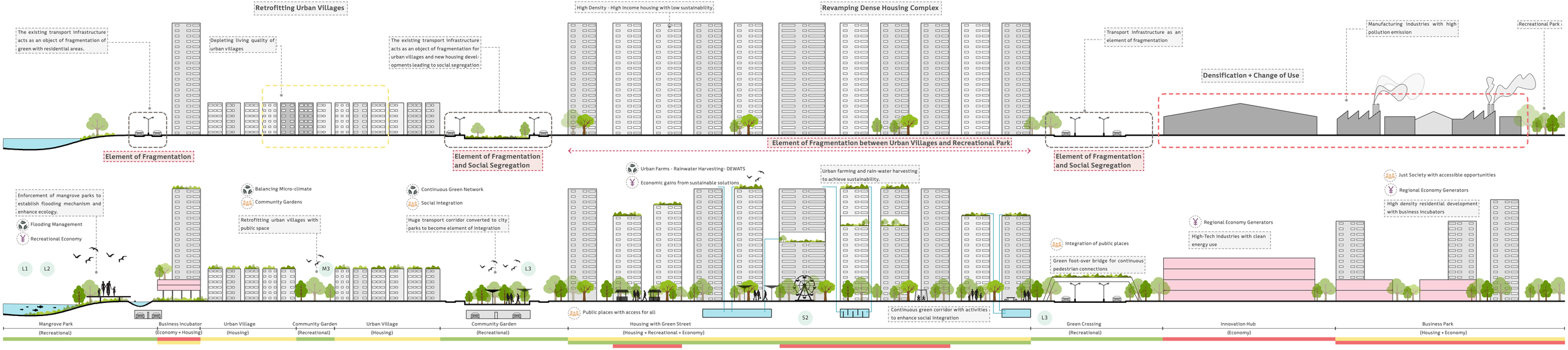
Image of street view showing proposed spatial interventions

Putting existing expressway underground to allow the wetland seep into the land more and allow human accessibility to the wetlands and the coast

Reactivation of coastal area

LINES of common ground
Illustration - Shenzhen

Collage showing the spatial qualities, LINES of common ground


Retrofitting Urban Villages
High Density - High Income housing with low sustainability
Revamping Dense Housing Complex
The existing transport infrastructure acts as an object of fragmentation of green with residential areas.
Depleting living quality of urban villages
The existing transport infrastructure acts as an object of fragmentation for urban villages and new housing develoments leading to social segregation
Transport infrastructure as an element of fragmentation
Densification + Change of Use
Manufacturing Industries with high pollution emission
Recreational Park
Element of Fragmentation
Element of Fragmentation and Social Segregation
Element of Fragmentation between Urban Villages and Recreational Park
Element of Fragmentation and Social Segregation
Urban Farms - Rainwater Harvesting - DEWATS
Economic gains from sustainable solutions
Urban farming and rain-water harvesting to achieve sustainability.
Just Society with accessible opportunities
Regional Economy Generators
High density residential development with business incubators
Enforcement of mangrove parks to establish flooding mechanism and enhance ecology.
Flooding Management
Recreational Economy
Balancing Micro-climate
Community Gardens
Retrofitting urban villages with public space
Continuous Green Network
Social Integration
Huge transport corridor converted to city parks to become element of integration
Regional Economy Generators
High-Tech Industries with clean energy use
Integration of public places
Green foot-over bridge for continuous pedestrian connections
L1
L2
M3
L3
S2
L3
Public places with access for all
Continuous green corridor with activities to enhance social integration
Mangrove Park (Recreational)
Business Incubator (Economy + Housing)
Urban Village (Housing)
Community Garden (Recreational)
Urban Village (Housing)
Community Garden (Recreational)
Housing with Green Street (Housing + Recreational + Economy)
Green Crossing (Recreational)
Innovation Hub (Economy)
Business Park (Housing + Economy)

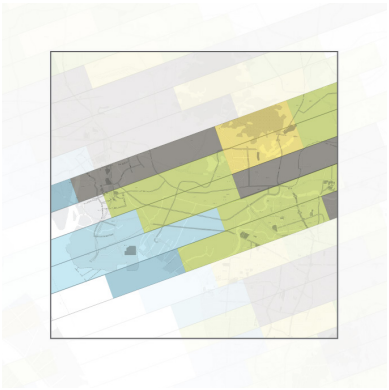
5.2 PLANES of transformation

DONGGUAN

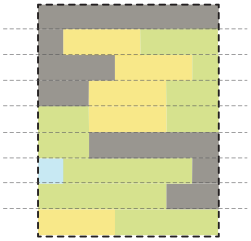
Dongguan is sometimes called “the world’s factory” due to its prosperous manufacturing industry, and some 75% of its 8.34m population are migrant workers who return home during the festive period, leaving the city nearly deserted. Despite its industrial image, Dongguan was recognised by the United Nations Environment Programme as an “international garden city” with 10 forest parks, five natural reserves, 13 wetland parks, 1,071 parks and squares and 923.5km of greenways. This intense natural topography is sometimes fragmented from its surroundings. The site presented here is situated on the waterfront area, with strong presence of urban villages and the potential of becoming the missing economy link between Guangzhou and Shenzhen.

PLANES of transformation

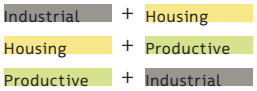
INTERACTIONS



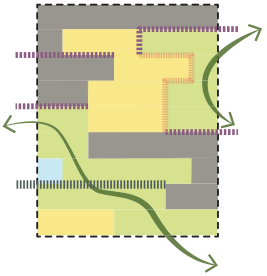
Adjacencies



Understanding Relationships



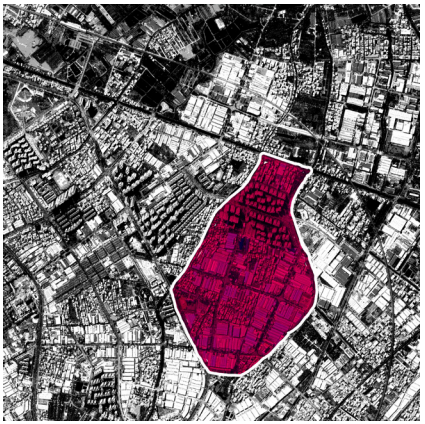
Edges integration



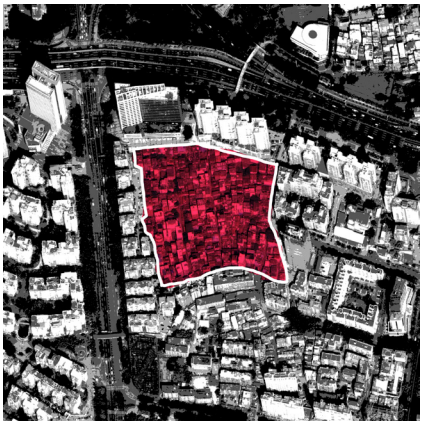
PLANES of transformation

CHARACTER

Sensitive ecological zone



Mix of living and working environments



Urban villages with poor livability

CHALLENGES

Discontinuous water network

[de]industrialisation

Hard green edge

PLANES of transformation

5.2.1 Vision meso scale - Dongguan

Fig. 5.62 - New green corridors along the water infrastructure

Revitalising the water infrastructure

Exploring the possible connections of all existing green patches.

The new green corridors responding to the water condition and the infrastructure line cutting across contrasting settings of dense urban fabric and dense green fabric.

Fig. 5.63 - Programmatic response of the corridors

Programmatic response of the corridors

Multiple green axes cutting across the corridors, further responding to the water.

Programmatic response of the new corridors according to existing clusters of functions.

PLANES of transformation
Vision meso scale - Dongguan

Donnguan, factories of the world

Urban villages on the fringes of the city, Dongguan

Factory buildings and residences in Dongguan

Fig. 5.64 - Potential sites of interventions responding to challenges

PLANES of transformation
Vision meso scale - Dongguan

Spatial framework - Zhongshan-Nansha

In the next step, for the definition of the spatial framework of the area, the potential sites are given priorities based on their proximities to - infrastructure nodes and the water network.

The area in question is a peculiar example as it is strategically located between Shenzhen and Guangzhou, the band where the gradation of industries and housing can be seen.

The area in question is characterized by the presence of large clusters of industries and urban villages. The framework attempts to bring out the potentials of the site, responding to the water network and focussing on the process of [de]industrialisation and transformation of the industries.

Fig. 5.65 - Intervention sites corresponding to infrastructure nodes and the water infrastructure

PLANES of transformation
Vision meso scale - Dongguan

Fig. 5.66 - Programmatic response of intervention sites

PLANES of transformation

5.2.2 Vision micro scale - Dongguan

Further zooming in to the micro scale, the prototypical site focuses on the process of [de]industrialisation and on tackling the case of fragmented urban living environments. It also aims to bring out the significance of the connection of smaller water bodies to the larger water network as a step towards establishing the regional biophysical backbone.

For this, the footprint of the sites of industries are concised to make the fringes along the water network making them sites of new housing with prominence given to local green spaces.

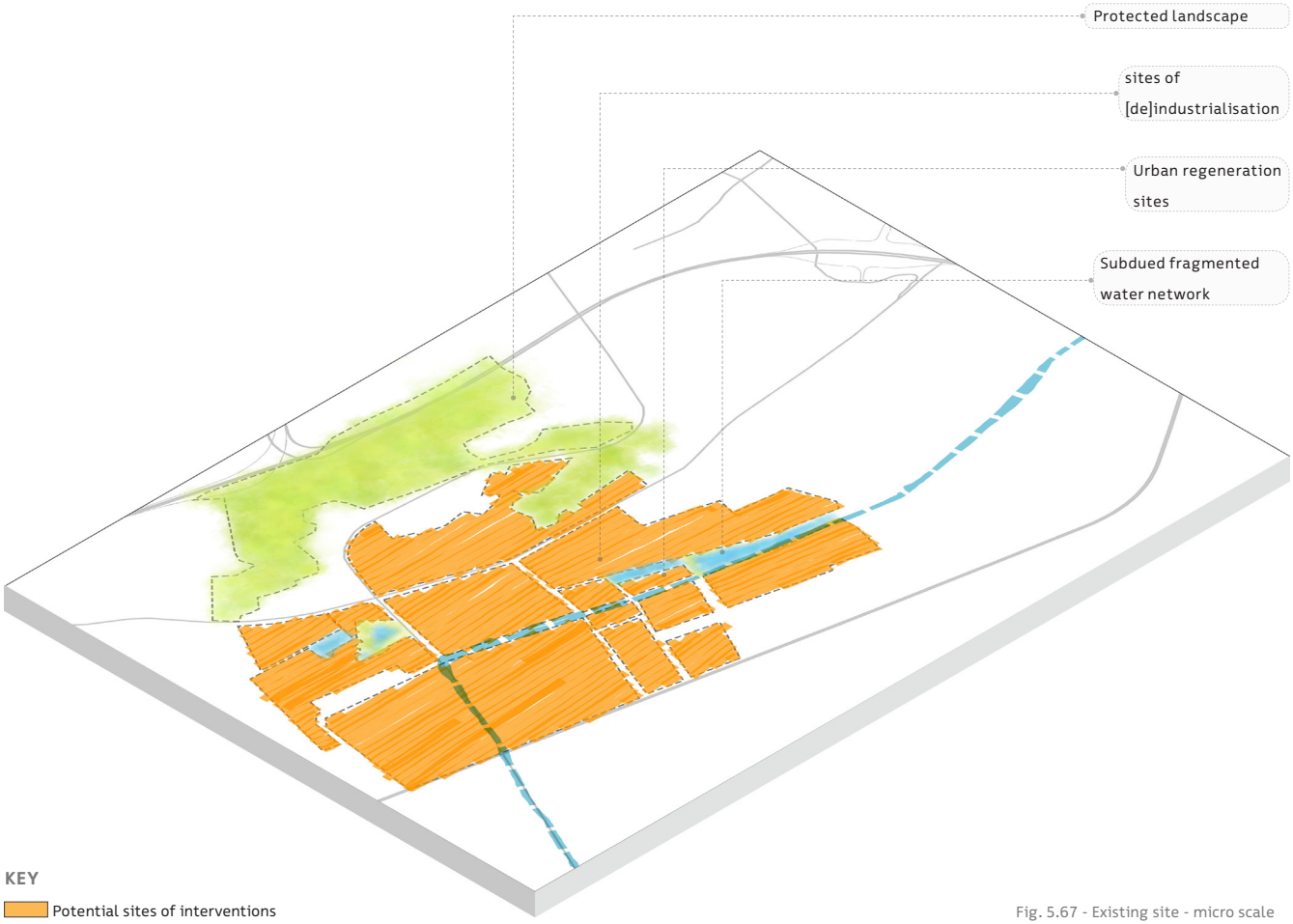


Fig. 5.67 - Existing site - micro scale

PLANES of transformation
Vision micro scale - Dongguan

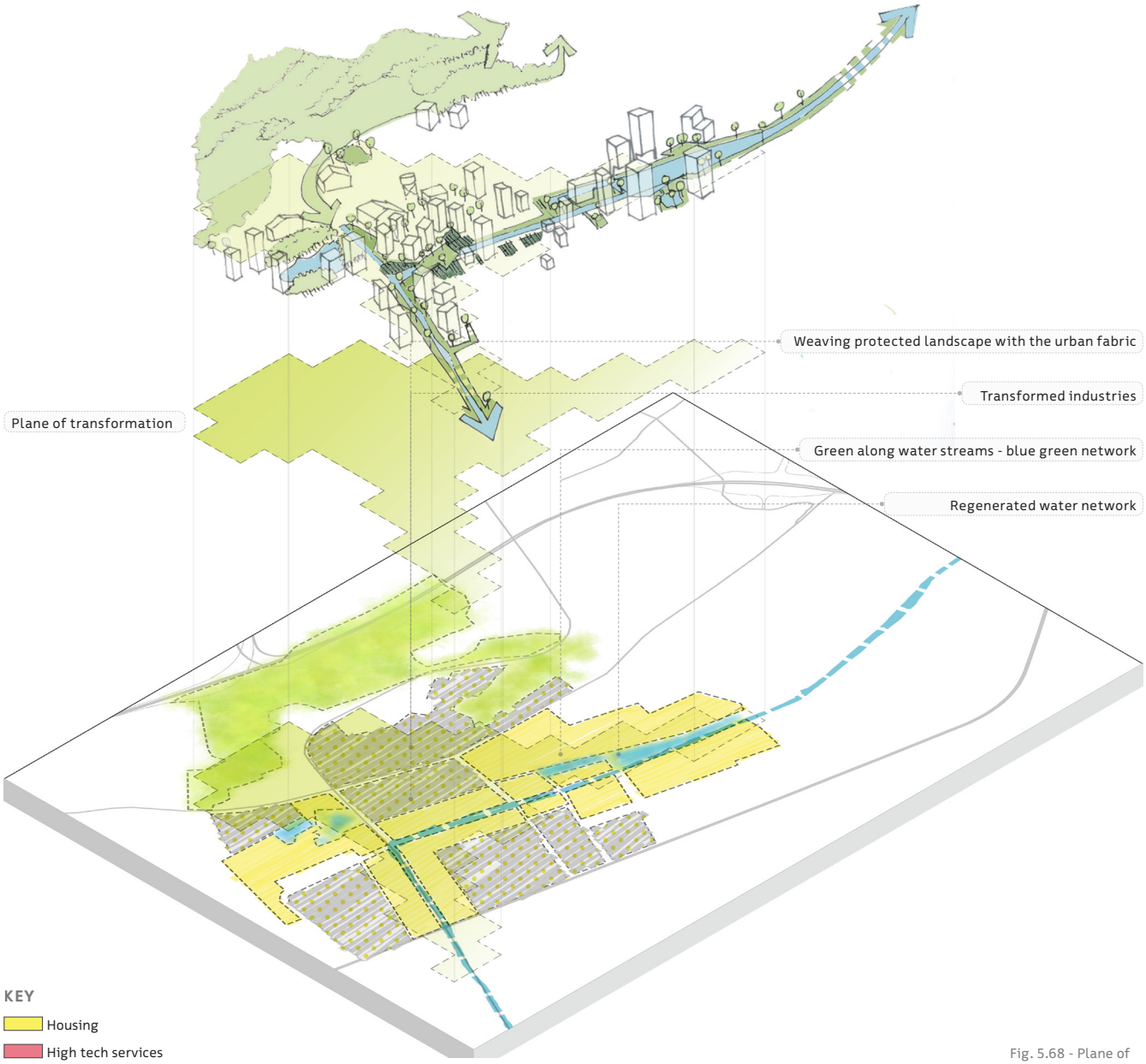


Fig. 5.68 - Plane of

PLANES of transformation
Impression - Dongguan

Predominantly impermeable surfaces resulting in surface run-off being discharged into the waterway and urban heat island effect

Vehicular road hinders the connection between houses water

Image of street view showing existing spatial quality

PLANES of transformation
Impression - Dongguan

Pedestrianised roads to extend street life and soft landscaping to reduce speed of traffic in the area

Image of street view showing proposed spatial interventions

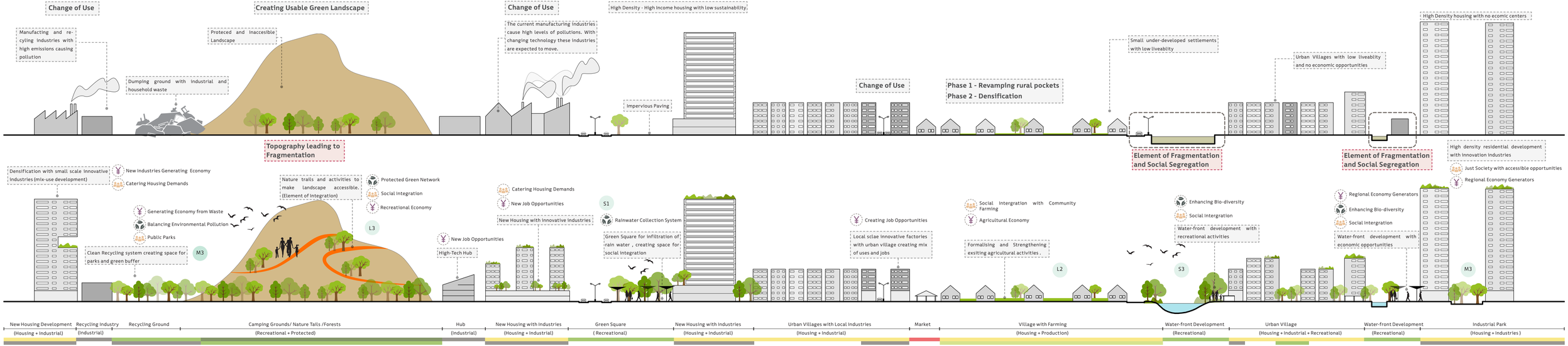
Permeable surface in the form of soft-scape and gravel paving to allow for water retention and filtration

Accessible waterway to encourage public relationship with the environment

PLANES of transformation

Illustration - Dongguan

Collage showing the spatial qualities, LINES of common ground


Change of Use
Manufacting and re-cyling industries with high emissions causing pollution
Dumping ground with industrial and household waste
Creating Usable Green Landscape
Proteced and Inaccesible Landscape
Change of Use
The current manufacturing industries cause high levels of pollutions. With changing technology these industries are expected to move.
High Density - High Income housing with low sustainability
Impervious Paving
Change of Use
Phase 1 - Revamping rural pockets
Phase 2 - Densification
Small under-developed settlements with low liveablity
Urban Villages with low liveability and no economic opportunities
High Density housing with no ecomic centers
Element of Fragmentation and Social Segregation
Element of Fragmentation and Social Segregation
High density residential development with innovation Industries
Just Society with accessible opportunities
Regional Economy Generators
Densification with small scale innovative Industries (mix-use development)
New Industries Generating Economy
Catering Housing Demands
Topography leading to Fragmentation
Nature trails and activities to make landscape accessible. (Element of Integration)
Protected Green Network
Social Integration
Recreational Economy
L3
Generating Economy from Waste
Balancing Environmental Pollution
Public Parks
Clean Recycling system creating space for parks and green buffer
M3
Catering Housing Demands
New Job Opportunities
New Housing with Innovative Industries
New Job Opportunities
High-Tech Hub
S1
Rainwater Collection System
Green Square for infiltration of rain water , creating space for social integration
Creating Job Opportunities
Local sclae innovative factories with urban village creating mix of uses and jobs
Social Intergration with Community Farming
Agricultural Economy
Formalising and Strengthening exsiting agricultural activities .
L2
Enhancing Bio-diversity
Social Integration
Water-front development with recreational activities
S3
Regional Economy Generators
Enhancing Bio-diversity
Social Integration
Water-front development with economic opportunities
M3
New Housing Development (Housing + Industrial)
Recycling Industry (Industrial)
Recycling Ground
Camping Grounds/ Nature Tails /Forests (Recreational + Protected)
Hub (Industrial)
New Housing with Industries (Housing + Industrial)
Green Square (Recreational)
New Housing with Industries (Housing + Industrial)
Urban Villages with Local Industries (Housing + Industrial)
Market
Village with Farming (Housing + Production)
Water-front Development (Recreational)
Urban Village (Housing + Industrial + Recreational)
Water-front Development (Recreational)
Industrial Park (Housing + Industries)

5.3 POINTS of integration

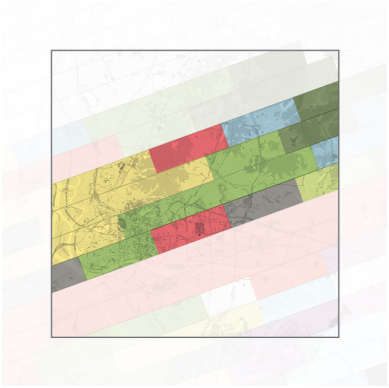
FOSHAN - GUANGZHOU

The next pattern in question is situated in the future Guangzhou metropolitan region.

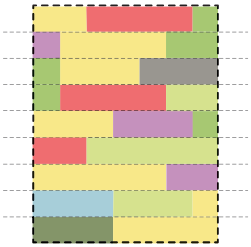
Guangzhou, or Canton, has a history of more than 2000 years. In the latest 5 year plan (2016-2020), China views Guangzhou as even greater transportation and commercial centre, with stronger connections to the rest of PRD. The capital of the region will integrate two neighbouring cities, Foshan and Qingyuan. Envisioning to follow the plan ''from Made in China to Created in China'', Foshan is focusing on high value-added industries and innovation-intensive industries. With the help of automatic and advanced technologies and equipment, the city's competitive traditional industries covering ceramic, metal, furniture and textile production are developing towards innovative upgrading with internationally advanced equipment and technologies. The two cities of Guangzhou and Foshan had long established inter-city trade and exchange relations. Such proximity and historical bonds create the possibility of a metropolitan development framework. The site presented here is where the two municipalities meet, and partly includes Yuexiu, Haizhu and Liwan districts that together form the centre of Guangzhou, and Nanhai district in Foshan. When the rural industrialization started in the 1980s, Nanhai found its new character in the region. Villagers built up their factories on the collectively owned land. The villagers have not moved from their original houses, but the transition from agricultural to industrial sector has anyway already occurred. Nanhai has been identified as one of the strongest towns of industry (Zhou, 2016).

POINTS of integration

INTERACTIONS



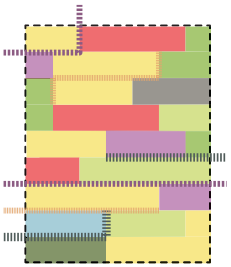
Adjacencies



Understanding Relationships

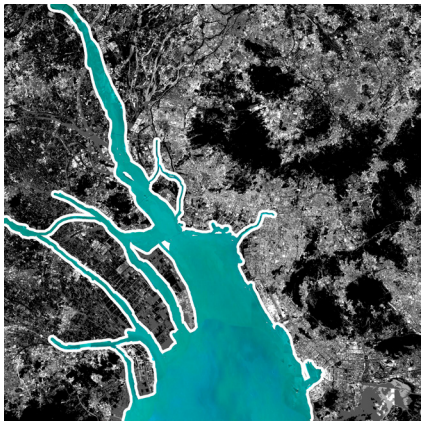
Housing + Economy
Recreational + Housing
Productive + Economy
Recreational + Educational
Productive + Productive

Edges integration

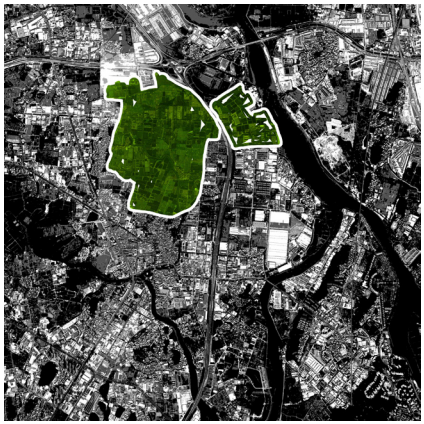


POINTS of integration

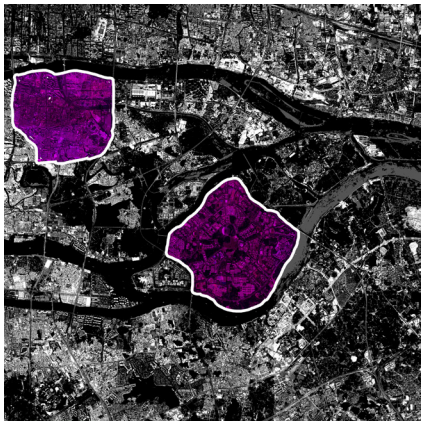
CHARACTER



Mouth of the delta

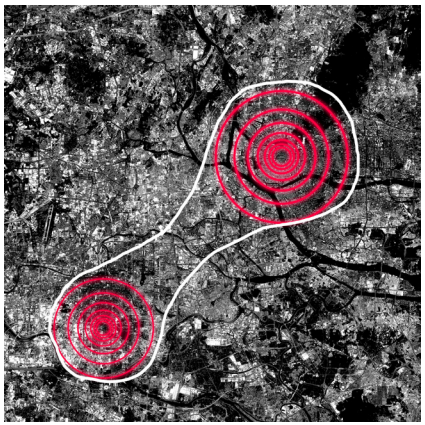


Agricultural fields

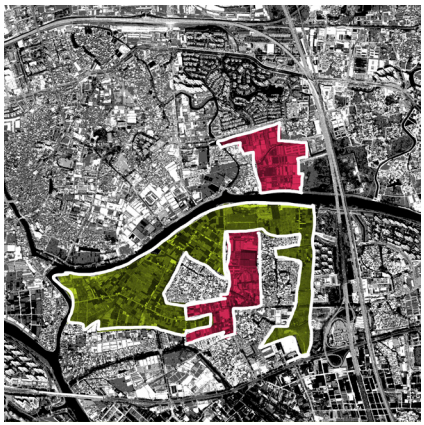


Educational hub

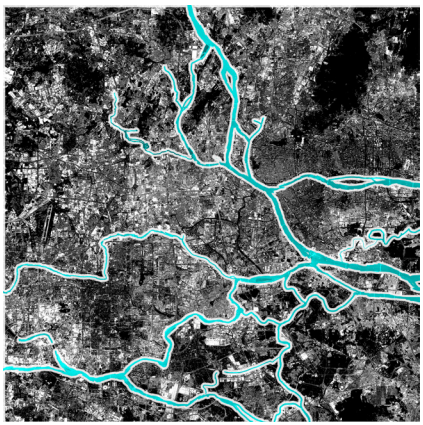
CHALLENGES



Integration of Foshan and Guangzhou



Polluted Agricultural fields



Concretised sensitive water network

POINTS of integration

5.3.1 Vision meso scale - Foshan - Guangzhou

Fig. 5.69 - Network of green and blue infrastructure

Revitalising the biophysical infrastructure

Understanding the existing biophysical infrastructure and exploring possible connections for a better, interwoven network moving through the urban fabric.

Fig. 5.70 - Points of permeability of the green and blue

Possible connections and permeations

Extrapolating the possible connections into points of permeation of the green and blue structures.

POINTS of integration
Vision meso scale - Foshan - Guangzhou

Guangzhou port

Agricultural feilds of foshan

The metropolitan area of Guangzhou

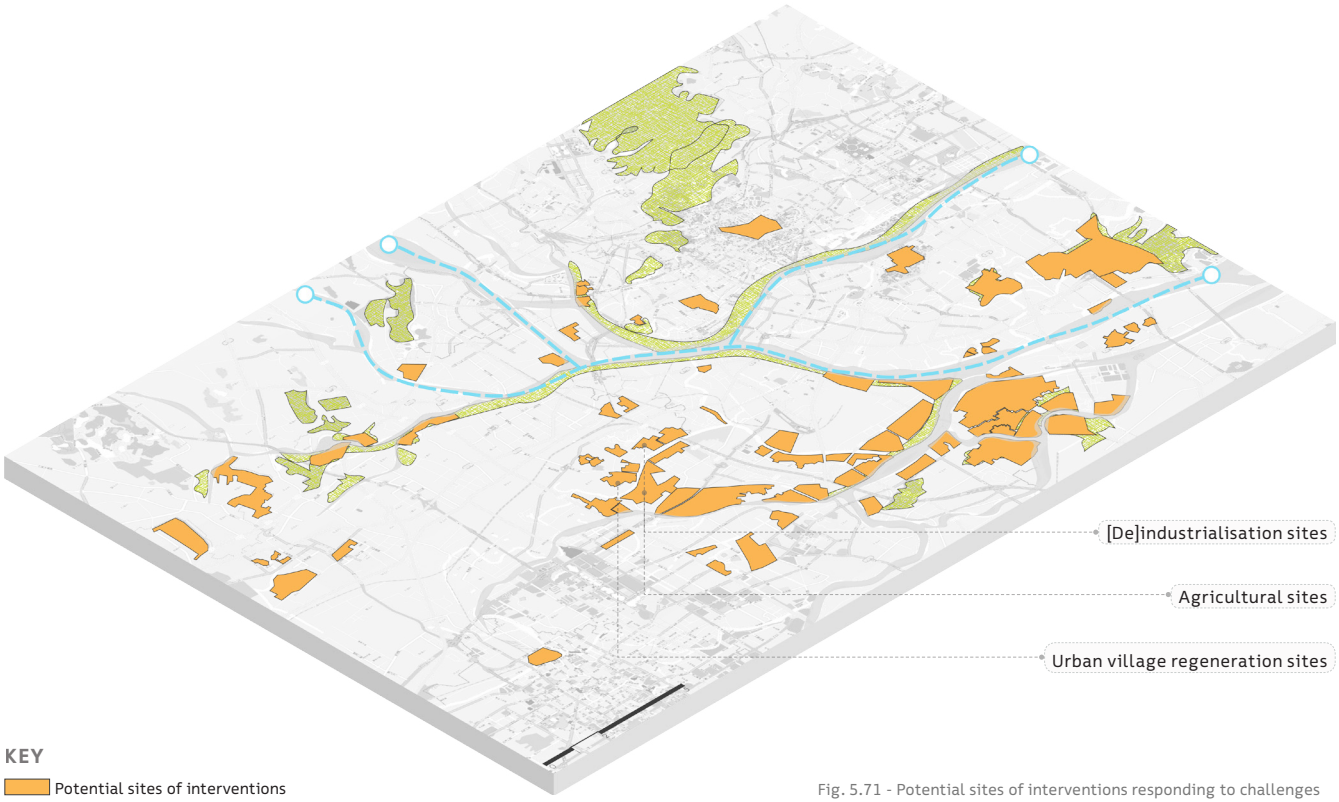


Fig. 5.71 - Potential sites of interventions responding to challenges

POINTS of integration

Vision meso scale - Foshan - Guangzhou

Spatial framework - Foshan-Guangzhou

In the next step, the potential sites for interventions are mapped and sorted into 3 types according to their hierarchy: sites of densification, regeneration and low priority. The ''densification'' sites in this case are either productive landscapes of agriculture or outdated port areas that fall within 1klm from the subway network nodes. That is because the accessibility of the green network and the interconnection of the sites is an essential priority. The ''regeneration'' sites become hybrids of housing and indigenous production close to water activities. Overall, the development character is affected by the historical influence of the natural conditions, and thus promotes the integration of Foshan and Guangzhou into one water-sensitive capital.

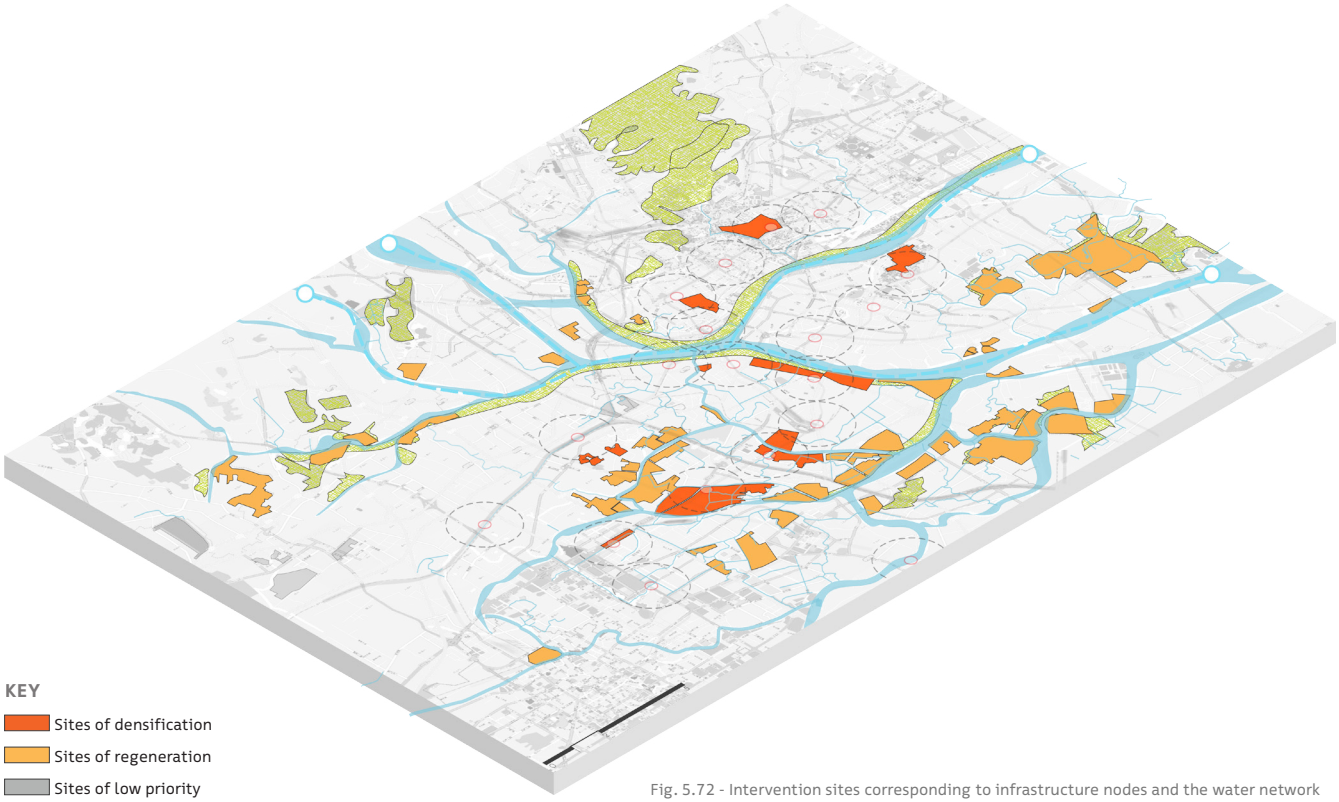


Fig. 5.72 - Intervention sites corresponding to infrastructure nodes and the water network

POINTS of integration
Vision meso scale - Foshan - Guangzhou

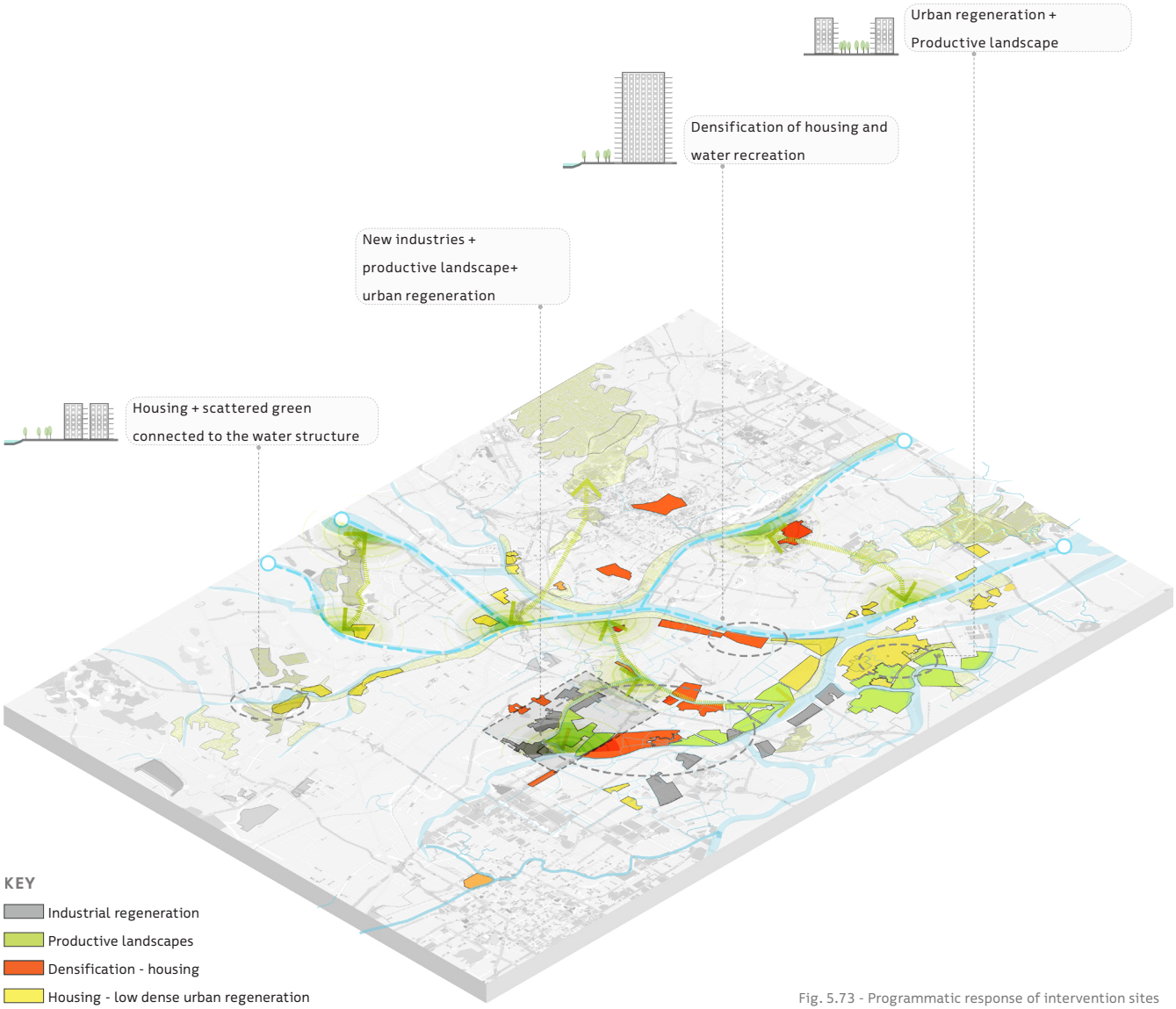


Fig. 5.73 - Programmatic response of intervention sites

POINTS of integration

5.3.2 Vision micro scale - Foshan - Guangzhou

The project closely addresses fragmentation in this example of the Yanbu Residential neighbourhood. In the existing situation, Urban Villages are clustered next to manufacturing industries and/or agriculture fields, whereas high-rise residential interventions have started to appear. The form of the neighbourhood is defined by the water streams that nonetheless are either acting as backyards or have been covered by cement. The project envisions to integrate these fragmented spaces by providing the common ground for potential community-related activities and by revitalising the water streams. Furthermore, the productive landscape along the main water element becomes accessible to public, with one continuous small-scaled promenade that then is connected to the centre of the neighbourhood.

Fig. 5.74 - Existing site - micro scale

POINTS of integration

Vision micro scale - Foshan - Guangzhou

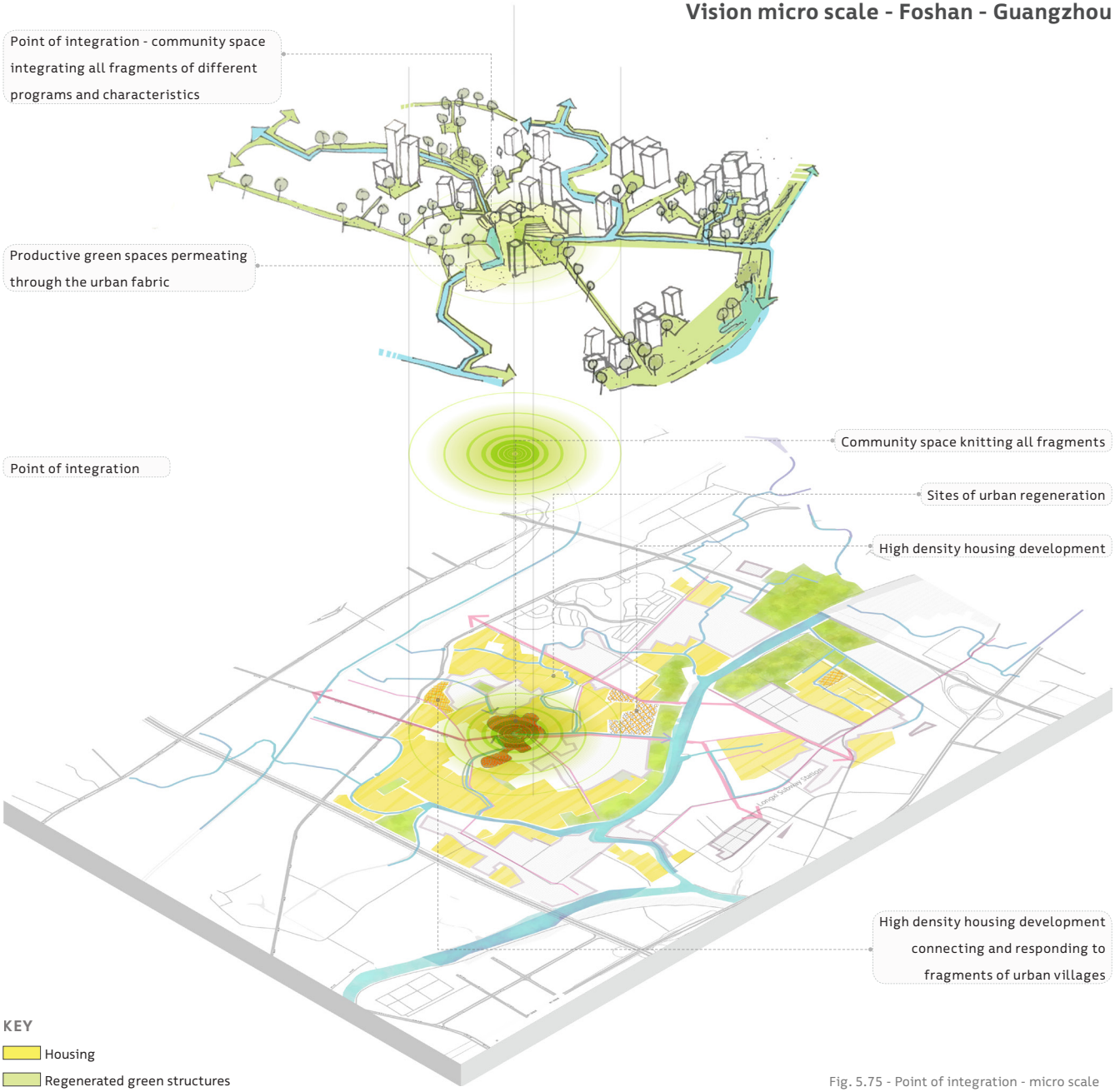


Fig. 5.75 - Point of integration - micro scale

POINTS of integration

Impression - Foshan - Guangzhou

Image of street view showing existing spatial quality

KEY

Potential sites of interventions

POINTS of integration

Impression - Foshan - Guangzhou

Reactivated connections and interactions between people and the waterway spaces via green way

Using level differences and planters to allow for physical interactions and monitoring of dynamic changes of waterway.

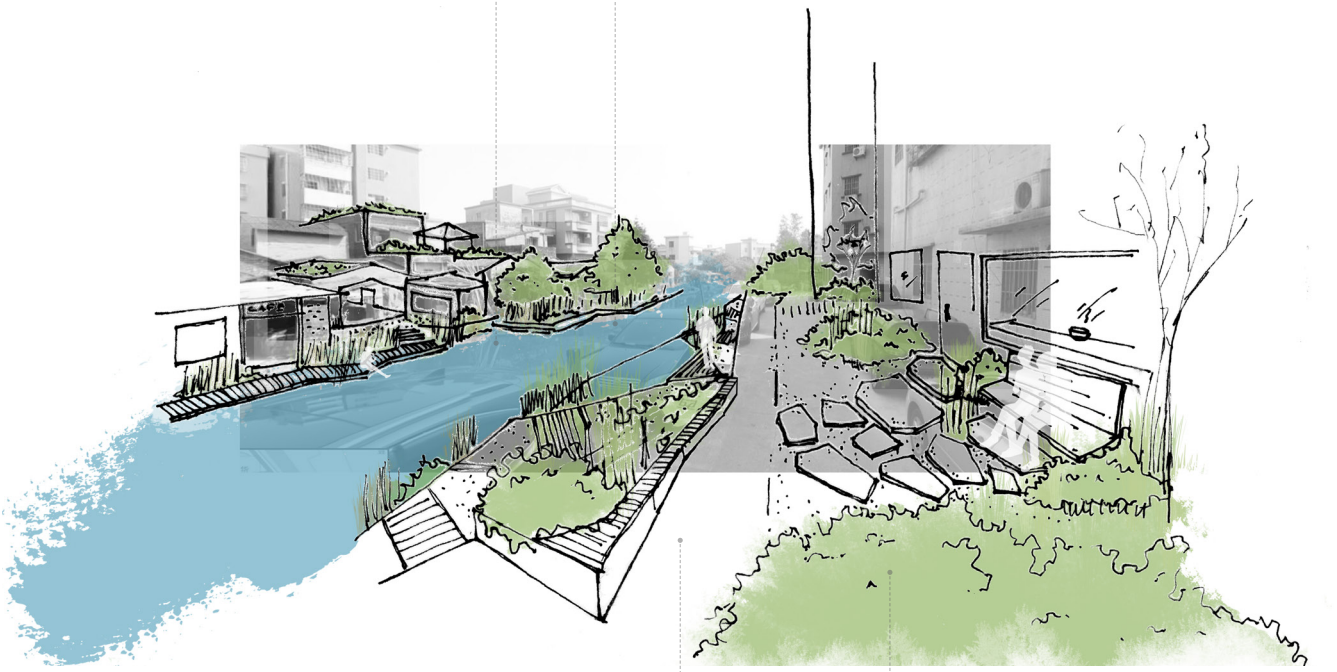


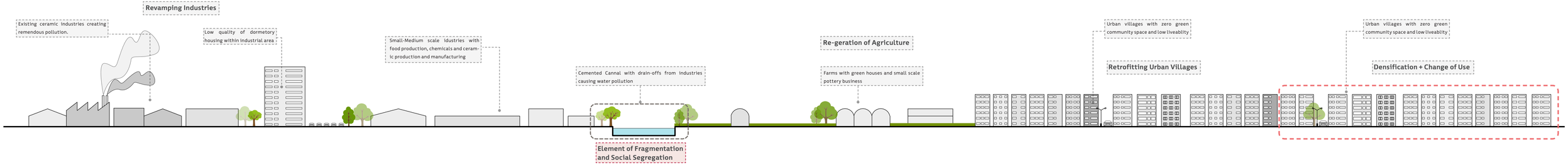
Image of street view showing proposed spatial interventions

Cleansing surface water through permeable surfaces by allowing water to percolate to the ground or/and channelled to a filtering zone before being released into the waterway.

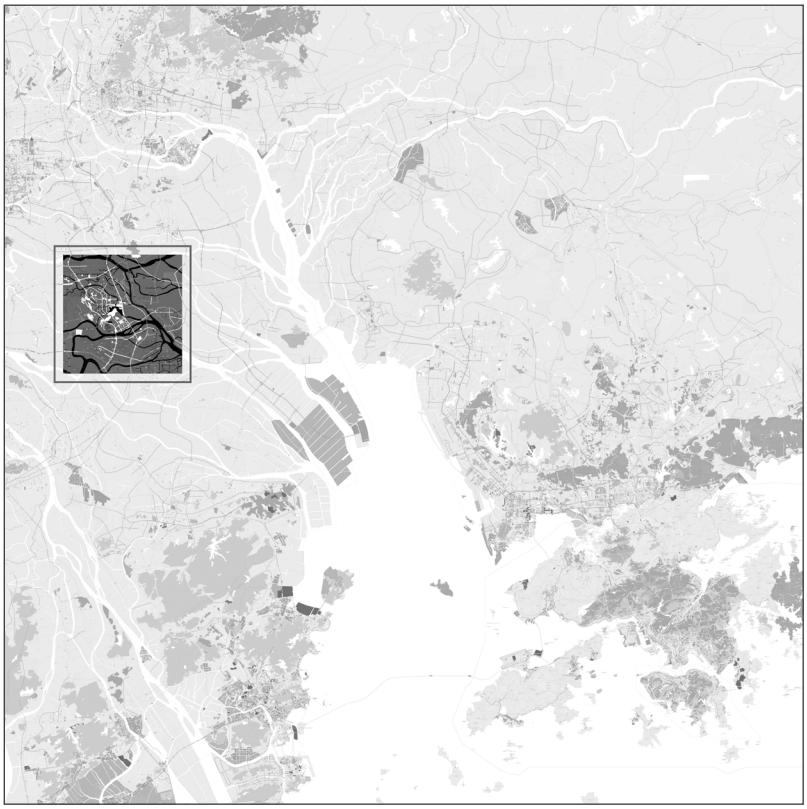
Green buffer zone in the peripheral edges of the buildings along waterways

POINTS of integration
Illustration - Foshan - Guangzhou

Collage showing the spatial qualities, POINTS of integration


Revamping Industries
Existing ceramic industries creating remendous pollution.
Low quality of dormetory housing within industrial area
Small-Medium scale idustries with food production, chemicals and ceramic production and manufacturing
Cemented Cannal with drain-offs from industries causing water pollution
Element of Fragmentation and Social Segregation
Re-geration of Agriculture
Farms with green houses and small scale pottery business
Urban villages with zero green community space and low liveablity
Retrofitting Urban Villages
Urban villages with zero green community space and low liveablity
Densification + Change of Use
Eco-Industries with social gathering spaces
Reduced Pollution
Regional Economy Generators
Networking and Business Opportunities
Cafes with working space to act as incubarotors for high skill research
Balancing Micro-climate
Community Gardens
Retrofitting dormitory with open green squares to increase liveability
M3
Economic Generation from Educational Institutes
Social Integration
Educational Institute with pioneering research in clean agricultural production
S3
L2
L1
Clean Streams - Increased Bio-diversity
Economic gains from Recreational Tourism
Stream re-naturalisation with recreational activities like fishing and board-walks
M3
M4
L2
S3
Sustrainable farming with reduced ground pollution
Economic gains from increased food production
Innovative and sustainable farming institute with vertical green houses
Regional Economy Generators
Integration of public places
Retrofitting of urban villages with green spaces and business incubators
Just Society with accessible opportunity
Regional Economy Generators
High-Tech business and service industries with clean energy use
Just Society with accessible green spaces
High density residential development with green community spaces and increased liveability
S3
Eco-Industrail Park (Industrial)
Business Incubator (Economy)
Dormitories (Housing)
Community Garden (Recreational)
Urban Village (Housing)
Educational Institute (Educational)
Stream with Recreational activities (Recreational)
Agro-Industries and Experimental Grounds (Housing + Economy + Educational)
Urban Village (Housing)
Green Crossing Innovation Hub (Recreational) (Economy)
Urban Village (Housing)
Business Park (Economy)
Urban Village (Housing + Recreational)

5.4 FIELDS of regeneration



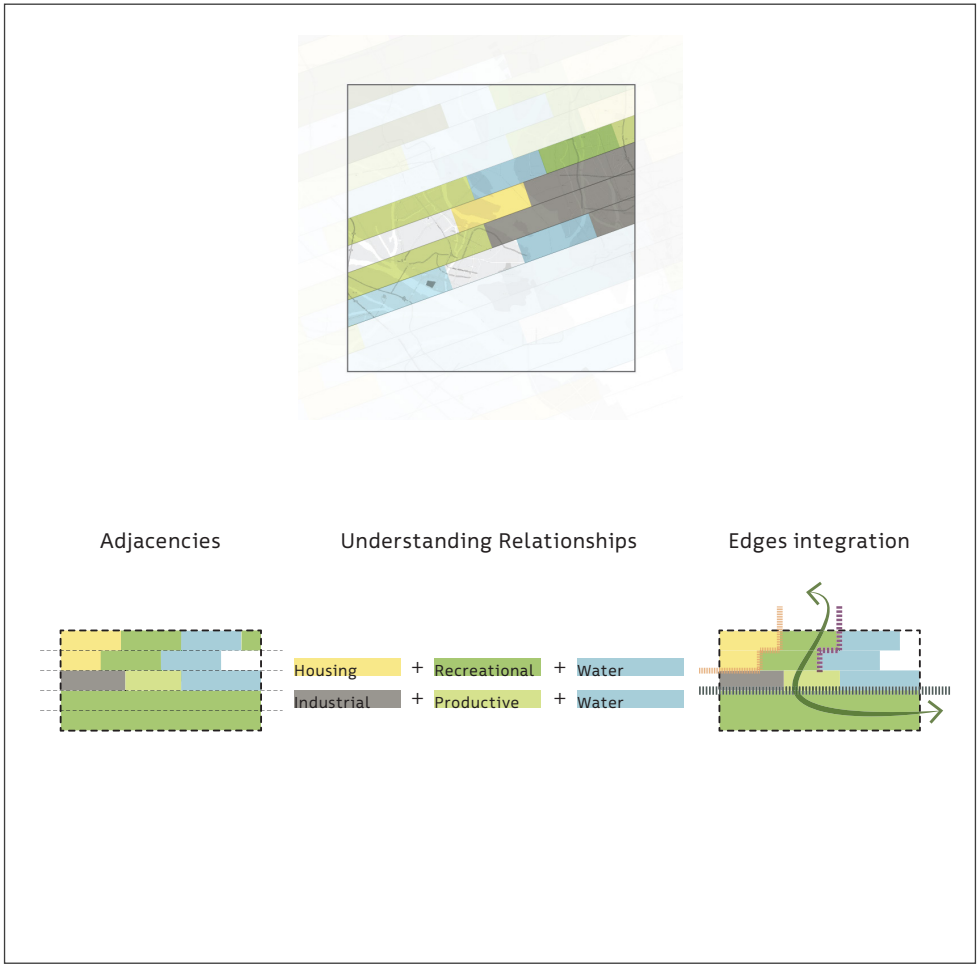
ZHONGSHAN - NANSHA

For the final prototype, the lens zooms in on the western side of the delta area where prominence is given to the ecological sensitivity of the area.

The selected site is located in the northern tip of Zhongshan prefecture of Guangdong province. Geographically, this site is located directly opposite Shenzhen and Hong Kong and the area (in contrast to its dense and urban counterparts) is a maze of intricate natural watercourses and concretised waterways. It is dominated by alluvial plains and rivers, with sporadic hillocks. Historically, this area used to be a part of the pearl river estuary with only a few scattered islands. Being in the delta region, the area is exposed to flooding and rising water levels. The urban fabric is composed of a large number of manufacturing factories and urban village blocks. The area is covered by a network of agriculture parcels and ponds most of which have now been converted into built-up areas, followed by cultivated lands, mainly due to poor governance and policies, and rural-urban migration. Zooming in closer, we can see what was once a fertile and porous land surface, is now dominated by clusters of factories and other industrial buildings with many of these large clusters being located along canal edges and waterways and thus rendering them inaccessible. Residents in the area are either living in rural villages or high rise urban villages in the vicinity of the industrial area. The area, in spite of the intricate water network, is blighted with a serious lack of urban green spaces contributing to poor liveability and spatial fragmentation, a resultant of poor planning and policies.

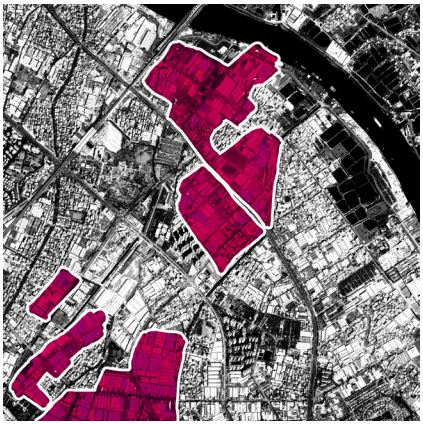
FIELDS of regeneration

INTERACTIONS



FIELDS of regeneration

CHARACTER

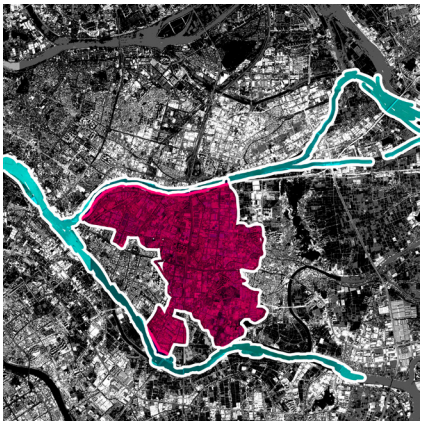


Large clusters of small industries

Mix of urban and rural fabric

CHALLENGES

Flood prone areas of the delta region



Inaccessible water - industrial clusters

FIELDS of regeneration

5.4.1 Vision meso scale - Zhongshan - Nansha

Fig. 5.76 - Network of blue infrastructure

Green and blue structures

Understanding the network of green and blue infrastructure exploring possible connections.

Fig. 5.77 - Fields of regeneration

Possible connections and permeations

Extrapolating the possible green and blue connections into fields of regeneration within the built fabric

FIELDS of regeneration

Vision meso scale - Zhongshan - Nansha

Source: *www.zs.gov.cn*

Industrial clusters along the streams

Source: *www.zs.gov.cn*

Mix of urban and rural environtments, Zhongshan

Source: *Guangzhou travel*

The delta area of the GBA

Source: *Liang Xu*

Aerial photograph showing the fish ponds of the delta region

FIELDS of regeneration

Vision meso scale - Zhongshan - Nansha

Spatial framework - Zhongshan-Nansha

The potential sites of interventions are mapped responding to the site context giving utmost importance to maximise the access to water. Thus the spatial framework focuses on site of urban regeneration and sites of [de]industrialisation along the water network.

The design of the framework brings out the waterways and re-activates them by buffering it with mandatory green spaces or water sensitive economic functions. Thus making them accessible green spaces for the new living environments.

Industrial areas directly beside waterways are converted to fields dedicated to clean energy production. And existing industries are upgraded to high tech industries or retrofitted to mix used functions.

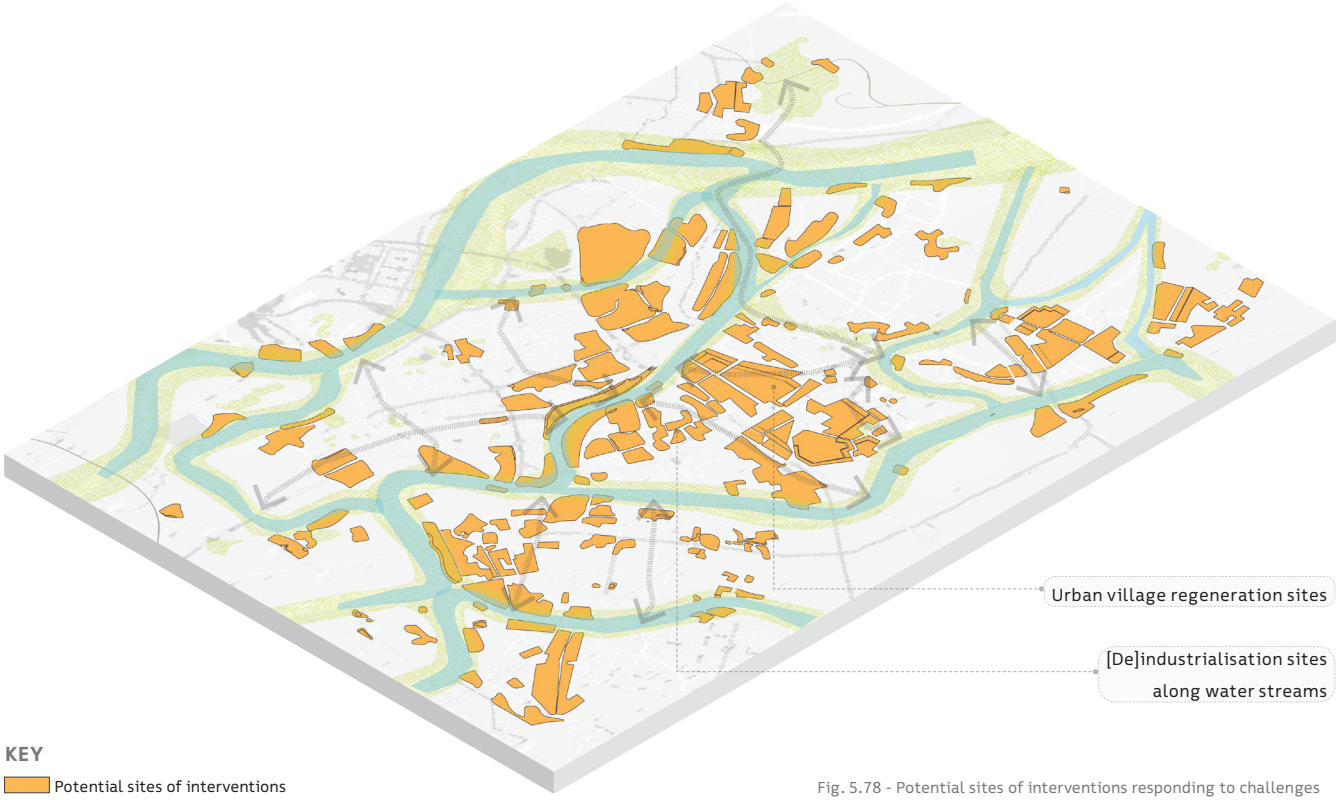


Fig. 5.78 - Potential sites of interventions responding to challenges

FIELDS of regeneration
Vision meso scale - Zhongshan - Nansha

Fig. 5.79 - Programmatic response of intervention sites

FIELDS of regeneration

5.4.2 Vision micro scale - Zhongshan - Nansha

In this particular example, the project focuses on the transformation of areas of large clusters of small industrial factories (a specific characteristic of the area) between and along water streams. WWThe presence of such functions renders these water bodies inaccessible.

This project aims to regenerate the characteristics of the flood plains in order to mitigate the effects of flooding by demarcating certain designated flooding areas. Furthermore, the flooding areas are utilized as productive greens in order to exercise efficient use of space.

This project also focuses on connecting local greens to larger regional greens and also on bringing out an intricate dialogue between the green and blue structures and the people, making these spaces a .

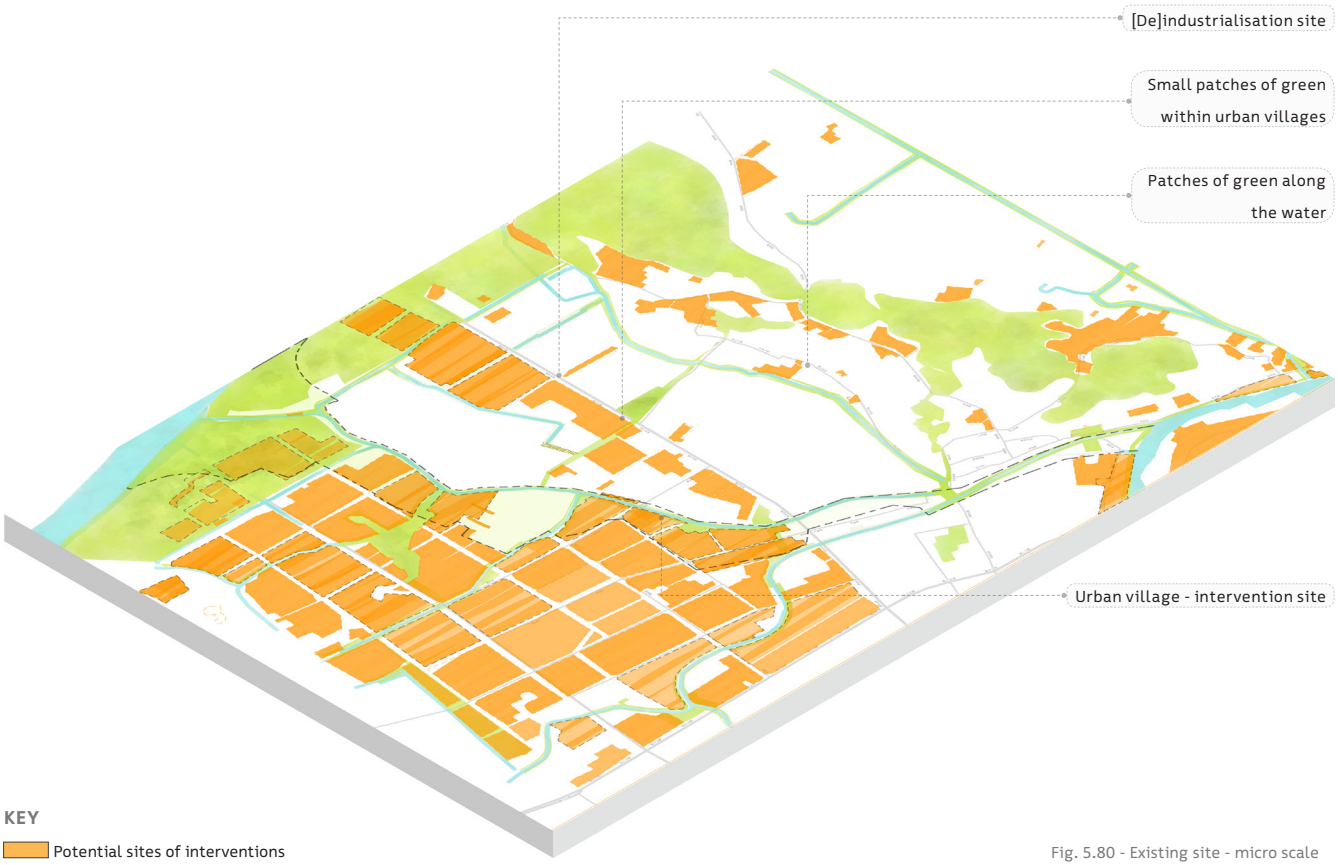


Fig. 5.80 - Existing site - micro scale

FIELDS of regeneration

Vision micro scale - Zhongshan - Nansha

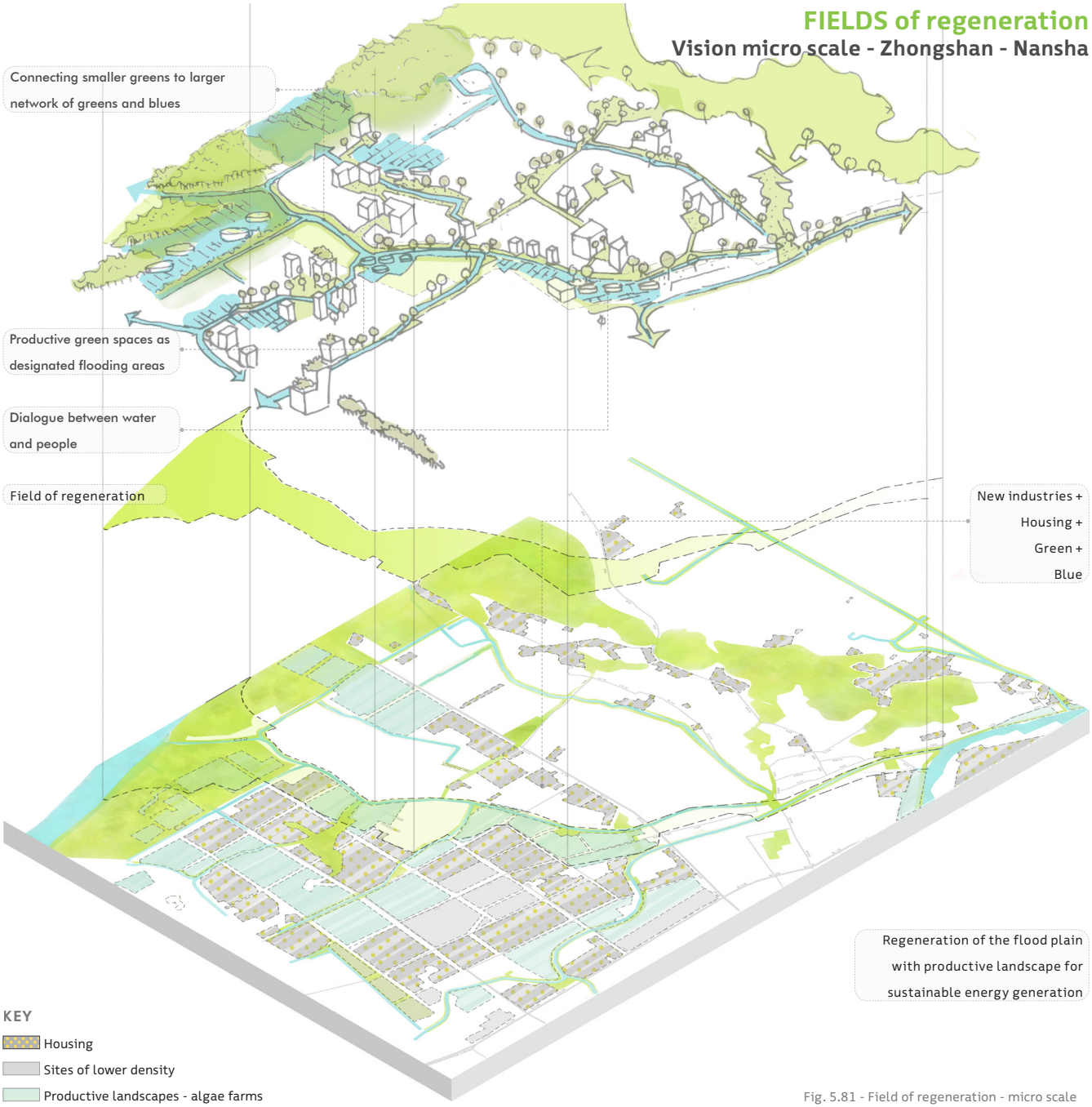


Fig. 5.81 - Field of regeneration - micro scale

FIELDS of regeneration

Impression - Zhongshan - Nansha

Concretised waterway seen as a means to channelise water flow

Image of street view showing existing spatial quality

Concretised waterway seen as a means to channelise water flow

FIELDS of regeneration
Impression - Zhongshan - Nansha

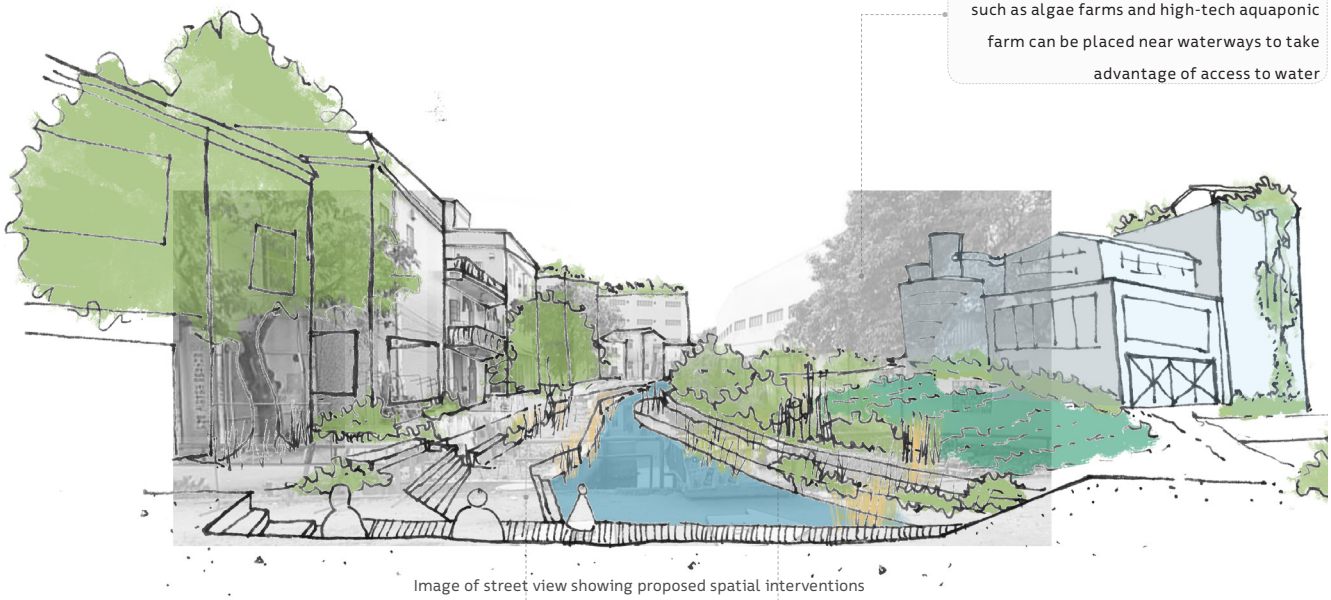


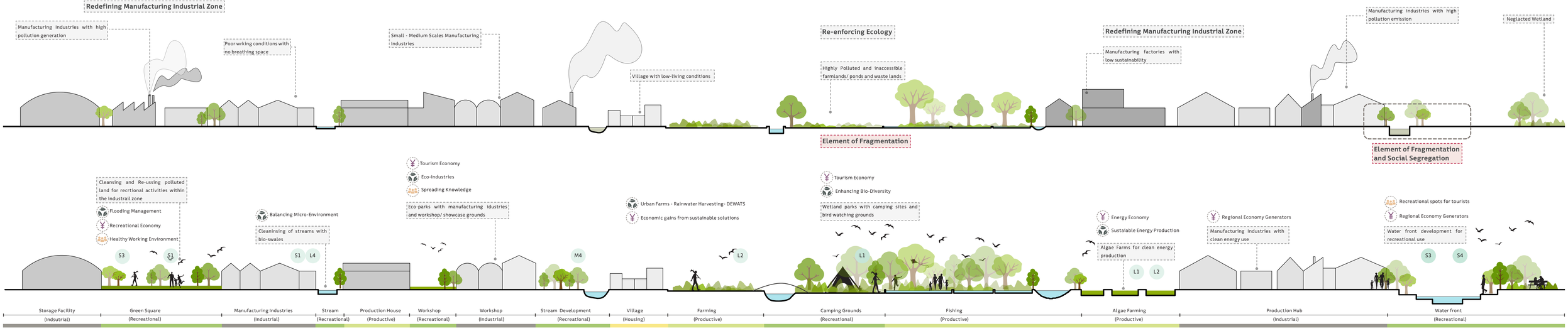
Image of street view showing proposed spatial interventions

Fig. 5.82 - Line of common ground - micro scale

FIELDS of regeneration

Illustration - Zhongshan - Nansha

Collage showing the spatial qualities, FIELDS of regeneration


Redefining Manufacturing Industrial Zone
Manufacturing Industries with high pollution generation
Poor wrking conditions with no breathing space
Small - Medium Scales Manufacturing Industries
Village with low-living conditions
Re-enforcing Ecology
Highly Polluted and Inaccessible farmlands/ ponds and waste lands
Redefining Manufacturing Industrial Zone
Manufacturing factories with low sustainability
Manufacturing Industries with high pollution emission
Neglected Wetland
Element of Fragmentation
Element of Fragmentation and Social Segregation
Cleansing and Re-ussing polluted land for recrtional activities within the Industrall zone
Flooding Management
Recreational Economy
Healthy Working Environment
Balancing Micro-Environment
Cleaninsing of streams with bio-swales
Tourism Economy
Eco-Industries
Spreading Knowledge
Eco-parks with manufacturing Idustries and workshop/ showcase grounds
Urban Farms - Rainwater Harvesting- DEWATS
Economic gains from sustainable solutions
Tourism Economy
Enhancing Bio-Diversity
Wetland parks with camping sites and bird watching grounds
Energy Economy
Sustalable Energy Production
Algae Farms for clean energy production
Regional Economy Generators
Manufacturing Industries with clean energy use
Recreational spots for tourists
Regional Economy Generators
Water front development for recreational use
S3
S1
S1
L4
M4
L2
L1
L1
L2
S3
S4
Storage Facility (Industrial)
Green Square (Recreational)
Manufacturing Industries (Industrial)
Stream (Recreational)
Production House (Productive)
Workshop (Recreational)
Workshop (Industrial)
Stream Development (Recreational)
Village (Housing)
Farming (Productive)
Camping Grounds (Recreational)
Fishing (Productive)
Algae Farming (Productive)
Production Hub (Industrial)
Water front (Recreational)

6

VISION

This chapter explains how do we envision the GBA in 2030. Related to the themes of Society, Environment and Economy.

The vision establishment process was explained through several steps. From setting the guiding values and principles, to defining the green back bone and the concept to the final vision.

6.1 VISION 2030: INTEGRATED GBA

6.1.1 Values and Principles

Situated between several interdependent political and economic zones of southern China's Pearl River Delta, the integrated GBA proposal focuses on exploring its ecological and economical opportinities aiming towards social cohesion.

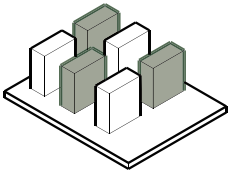
VALUES TO CONDUCT.

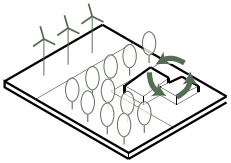
Keyvalues were established in order to support the three guiding themes.

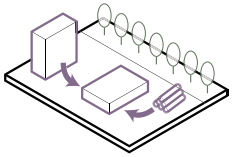
GUIDED BY ADAPTIVE DEVELOPMENT

Through the principle of Blue and green integration

UNEQUAL OPPORTUNITIES OF DEVELOPMENT







SOCIETY

Social **Cohesion**

Achieve **Liveability**

ENVIRONMENT

Strengthen Blue Green Infrastructure

Enhance bio-diversity

Address **Accessibility** of new housing areas through the re-use of existing infrastructure.

ECONOMY

Alternative Economy development

Shifting towards a more high-end sustainable industries.

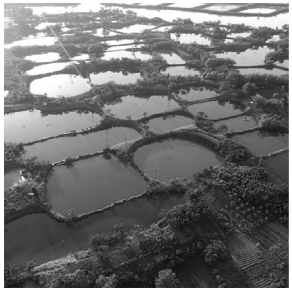
ADAPTIVE DEVELOPMENT

Integration of bio-physical infrastructure and economical development

VISION 2030: INTEGRATED GBA

6.1.2 Green & Blue Economy

Public accessibility to quality open green space.



Upgrading existing local agriculture industry.

Promotion of new agriculture typology appropriate for higher efficiency and density.

Generation of regional tourism and recreation.

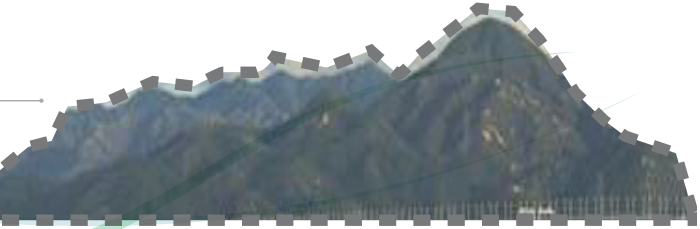
LOCAL

REGIONAL

Introduction of new clean energy production that work with the delta.

Deindustrialisation pushing workforce to equire skills and knowledge upgrade.

Clean energy production and export.



NATIONAL-INTERNATIONAL

Becoming front runners and experts in industrial ecology and providing internation guidance to others.

Integration of bio-physical infrastructure and economic development into the planning development of a mega region will provide socio-economic impact within regional and national level. Due to the geo-political positioning of the GBA in Asia Pacific and China's position to the global arena, this transformation will impact and influence other actors on a global scale. The integration of bio-physical infrastructure raises living and environmental standards for people at the same time shortens the gap between rich and poor. The impending process of de-industrialisation will provide space for the needed economy rejuvenation and skills upgrade will provide a workforce ready for the challenges of the high tech industry and services. Previously dubbed as 'world's factory', providing the world with products of consumerism and world's pollution, the ecological industrialism in the GBA will turn the wheels around by producing and providing sustainable energy to the region and the rest of the world.

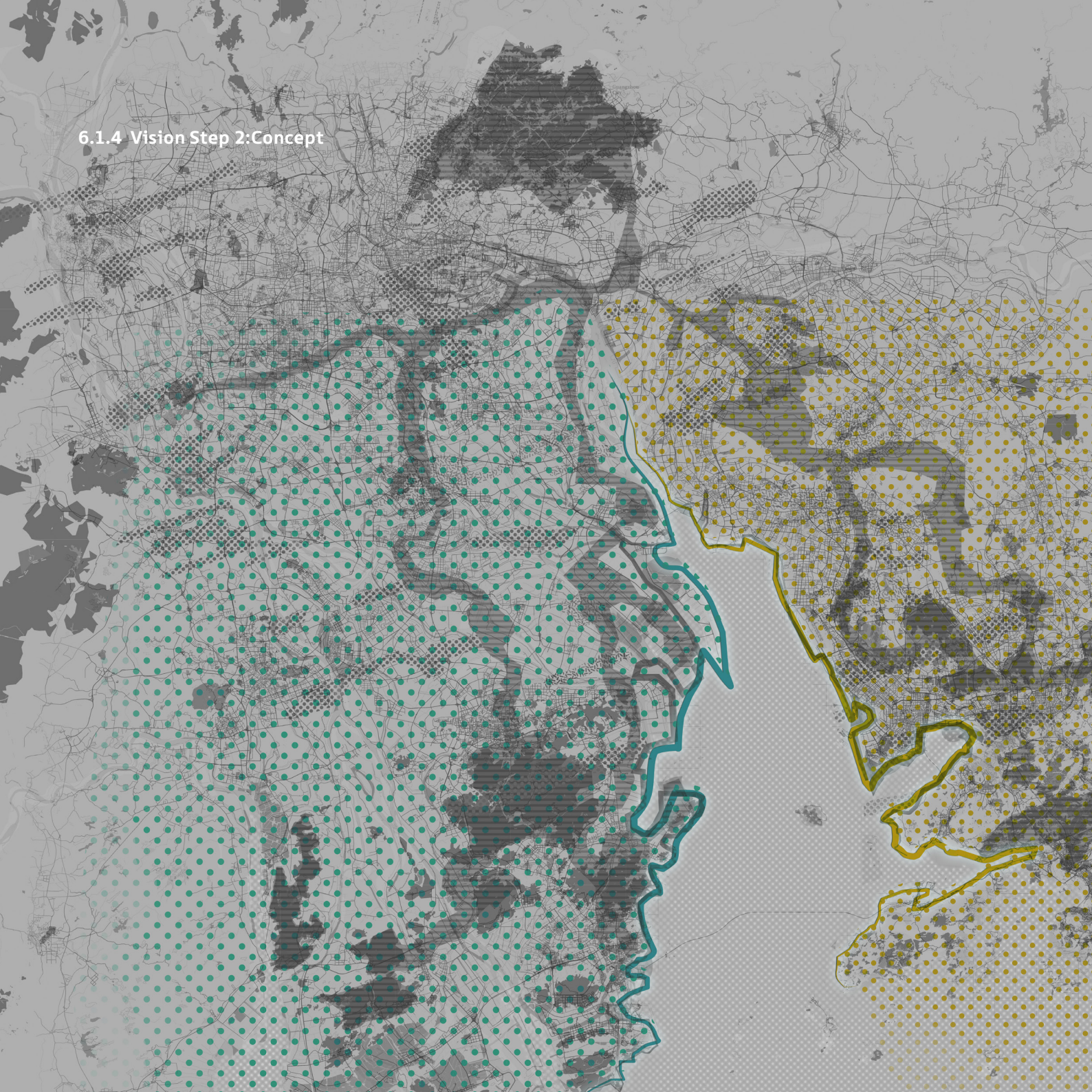

6.1.3 Vision Step 1: Green network
Guangzhou
Foshan
Dongguan
Zhongshan
Zhuhai
Macau
Hong Kong

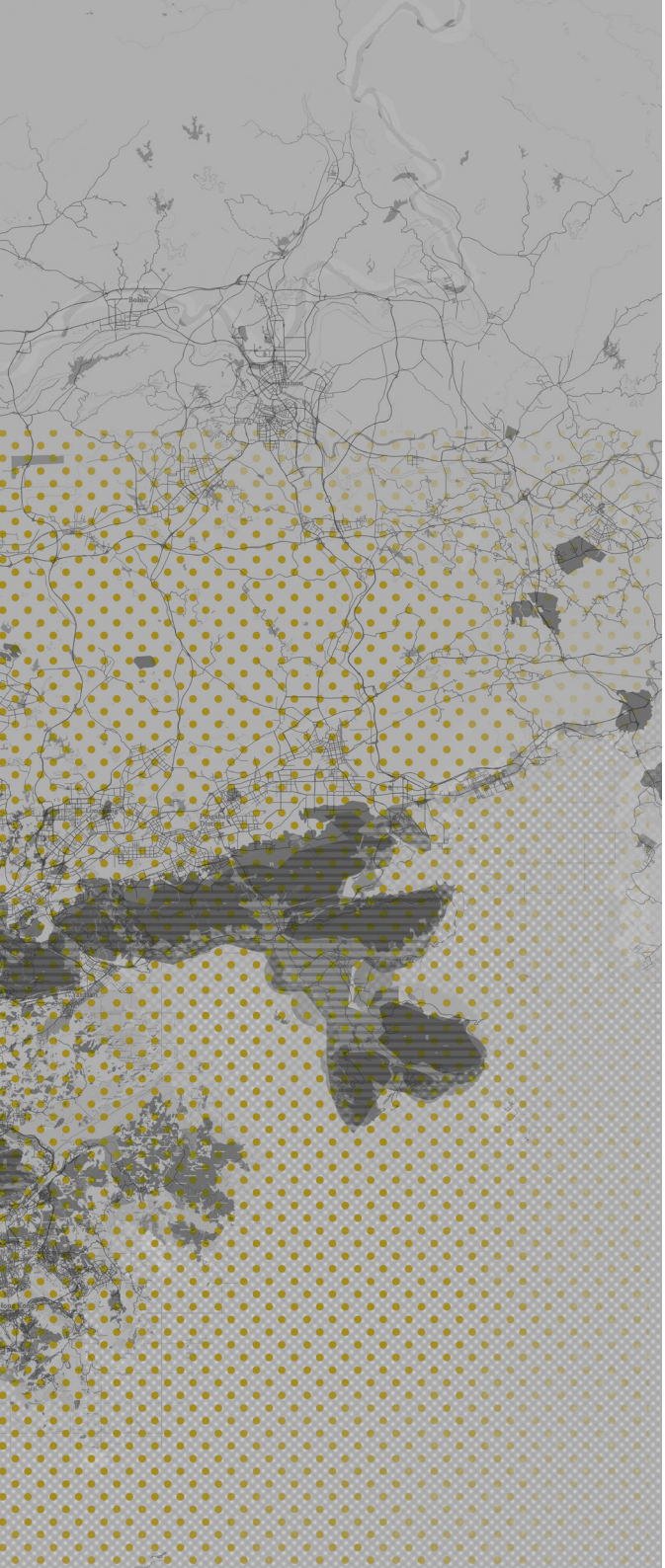
Green Back-bone

In order to spatially translate the values and principles mentioned above, we started first by defining a green backbone that connects the main nodes, valuable country parks, natural protected areas, to create a network for conservation, recreation, sport, and eco-tourism.

The plan represents a network of diverse green systems in both urban and natural environments and offers an infrastructure for new types of developments and densification processes and it is beyond municipal boundaries.

6.1.4 Vision Step 2:Concept





One river, two banks, two proposals.

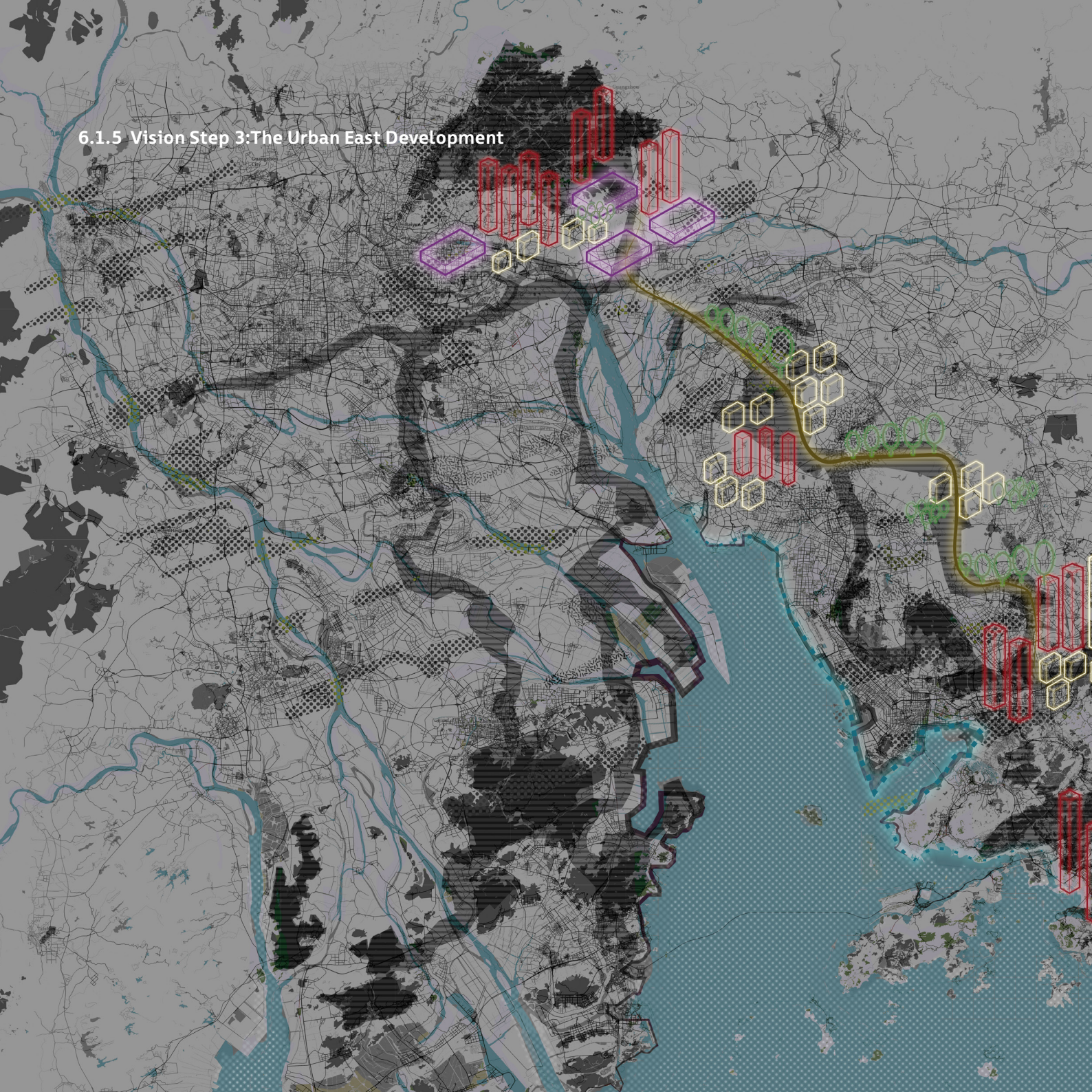
Our vision concept is inspired from the game, strategies, zoom-in sites and the existing pre-conditions of the delta all discussed in the previous chapters.

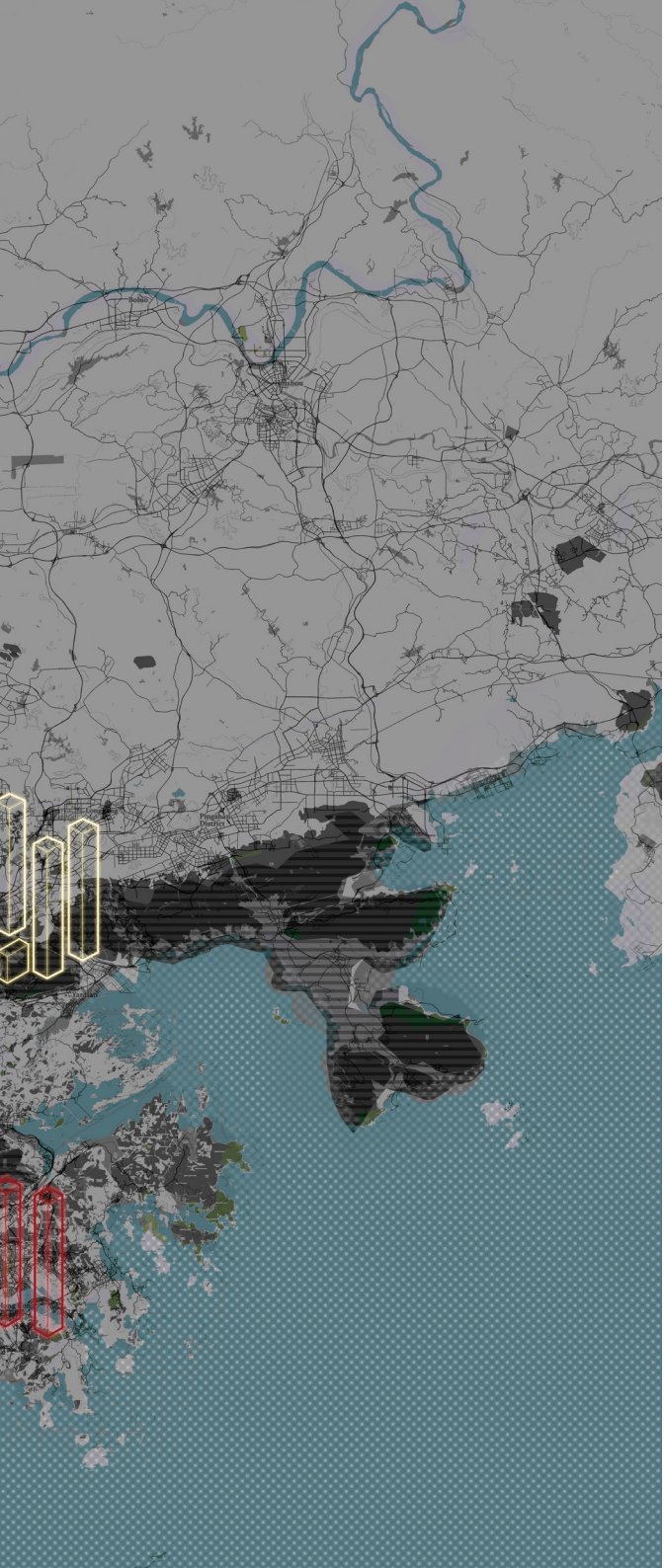
Two types of development will take place on the opposing banks of the pearl delta.

The right side (yellow) is oriented towards an adaptive balanced densification proposal connected by the green in order to form a continuity.

The left side (turquoise) is where the delta conditions and the natural system takes the upper control and guides the development.

6.1.5 Vision Step 3:The Urban East Development



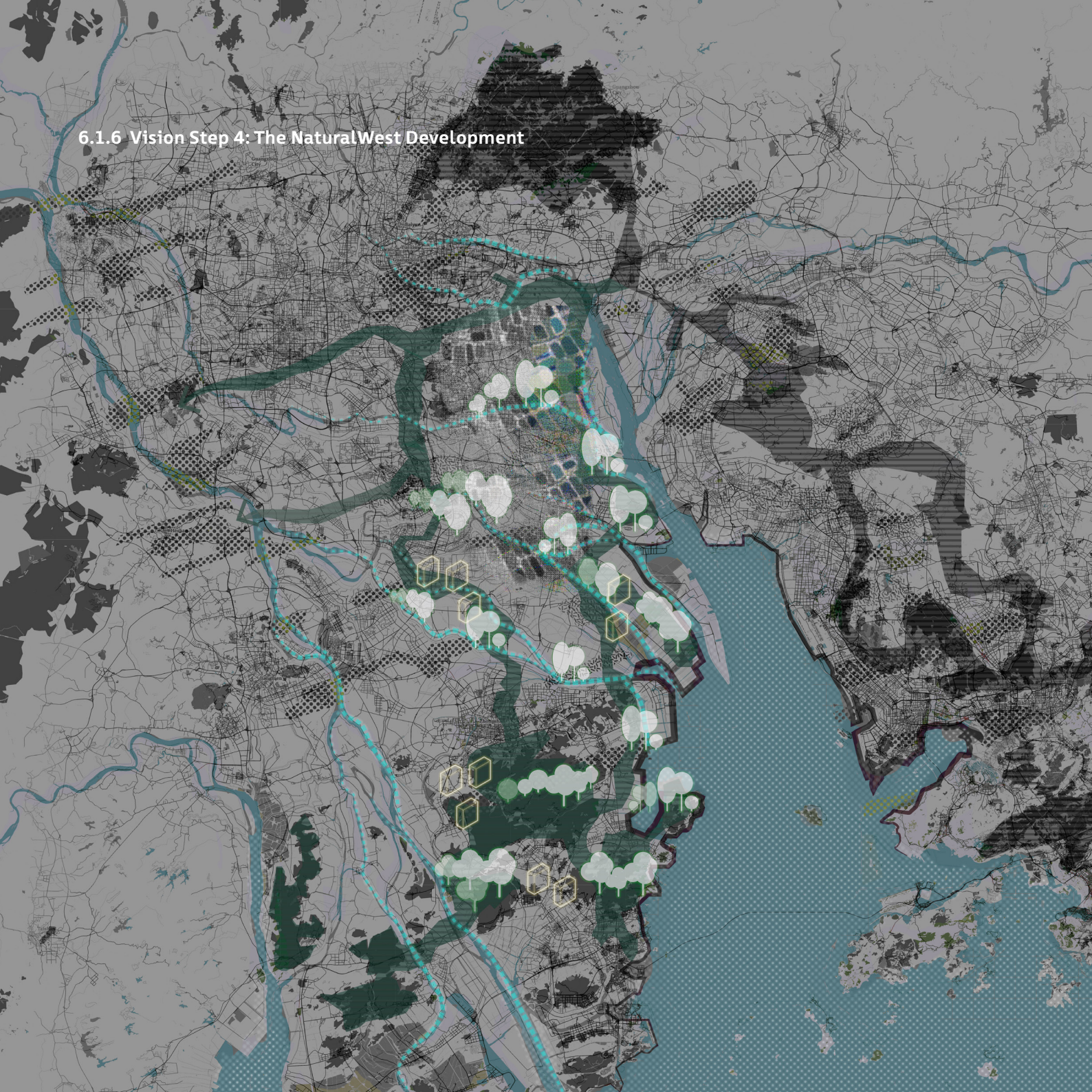


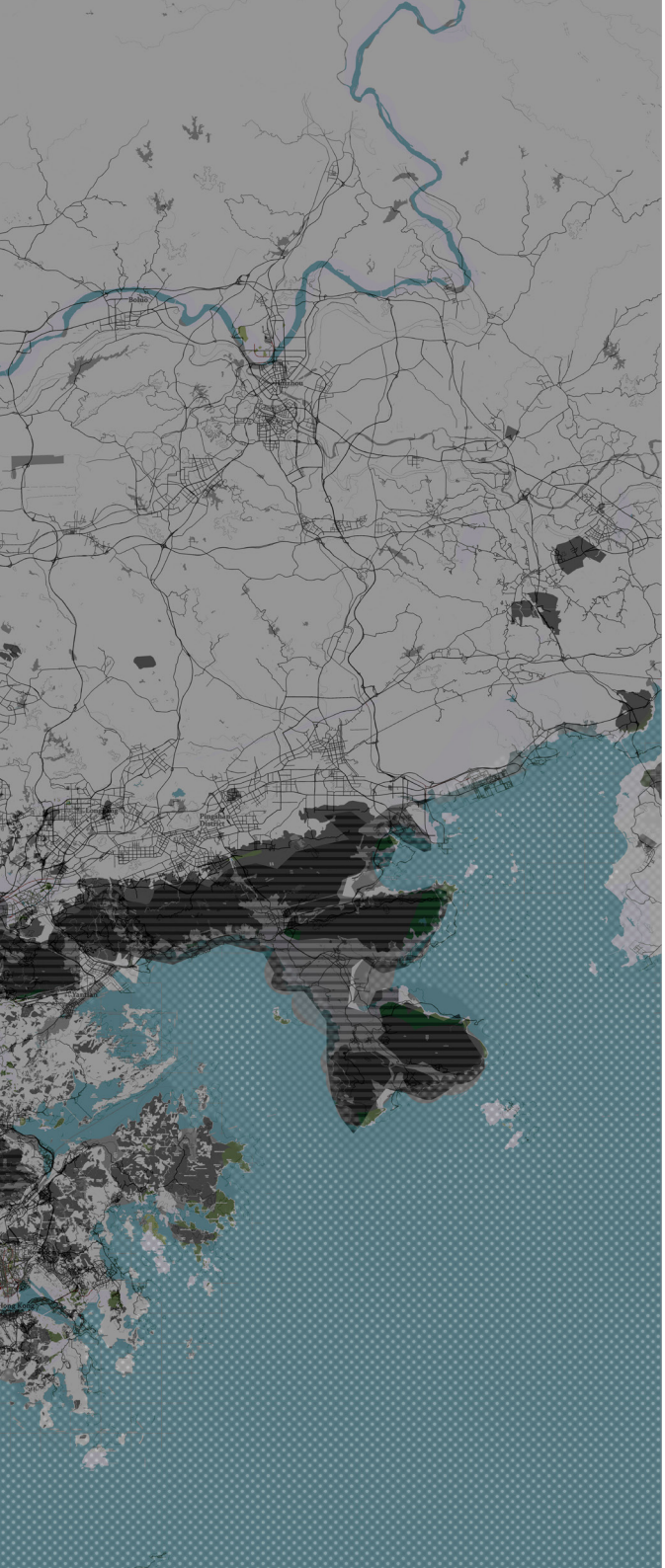
The East Bank

The right side proposes an urban development that focuses on densification all along the green corridor through the re-use of the existing manufactures in response to the de-industrialisation.

The goal is to switch towards a more high-end sustainable industries whilst developing new forms of economies on a local level. The east waterfront is oriented towards enhancing an economic continuity between the main cities: Hong Kong, Shenzhen and Guangzhou.

6.1.6 Vision Step 4: The NaturalWest Development

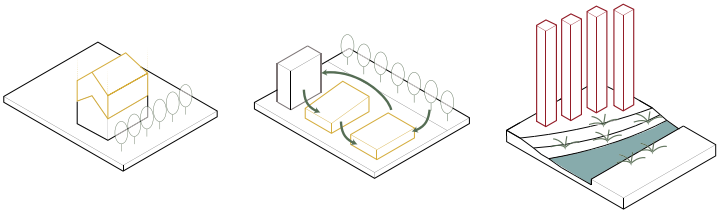




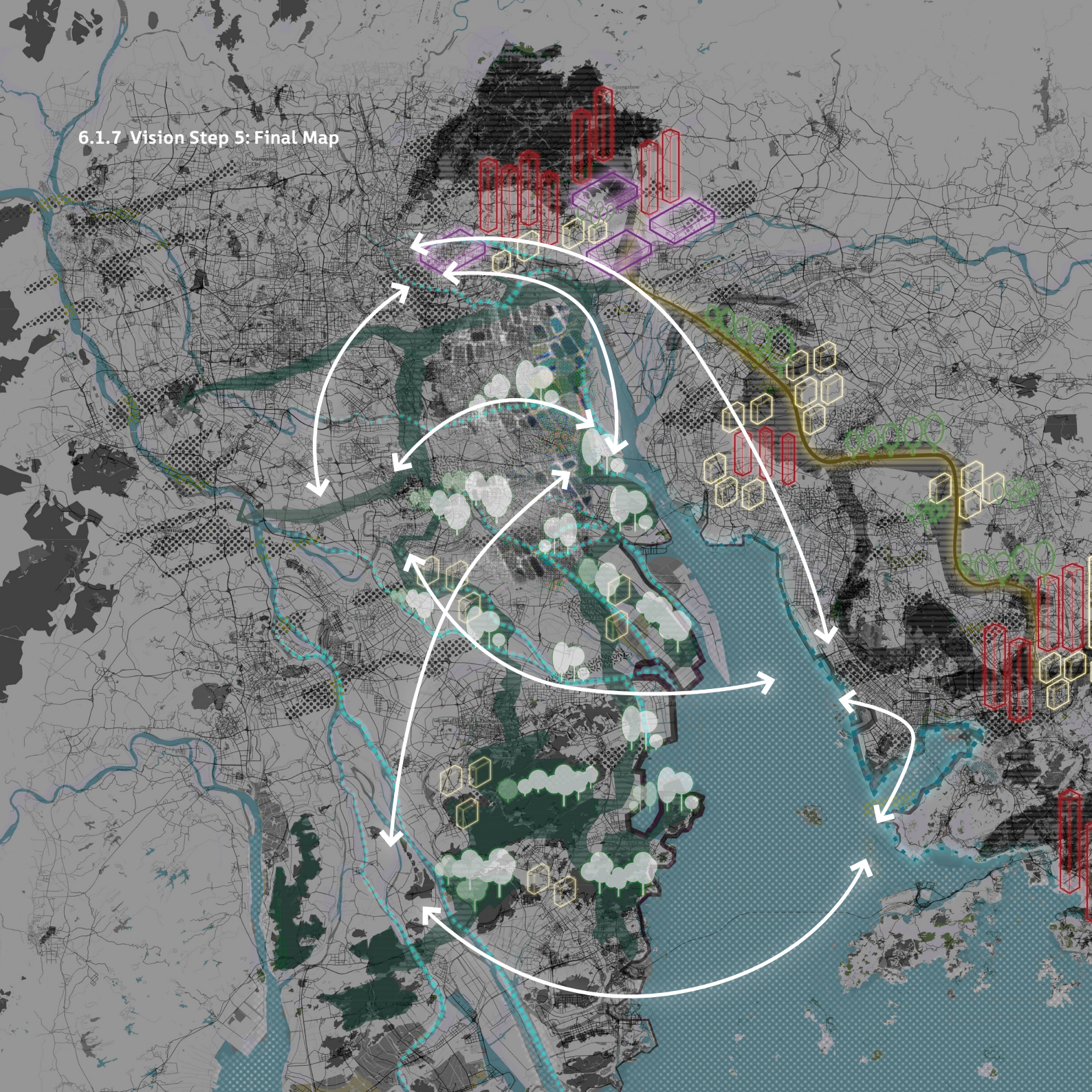
The West Bank

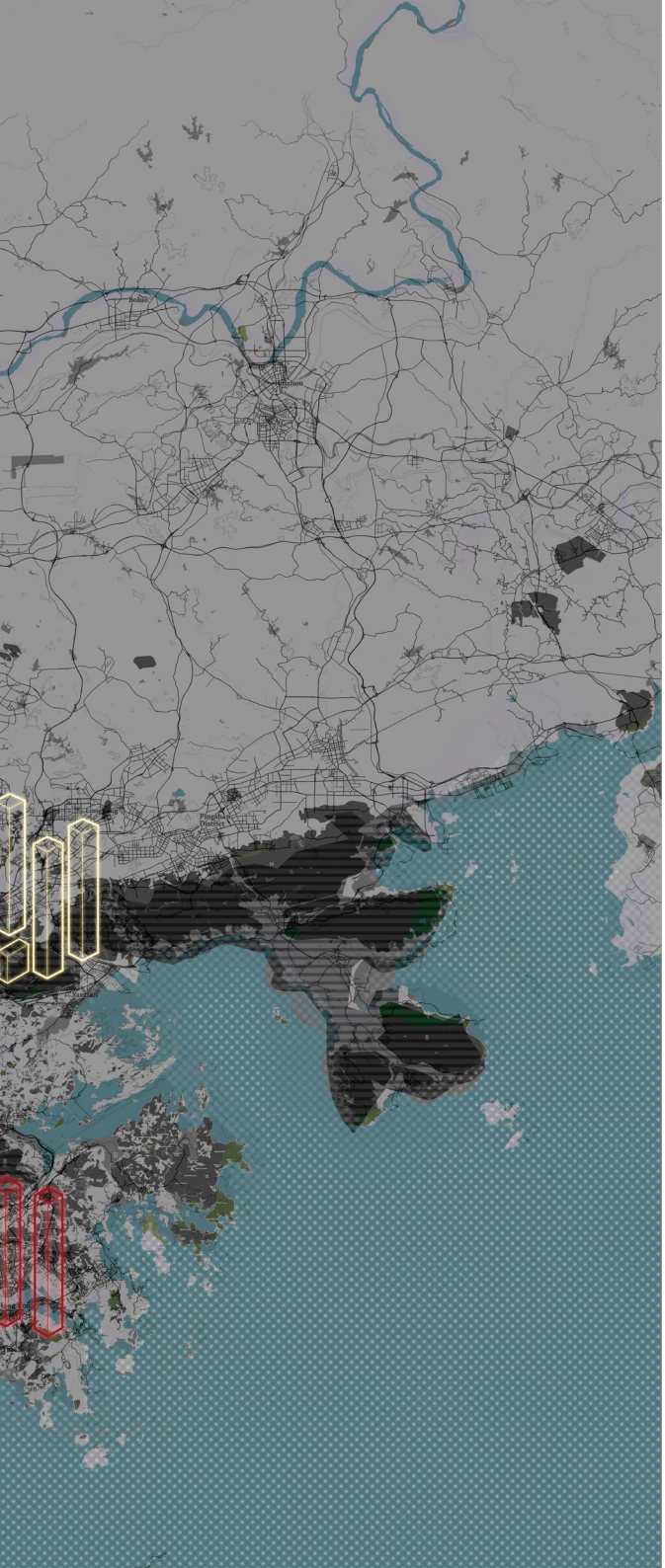
On the left side, another type of development will take place. It focuses on regenerating ecological sensitive economies that profits and protect the natural dynamics of the delta water system.

The spatial qualities of the are will be characterised by lower densities of built fabrics with a nuanced balanced play of green and blue.



6.1.7 Vision Step 5: Final Map





Vision Statement

In 2030, the GBA will be the global forerunner in sustainable development, while still maintaining its status as one of the most dynamic socioeconomic regions in the world. The high levels of pressure on the main cities will be relieved by planing a green and blue backbone, with a focus on creating balanced densification and development program throughout the region. This will create a more liveable integrated and sustainable environment for the residents.

CONCLUSION

Group Reflection

The core of this elective was to understand and grasp the consequences of Globalisation on one of the most interesting challenging urban areas in the world: the Greater Bay Area.

Our task was to formulate a proposal on different scales to explore the possible planning frameworks for the next decades.

This region is extremely complex, offering new challenges that we think are imperative for us; future urbanists and landscape architects to explore in order to position ourselves in the future urban challenges.

Visiting Hong Kong and conducting the workshop in Poly U was definitely an eye-opener on the urban realities that we could never assimilate without being there. The explorative game of strips developed during the workshop played a major role in simplifying the complexity of the region while being a tool of understanding and analyzing the region, it was also a design tool that defined the vision and strategy proposals.

With this research we aim to create an asymmetrical model, where the variety of functional morphologies helps achieve integration of economies landscape and society under one sustainable highly-developed region.

Scientific Relevance

The research showcases how landscape can be seen differently in the modern metropolis, not only as an enabler of environmental sustainability, but also as territory that can potentially bring great economy merits in cities. The landscape becomes an infrastructural element in the present project: infrastructure, meaning the apparatus that equips the land that is accessible and operationalised by humanity (Katsikis, 2018). The landscape is engineered according to its natural pre-conditions, and embraces moderate development. It is the landscape that promotes prosperity through sustainability: branding natural attractions with rural tourism, encouraging inward investments and increased land value are some examples of the green and blue economic benefits. The climate adaptive engineered landscape will have long term effects on the costs designated to natural disasters. By and large, given that the adaptation strategies presented here are applied beforehand, they allow for possible future development path and climate resilience.

Societal Relevance

Guangzhou, Huizhou, Zhuhai, Dongguan, Zhaoqing, Foshan and Jiangmen, together with Shenzhen and Zhongshan, will form China's first national forest city cluster in 2020 (China Daily, 2018). Is this process including as many as possible? Or is it responding to global problems, bypassing indigenous but still significant social problems? Today, cities in China are faced with the following challenge: the push and pull dynamics between population growth and scarce liveability in an increasingly unpredictable urban evolution. Rapid urbanisation has various spatial and social implications as explained through the course of our research. The project analyses how this can be battled by creating the future region which is often a hybrid of living landscapes and recreational or productive landscapes. For instance, community-owned green spaces can create employment opportunities and boost the feeling of belonging. The transition to sustainable urban forms is inevitable and to achieve this we need to look at innovative solutions taking into consideration the developmental effect on fragile social circuits. Overall, this research becomes socially relevant by dealing with both spatial and social aspects of fragmentation.

Limitations and Recommendations for Further Studies

For sustainable development and densification processes, we encourage to densify on already existing urban fabrics within the city near station areas. However, as the pressure on the cities is extremely high we understand the complexity of the challenge. Hence further study is required in formation of detailed time-line for these projects.

The existing urban villages are currently in depleting state, and are in urgent need for retrofitting or reconstructing. Though the task seems achievable, with legalisation process of migrants and house owners the implementation might take longer than expected.

In our vision, we suggest shift towards ecological-industrialisation and sustainable development with integration of green-blue structure, although the shift seems achievable but there exists challenges due to the current economic and political framework.

The vision proposes to obscure political boundaries in favour of ecological ones. In doing so, the region is understood as a continuous network organized around shared water and green resources, rather than a series of zones divided by political and geographical boundaries. These issues need further investigation and innovation.

Finally, a balanced just integration between all the type of development matters. We understand the importance of enhancing in depth the cooperation between Hong Kong, Shenzhen and Guangdong. However, the idea of competition between theses clusters should be reduced since many areas of the manufacturing sector are still at the lower end of the value chain and the proportion of business with high added value is small. This requires an in depth formulation of a business model to upgrade this crucial sector in parallel with all the developments that are happening.

REFERENCES

Academic Journals

Bian, Y., Ouyang, T., Zhu, Z., Huang, N., Wan, H., & Li, M. (2014). Magnetic properties of agricultural soil in the Pearl River Delta, South China – Spatial distribution and influencing factor analysis. Journal Of Applied Geophysics, 107, 36-44. doi: 10.1016/j.jappgeo.2014.05.003

Benedict, M. and McMahon E. (2002). Green Infrastructure: Smart Conservation for the 21st Century. Renewable Resources Journal, 20 (3), 12-17.

Bonadies, G. (2010). Implementing a Water Resources Regulatory Framework in China. doi: 10.13140/rg.2.2.15737.88160

Dai, E., Wu, Z., & Du, X. (2017). A gradient analysis on urban sprawl and urban landscape pattern between 1985 and 2000 in the Pearl River Delta, China. Frontiers of Earth Science, 12(4), 791-807. doi: 10.1007/s11707-017-0637-0

Doulet, J.F. (2008). Where Are the Chinese Cities Heading? Three Approaches to the Metropolis in Contemporary China. China Perspectives, 4, 4-14.

Francesch-Huidobro, M., Dabrowski, M., Tai, Y., Chan, F., & Stead, D. (2017). Governance challenges of flood-prone delta cities: Integrating flood risk management and climate change in spatial planning. Progress In Planning, 114, 1-27. doi: 10.1016/j.progress.2015.11.001

Friedmann, J. (1986). The World City Hypothesis. Development and Change, 17(1), 69-83. doi: 10.1111/j.1467-7660.1986.tb00231.x

Jim, C., & Chan, M. (2016). Urban greenspace delivery in Hong Kong: Spatial-institutional limitations and solutions. Urban Forestry & Urban Greening, 18,65-85. doi: 10.1016/j.ufug.2016.03.015

Karczmarski, L. et al. (2016). Humpback Dolphins in Hong Kong and the Pearl River Delta: Status, Threats and Conservation Challenges. Advances in Marine Biology 73, 27-64. doi: 10.1016/bs.amb.2015.09.003

Li, F., Liu, K., Tang, H., Liu, L., & Liu, H. (2018). Analyzing Trends of Dike-Ponds between 1978 and 2016 Using Multi-Source Remote Sensing Images in Shunde District of South China. Sustainability, 10(10), 3504. doi: 10.3390/su10103504

Liu, K., Li, X., Shi, X., & Wang, S. (2008). Monitoring mangrove forest changes using remote sensing and GIS data with decision-tree learning. Wetlands, 28(2), 336-346. doi: 10.1672/06-91.1

Liu, Z., Huang, H., Werners, S., & Yan, D. (2015). Construction area expansion in relation to economic-demographic development and land resource in the Pearl River Delta of China. Journal of Geographical Sciences, 26(2), 188-202. doi: 10.1007/s11442-016-1262-7

Mao, Y., Ye, A., & Xu, J. (2012). Using Land Use Data to Estimate the Population Distribution of China in 2000. Giscience & Remote Sensing, 49(6), 822-853. doi: 10.2747/1548-1603.49.6.822

Ottinger, M., Clauss, K., & Kuenzer, C. (2018). Opportunities and Challenges for the Estimation of Aquaculture Production Based on Earth Observation Data. Remote Sensing, 10(7), 1076. doi: 10.3390/rs10071076

Roy, A. (2009). The 21st-Century Metropolis: New Geographies of Theory. Regional Studies, 43(6), 819-830. doi: 10.1080/00343400701809665

Ruddle, K., Furtado, J., Zhong, G., & Deng, H. (1983). The mulberry dike-carp pond resource system of the Zhujiang (Pearl River) Delta, People's Republic of China: I. Environmental context and system overview. Applied Geography, 3(1), 45-62. doi: 10.1016/0143-6228(83)90005-x

Sepúlveda Carmona, D., Qu, L., & Tai, Y. (2014). TOWARDS A LIVABLE URBANIZED DELTA REGION. SPATIAL CHALLENGES AND OPPORTUNITIES OF THE PEARL RIVER DELTA. Revista M, 11(1), 8. doi: 10.15332/rev.m.v11i1.949

Soja, E. (1985). Regions in context: spatiality, periodicity, and the historical geography of the regional question. Environment and Planning D: Society and Space, 3(2), 175-190. doi: 10.1068/d030175

Vivien, F. D. (200). Sustainable development: An overview of economic proposals. S.A.P.I.EN.S, 1(2). Retrieved from https://bit.ly/2Xn0Qsu

Wolch, J., Byrne, J., & Newell, J. (2014). Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. Landscape And Urban Planning, 125, 234-244. doi: 10.1016/j.landurbplan.2014.01.017

Wong, T.H.F. (2006). Water sensitive urban design - the journey thus far. Australian Journal of Water Resources, 10(3), 213-222.

Wang, A., Chan, E., Yeung, S., & Han, J. (2017). Urban Fringe Land Use Transitions in Hong Kong: From New Towns to New Development Areas. Procedia Engineering, 198, 707-719. doi: 10.1016/j.proeng.2017.07.122

Weng, Q. (2007). A historical perspective of river basin management in the Pearl River Delta of China. Journal Of Environmental Management, 85(4), 1048-1062. doi: 10.1016/j.jenvman.2006.11.008

Wu, Z., Milliman, J., Zhao, D., Zhou, J., & Yao, C. (2014). Recent geomorphic change in Ling Ding Bay, China, in response to economic and urban growth on the Pearl River Delta, Southern China. Global And Planetary Change, 123, 1-12. doi: 10.1016/j.gloplacha.2014.10.009

Xu, B., & Wei, H. (2011). Evaluation on the Construction and Implementation of Pearl River Delta Greenway from the Viewpoint of "Prototype Features". In 47th ISOCARP Congress.

York, A., Shrestha, M., Boone, C., Zhang, S., Harrington, J., & Prebyl, T. et al. (2011). Land fragmentation under rapid urbanization: A cross-site analysis of Southwestern cities. Urban Ecosystems, 14(3), 429-455. doi: 10.1007/s11252-011-0157-8

Electronic Books

Ahern, J. (2006). Theories, methods and strategies for sustainable landscape planning. In From landscape research to landscape planning (119-131). Dordrecht: Springer.

Ahern, J. (2007). Green infrastructure for cities: the spatial dimension. In Cities of the Future: Towards Integrated Sustainable Water and Landscape Management. IWA Publishing.

Cohen, R.B. (1981) 'The New International Division of Labor, Multinational Corporations and Urban Hierarchy', In Michael Dear & Allen J. Scott (eds), Urbanization and Urban Planning in Capitalist Society. London and New York: Methuen.

Gar-on Yeh, A. and Li, X. (2004). The Need for Compact Development in the Fast- Growing Areas of China: The Pearl River Delta. In Compact Cities: Sustainable Urban Forms for Developing Countries. London and New York: Taylor & Francis.

Graham, S., & Marvin, S. (2001). Splintering urbanism. London: Routledge.

Jenks, M., Kozak, D., & Takkanon, P. (2013). Polycentrism and 'Defragmentation': Towards a more sustainable urban form? In World Cities and Urban Form. Hoboken: Taylor and Francis.

Katsikis, N. (2018). The 'Other' Horizontal Metropolis: Landscapes of Urban Interdependence. In The Horizontal Metropolis Between Urbanism and Urbanization (pp 23-45): Springer International Publishing AG.

Landman, K. (2011). Urban Fragmentation: Different views on its causes and consequences. In International handbook of urban policy. Issues in the developing world (pp. 39-61). Cheltenham and Northampton: Edward Elgar.

Shidong Z. et al. (2001). Population, Consumption, and Land Use in the Pearl River Delta, Guangdong Provinc. In Growing Populations, Changing Landscapes: Studies from India, China, and the United States. Washington, D.C.: National Academy Press.

Walton, John (1982) 'The International Economy and Peripheral Urbanization', pp. 119-35. In Norman I . & Susan S. Fainstein (eds), Urban Policy Under Capitalism. Beverly Hills, California: Sage Publications.

Reports

Global Water Partnership (China). (2016). Global Water Partnership (China) WACDEP Work Package Five outcome report.

Hong Kong Planning Department. (2016). Hong Kong 2030: Towards Planning Vision and Strategy Transcending 2030. Retrieved from HK 2030 plus website: https://www.hk2030plus.hk/

Websites

Barak, R. (2009). Fighting pollution on the Pearl River. Retrieved from https://bit.ly/2JbWIrp

Centre for Strategic Research and Analysis (2017). The Needs of Further Development for Pearl River Delta. Retrieved from https://bit.ly/2XnTc5T

Chan, R.C.K. et al. (2016). Development beyond growth poles: new districts in the Greater Pearl River Delta Region. Retrieved from https://bit.ly/2RQyRQL

China Daily (2003). Pollution clouds future of Pearl River Delta. Retrieved from https://bit.ly/2XDYtFV

China Daily (2018). Pearl River Delta to build forest city cluster. Retrieved from https://bit.ly/2JrWVpn

Essays, UK. (November 2018). Impact Of Globalization On Sustainable Development Politics Essay. Retrieved from https://bit.ly/2XGrII9

Heslam, P. (2004). Is economic globalization sustainable? Retrieved from https://bit.ly/2XLxwzP

Hu, F. (2017). Pearl River Delta: 5 Water Must-Knows. Retrieved from https://bit.ly/2YrL8NX

Hypergeo (n.d.). Metropolisation (metropolis development). Retrieved from http://www.hypergeo.eu/spip.php?article257

NASA (2007). Urbanization of the Pearl River Delta. Retrieved from https://go.nasa.gov/2J2vwek

Palanivel, T. (2017). Rapid urbanisation: opportunities and challenges to improve the well-being of societies. Retrieved from https://bit.ly/2j49gWu

Routley, N. (2018). Megacity 2020: The Pearl River Delta's Astonishing Growth. Retrieved from https://bit.ly/2Jm7jPp

Other

Cardoso, R. and Meijers, E. (2019, May).The process of metropolisation in megacity-regions.Lecture presented during AR0400 TU Delft course, Delft.

Kozak, D. Metropolis Development and socio spatial Fragmentation., PhD Thesis, Chapter 2: From the ‘unitary city ideal’ to the ‘City of Fragments’ and Chapter 3: Fragmentation and Postmodernism.

Tai, Y. (2018). Changing Values on Water in Delta Cities. The case of Guangzhou in China's Pearl River Delta (PhD Thesis). Delft University of Technology, Delft, Netherlands.

Images

Arch Daily (2016). Enabling Village / WOHA.Retrieved from https://bit.ly/2J8SqB0

Behance. Retrieved from: https://www.behance.net/

Daily Overview (n.d.). Retrieved from http://www.dailyoverview.com/eightytwo

Foshan News (2017). Three wetland parks for your spring outgoing in Foshan. Retrieved from https://bit.ly/2Lv7ZEK

Google. 22° N, 113° W, Eye alt variant. Retrieved from http://www.earth.google.com

Illustrate It. Retrieved from https://www.instagram.com/illustrate.it/

Toffu Content Library. Retrieved from https://www.toffu.co/

That’s Shenzhen (2017). The Fall of Guangdong's Urban Villages, Migrants' Last Refuge. Retrieved from https://bit.ly/2JbzmCf

The Noun Project. Retrieved from https://thenounproject.com/

United Nations Development Programme (n.d.).Goal 11: Sustainable Cities and Communities.Retrieved from https://bit.ly/2XLFb1h

United States Geological Survey (n.d.).Earthshots: Satellite Images of Environmental Change.Retrieved from https://on.doi.gov/2Xqxoqm

APPENDIX

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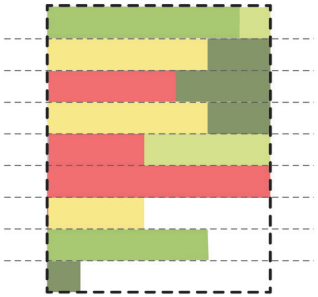
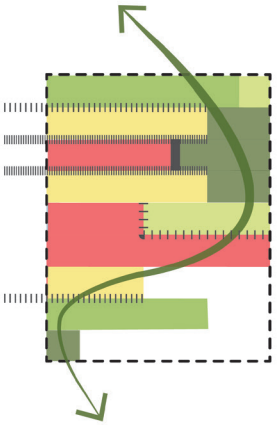
6.1.8 Morphological pattern 1

ADJACENCIES

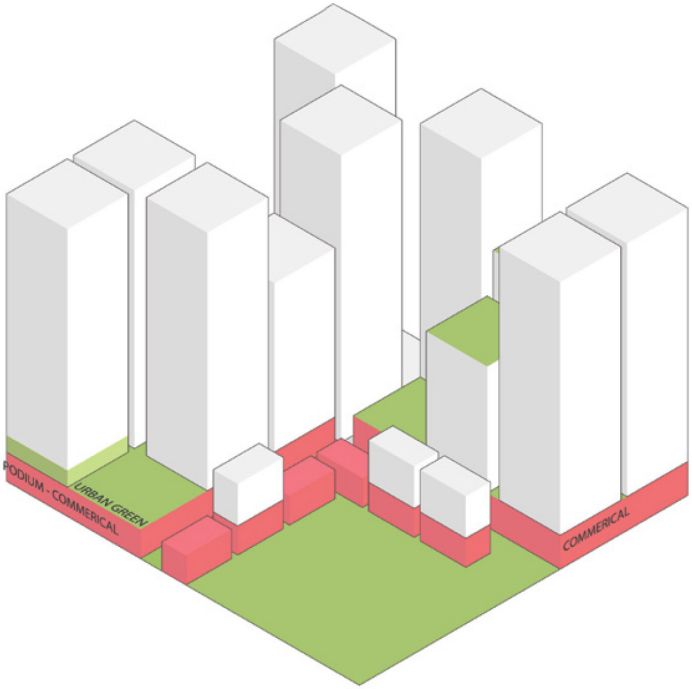


UNDERSTANDING RELATIONSHIPS

INTEGRATION OF EDGES



URBAN BLOCK MORPHOLOGY



KAMPUNG ADMIRALTY BY WOHA

SINGAPORE

Overall view of the complex

Housing hybrid with Green and Economy Services

This project (Kampung Admiralty) is Singapore's first integrated public development that brings together a mix of public facilities and services into one hybrid block. The approach that is traditionally followed in Singapore is that each government agency carves out one individual plot, which results in several standalone buildings.

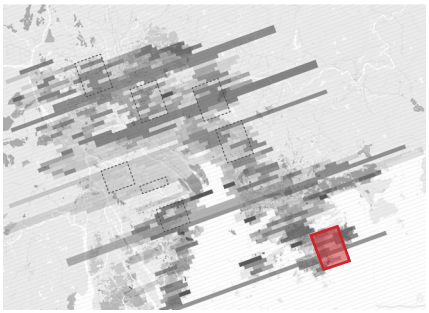
This one-stop integrated complex, on the other hand, maximises land use, and is a prototype for meeting the needs of Singapore's ageing population.

The Community Park, situated in the complex, is intimately scaled, elevated village green where residents can actively come together to exercise, chat or tend community farms.

Complementary programmes such as childcare and an Active Aging Hub (including senior care) are all included in this project.

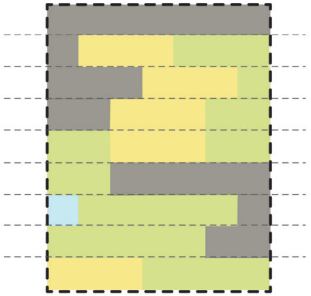
Source: *Archdaily (2018).*

Key

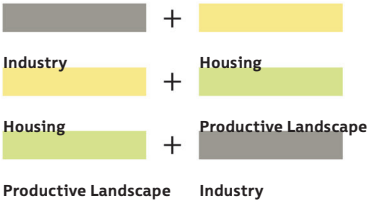


6.1.9 Morphological pattern 2

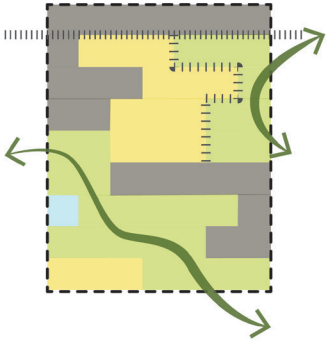
ADJACENCIES



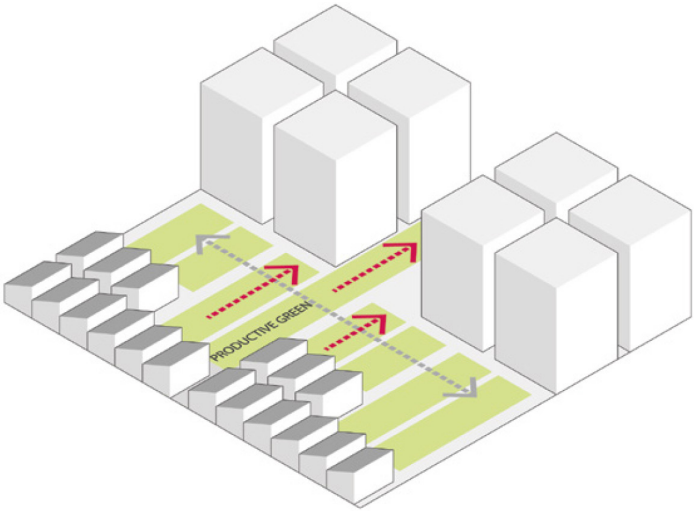
UNDERSTANDING RELATIONSHIPS



INTEGRATION OF EDGES

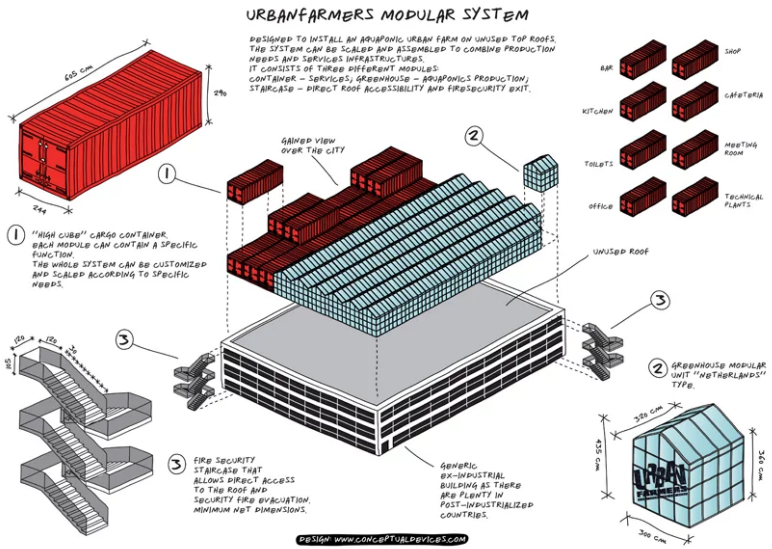


URBAN BLOCK MORPHOLOGY



URBAN FARMERS ROOFTOP BY ANTONIO SCARPONI

BASEL



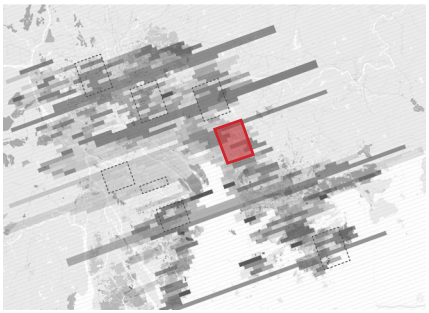
The aquaponics system producing fruits and vegetables.

The 'Urban farmers rooftop' in Basel, Switzerland, is a strategy that brings the idea of combing urban farming in industrial areas into realisation.

The 400 m^2 site is conceived as the device that brings growth to the district.

The architecture consists of two prefabricated modules that correspond to the main features of the program: one greenhouse for the production of the plants, and multiple containers for all the other activities such as administration offices, storage closets, and dressing rooms. Both spaces can be organized in different layouts to engage the possibility that food can be grown on top of any flat industrial building, overcoming the historical dichotomy between city and country side.

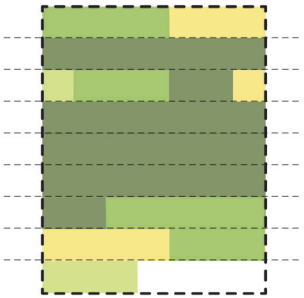
Key



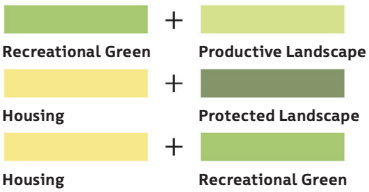
Source: *Designboom (2014).*

6.1.10 Morphological pattern 3

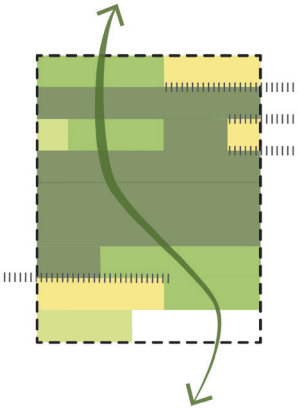
ADJACENCIES



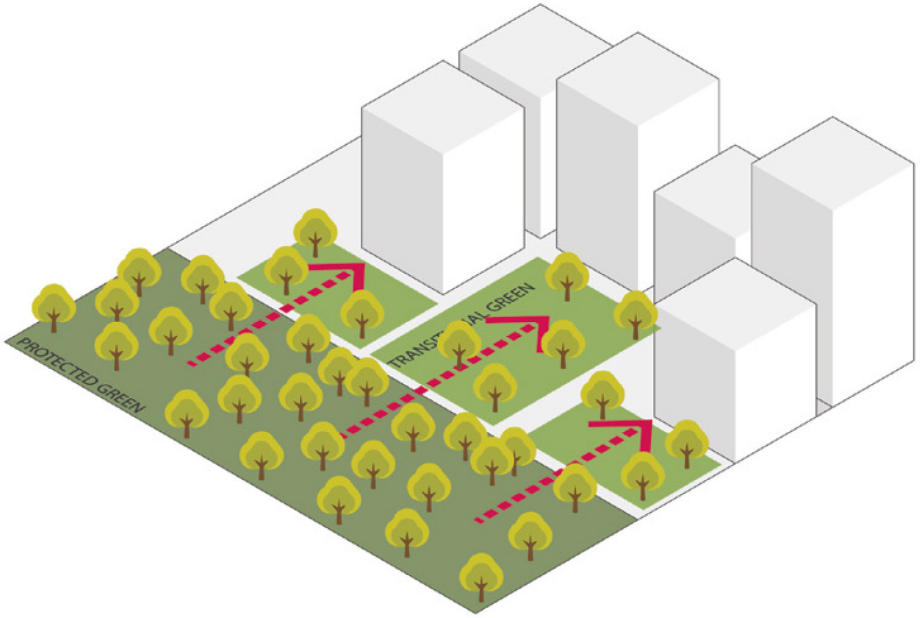
UNDERSTANDING RELATIONSHIPS



INTEGRATION OF EDGES



URBAN BLOCK MORPHOLOGY



TENGAH BY HOUSING & DEVELOPMENT BOARD (HDB)

SINGAPORE

The green structure of Tengah.
Five housing districts, each with unique character.

Urban jungle combined with housing

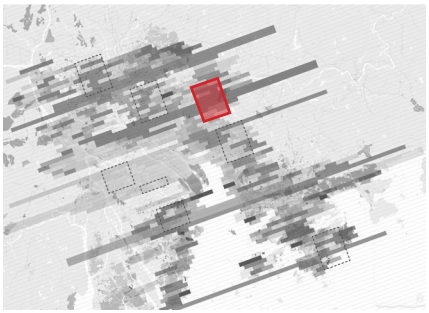
Five unique housing districts will be developed in Tengah progressively, namely Plantation, Park, Garden, Brickland and Forest Hill.

Keeping up with the vision to develop Tengah as a 'Forest Town', each of these districts will be designed with community standards, where residents can experience quality living with nature and greenery.

The housing districts will provide farming production and natural recreation within their territory.

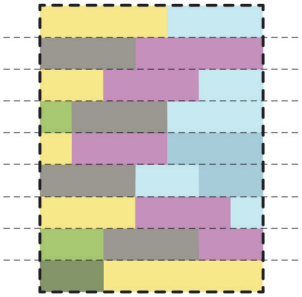
Specifically in the Plantation project, the main socio-communal spine is the 40m wide and 700m long Farmway.

Key

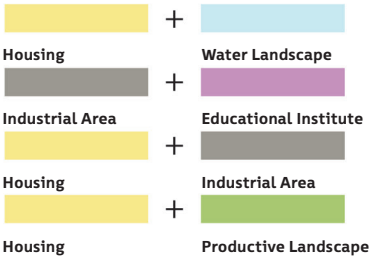


6.1.11 Morphological pattern 4

ADJACENCIES



UNDERSTANDING RELATIONSHIPS



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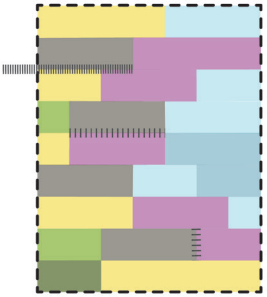
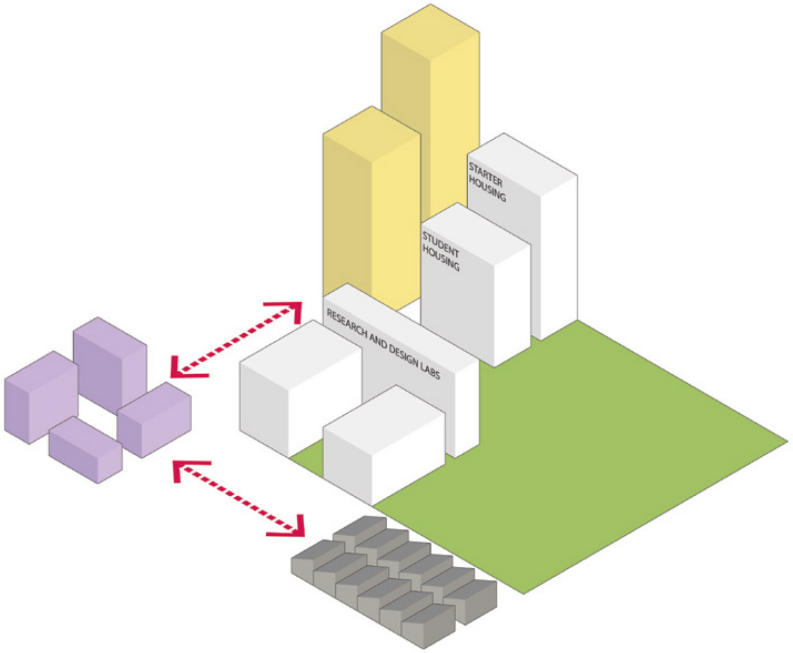


URBAN BLOCK MORPHOLOGY



STRIJP S BY WEST 8

EINDHOVEN

The interior of Strijp-S.

Industrial multi-space with educational activities

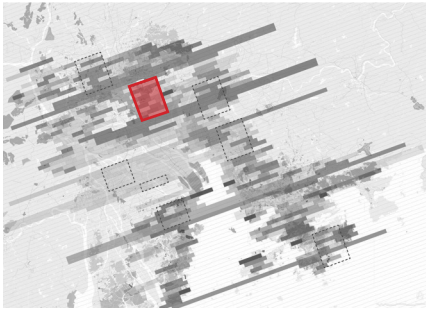
Strijp-S, located in Eindhoven, is characterised by the surrounding industrial landscape and its development was rather challenging mainly because of its scale.

In addition to the new construction, one can find in situ the monumental Philips factory buildings, so essential to the history and identity of Eindhoven. These buildings form the heart of the new city district and continue to determine its appearance.

The industrial architecture and creative businesses, loft houses, urban recreational functions, concept stores, innovative restaurants and activities such as Dutch Design Week are all hosted in the same multi-functional Strijp-S.

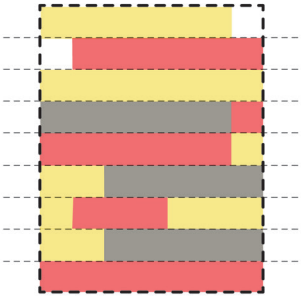
Source: *Brabants Erfgoed (2014).*

Key



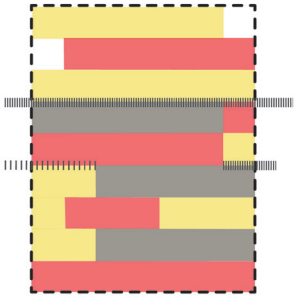
6.1.12 Morphological pattern 5

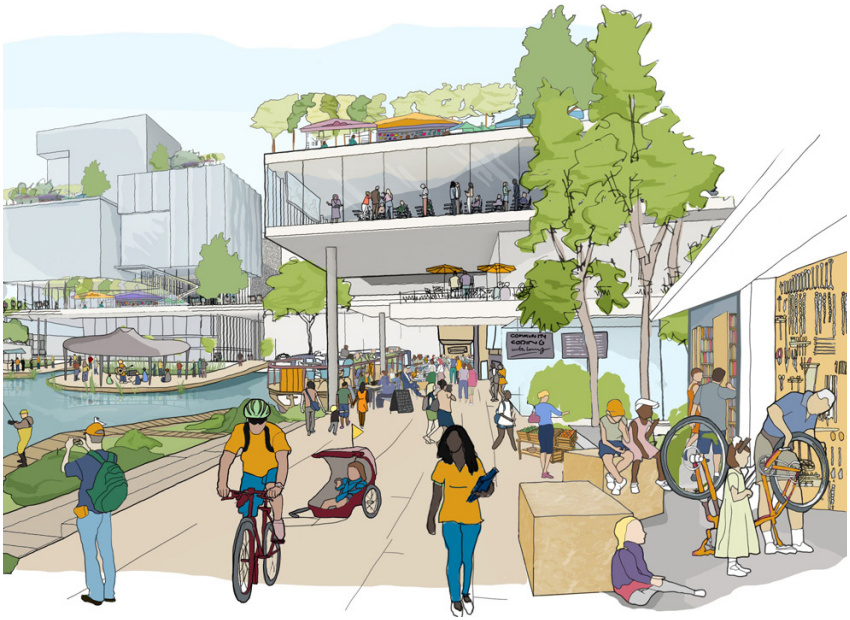
ADJACENCIES



UNDERSTANDING RELATIONSHIPS

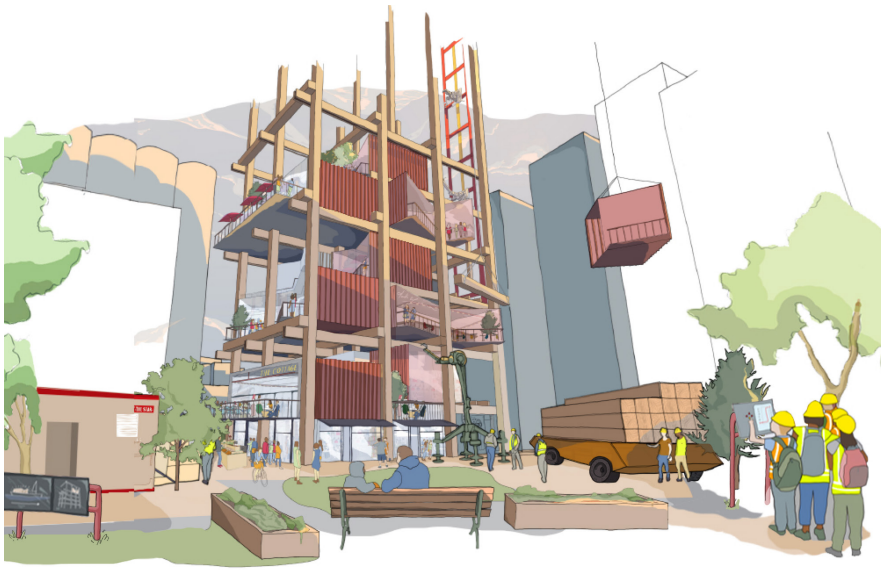
INTEGRATION OF EDGES

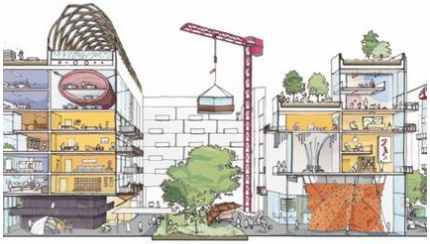




QUAYSIDE REDEVELOPMENT BY SIDEWALK LABS

TORONTO



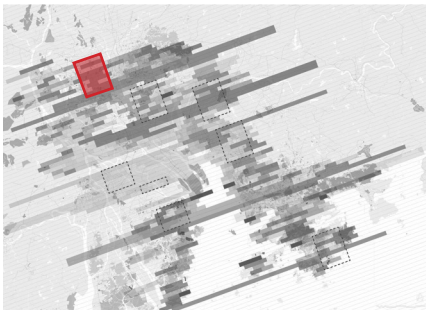


Residential, manufacture, office and commercial space.

"Sidewalk Toronto" might represent North America's largest example of the ''smart city'' model, an urban district that is built around information technology and tracks data about traffic, noise, air quality, electricity and the performance of systems such as the disposal network.

Although the project promises to revolutionise the worlds of planning, architecture, development and construction it is currently seeing controversy on matters of intellectual property and privacy. Nonetheless, it also presents relevant merits regarding social inclusion and multi-functionality. The waterfront proposal envisions affordable housing, light manufacturing activities and services into one smart district.

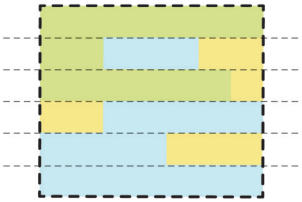
Key



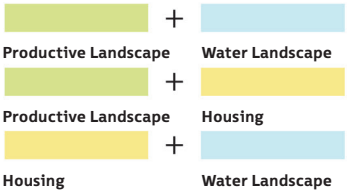
Source: *The Global Mail (2019).*

6.1.13 Morphological pattern 6

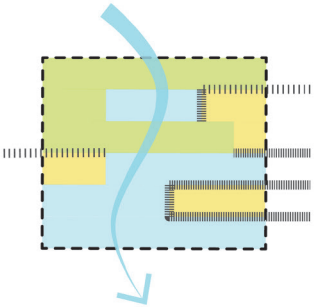
ADJACENCIES



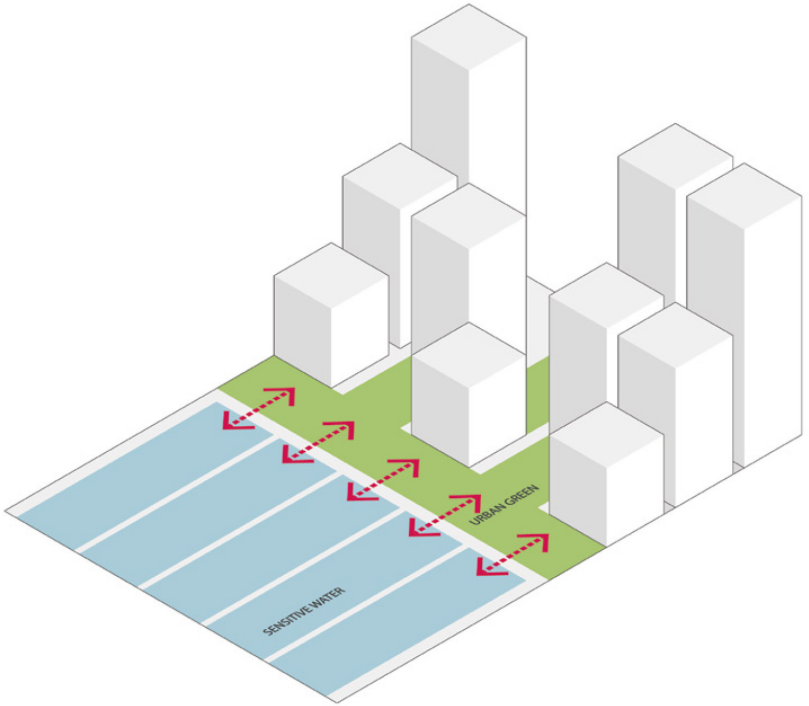
UNDERSTANDING RELATIONSHIPS



INTEGRATION OF EDGES



URBAN BLOCK MORPHOLOGY



ENABLING VILLAGE BY WOHA

SINGAPORE

Production along water in housing district

Located in Redhill district of Singapore, the project is a demonstration of heartland rejuvenation and community building, through the adaptive reuse of Bukit Merah secondary school erected in the 1970s.

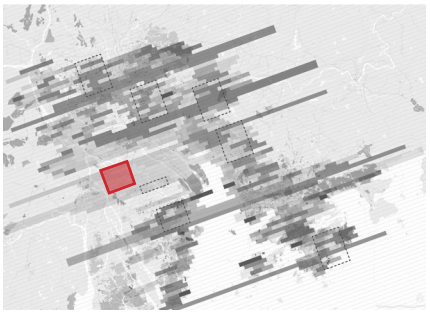
The property was re-purposed as the Enabling Village - an inclusive space that integrates education, work, training, retail connecting the inhabitants to the society.

Before re-development, the property did not contribute to the neighbourhood. The Masterplan re-imagines the Enabling Village as an integral part of the neighbourhood's pedestrian network.

Source: *Bingham-Hall P., Hendricks E.*

The project promotes equilibrium between housing and indigenous production activities.

Key



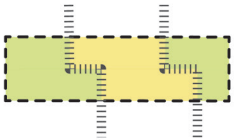
6.1.14 Morphological pattern 7

ADJACENCIES

UNDERSTANDING RELATIONSHIPS

Productive Landscape **Housing**

INTEGRATION OF EDGES



HOME FARM BY SPARK

SINGAPORE

High dense, self-sustained

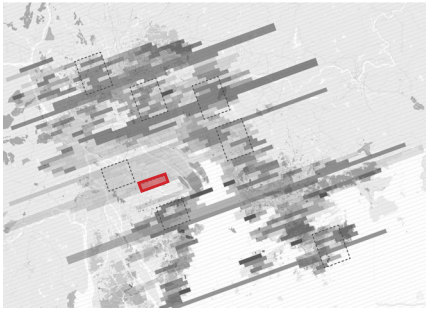
Homefarm is a conceptual proposal for the next generation of urban retirement housing. It presents a residential and commercial farming typology for Singapore, that combines apartments and facilities focused mostly, but not exclusively, on senior living and vertical urban farming.

The residents live in a high-density garden environment created by the vegetable farm, where they may also find employment.

SPARK's aim is to generate discussion about the potential that can emerge from the mixing of two typically separate realms.

The research-based design addresses two pressing questions that Singapore faces: how the city-state might support a rapidly ageing society, and how it might enhance its food security, 90% of which is currently imported.

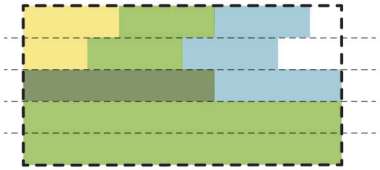
Key



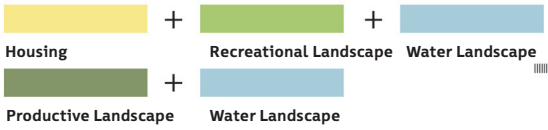
Source: *Spark Architects (2014).*

6.1.15 Morphological pattern 8

ADJACENCIES



UNDERSTANDING RELATIONSHIPS



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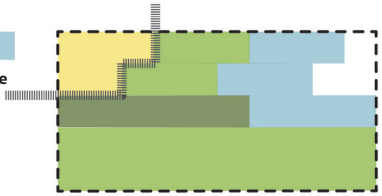
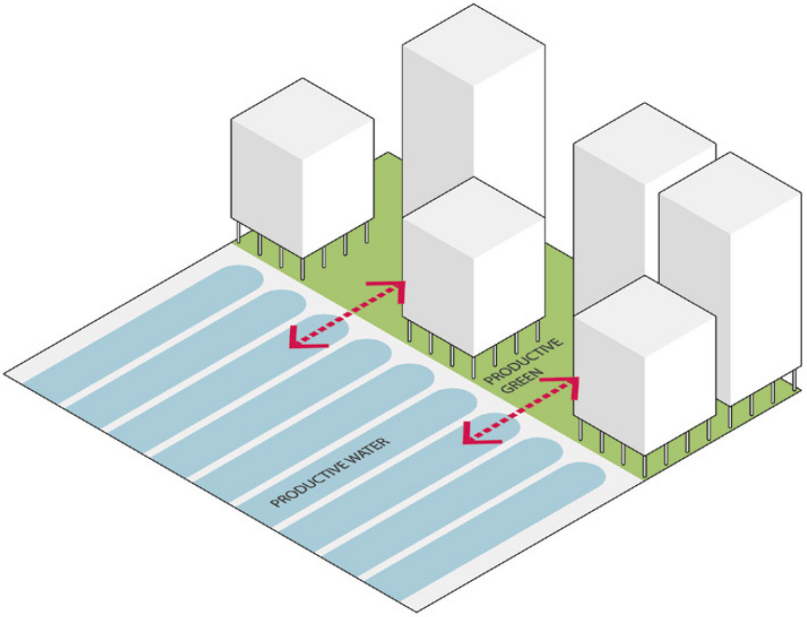


URBAN BLOCK MORPHOLOGY



BISHAN-ANG MO KIO PARK BY RAMBOLL

SINGAPORE

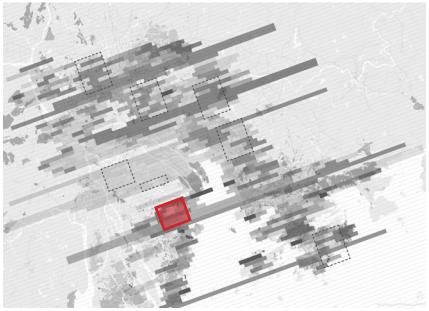
Transforming water bodies

Bishan Park is one of the most popular parks in the heartlands of Singapore. The project was part of a much-needed park upgrading and included improvement of the channel that pierces through the park.

Works were carried out simultaneously to transform the utilitarian concrete channel into a naturalised river with increased capacity, creating new spaces for the community to enjoy.

The project is part of the Active, Beautiful, Clean Waters Programme (ABC Waters), a long-term initiative to transform the country's water bodies from drainage and water supply infrastructure, into vibrant, new spaces for community bonding and recreational activities.

Key



Source: *Ramboll Dreseiti,Ramboll*