# green

A Research on Chinese Eco-city

# is the new

In Search of An Alternative Vision for Chinese Eco-city Development

# black

Wenchi Yang 4363914 Mentors: M. Relats Torante T. Kuzniecow Bacchin M.M. Dabrowski



# GREEN IS THE NEW BLACK

A research on eco-city phenomenon in China, in search of an alternative vision for Chinese eco-city development

### **Master Graduation Thesis**

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 $\odot$  Delft University of Technology, 2016

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### **MOTIVATION**

The world's population is set to reach 9.7 billion by 2050 – up from 7.2 billion in 2012 (UN News Center). That global population will be a vastly urban one. The increasing demand for supplying the future urban dwellers and the threatening climate change have posed the question about our current urban development model. Our urbanization has exacerbated the adverse impacts of climate change, which has already exposed the residents of some cities to problems like air and water pollution, flooding and decreasing biodiversity. Major Chinese cities are suffering from these impacts.

At this crucial moment, China is facing industrial transformation, political and economic reform, and drastic environmental problems. It is a good time to review the past experience in China's effort building sustainable cities, which are also known as Eco-Cities.

This thesis research focuses on the discussion and reflection on Chinese Eco-cities and also expands to general sustainable discourse. For me, it is an important 'lesson learning' moment to understand the dilemma and opportunities in the exploration of a new approach of developing a greener future.

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### **FOREWORD**

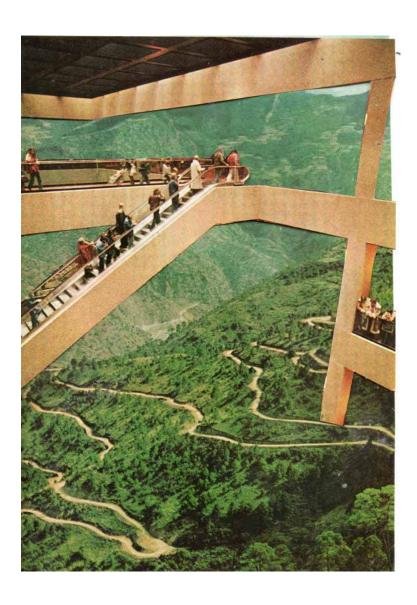
The global report of United Nations Human Settlements Programme 2011 stated that urbanisation and climate change come together to produce negative impacts upon human beings and human settlements in the perspectives of social, economic and living quality (UNHABITAT, 2011). The discourse of sustainability is everywhere at this moment, especially in the discipline of architecture and urbanism. Who could possibly oppose green? Green seems like the perfect solution to the problems of our world: pollution, degrading urban environment, inequality, climate change. Politician and various initiatives are promoting green development and urbanization, including China.

The rapid urbanization of China causes serious environmental degradation. Pollution problems are urgently forcing the government to take actions. Chinese government had promised in 2009 to cut carbon intensity by 40 to 45 percent from its 2005 level by 2020. (Xinhua News, 2009)

In order to achieve the goal, Chinese government becomes one of the most active practitioners in developing ecological friendly cities. Eco-cities are a relatively young urban phenomenon. Tracing back to history, eco-urbanism attempt started during the 60s to 70s in the western world during the environmental movement. Since then, eco-villages of varying sizes have appeared among the United States and Europe. However, in Chinese manifestation, the eco-village has now raged into a full-blown eco-metropolis.

In this thesis research, the main objective is to understand the reason for the emergence of eco-city phenomenon, the opportunities and challenges it offers us, and to explore the way forward. This research opens a question regarding the future sustainable development in China, and intends to raise the awareness of the urgency to deal with climate change in China.

Fig 2 SuperStudio Monumento Continuo Escalator

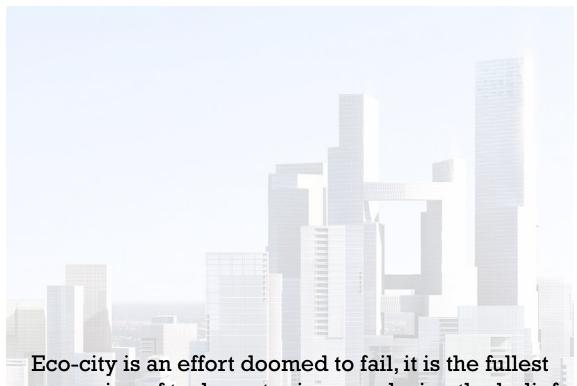


## CHAPTER I

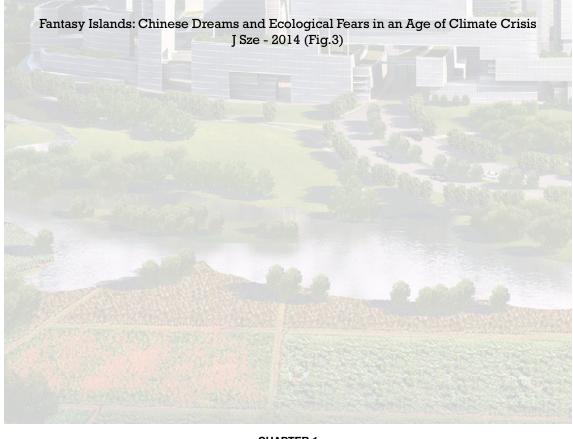
# Eco-city Profile

Understand the Eco-city Phenomenon in China

GREEN IS THE NEW BLACK THESIS REPORT



expression of techno-utopian eco-desire, the belief that technology, engineering, and built solutions can provide the pathway out of environmental destruction.



CHAPTER 1 ECO-CITY PROFILE



Fig.1 A big screen showing blue sky at Ti'anmen Square (Feng Li/Getty Images)



CHAPTER 1 ECO-CITY PROFILE

### 1. INTRODUCTION

Chinese premier Li Keqiang mentioned:" We will resolutely declare war against pollution as we declared war against poverty." (Reuters, 2014) Chinese won the war against poverty through urbanization. In the past 30 years, 230 million people got out of poverty. This time against pollution, Chinese government's weapon is still urbanization. In order to develop in a more sustainable way, Chinese government becomes one of the most active practitioners in building eco-cities. In 2010, a research shows there are 276 cities in China brand their development goals as 'Eco-city' or 'Low Carbon City'. In early 2013, Chinese government officially approved eight national ecological friendly cities or districts.

The term eco-cities was coined by Richard Register, who proposed that an ecocity should minimise the resource use (Register, 1987). However, over time the term has been embraced by a growing number of academic and policy specialists, with the attempt to translate the general definition into workable principles for construction, production and consumption, but there is still no com-

monly agreed definition has emerged to date (De Jong et al., 2014). Without a clear definition of eco-cities, the effort Chinese government put into the ecological friendly urban development sometimes becomes merely greenwashing. In order to understand the current eco-city movement deeply, this research will examine ongoing eco-city projects to understand the 'eco-desire' of modern China, and how it drives current Chinese urbanization.



Fig 4 Sino-Singapore Tianjin Eco-city project, Collaborations between two countries



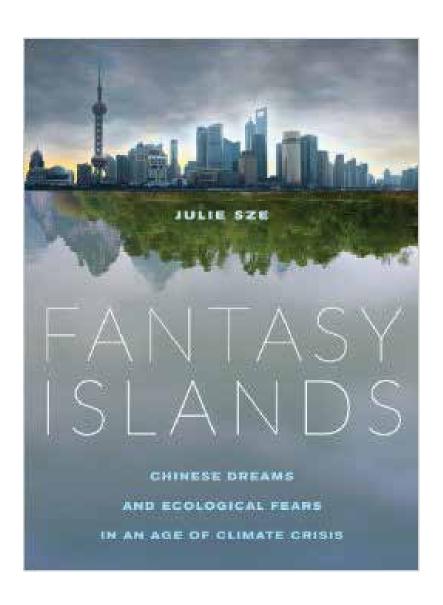
Fig 5 Pollution at Tian'anmen Square

CHAPTER 1 ECO-CITY PROFILE

### 1.1 Chinese Dream and Ecological Fear

In the book 'Fantasy Island' (Fig 6), Julie Sze described Chinese eco-city development fever as eco-desire, which can be understood as the fusion of desire, projection and profit in certain top-down versions of eco-development. Discourse about eco-desire will exceed the current discussion within the technological debate about eco-cities, which ignores concerns about political governance and the distribution of ecological burdens. According to Sze, from a political and institutional point of view, the hypothesis of most current ongoing eco-city projects is that their essential purpose is not environmental but rather to function as a pragmatic and technical solution to nearby metropolis' (like Shanghai, Beijing, Tianjin) numerous environmental and political problems associated with urbanization and development. From a planning and design point of view, most of the plans adopted by governments are still more or less like traditional zoning plan with some sustainable features, which are also unknown to what extent will be realized.

Therefore, in this research, eco-city development from different perspectives including political, institutional, planning and design will be examined to illustrate a more holistic picture of the current eco-city development. Fig 6 Bookcover Fantasy Islands Julie Sze



### 1.2 Terminology and Relevance

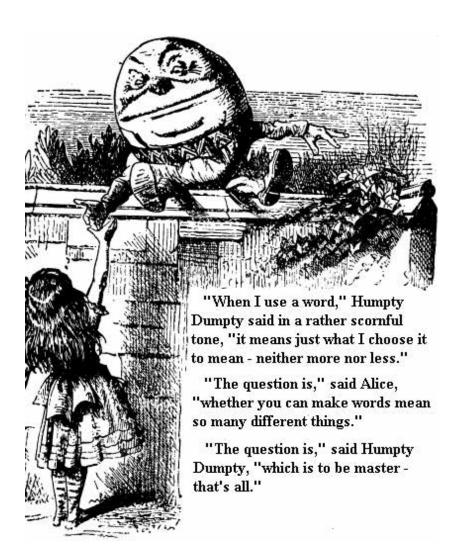
Efforts to render cities environmentally and socially sustainable are not new (Joss, 2011). Urban planning and regeneration over the last one hundred years or so have been significantly influenced by attempts to redress the perceived detrimental effects of large-scale urbanisation, such as environmental degradation, social inequalities and urban sprawl (Joss, 2011).

During the environmental movement in 1960s and 70s among the west, the concept of eco-city was coined by Richard Register. Throughout the 1980s and early 1990s, eco-city was still mainly an innovative concept, with very little practical examples. Until recent years, however that the eco-city phenomenon has become truly global and mainstream, against the background of a majority of people now living in cities and the growing international recognition of the scale and severity of climate change.

Nevertheless, the concept of eco-city has been interpreted differently everywhere. One possible reason is the ambiguity of this term. Normally the vaguer the concept is, the more it is attractive to people and to policy makers, because they can throw in their own content. In the case of eco-city, it results in massive development claiming as eco-cities, but initiated as land speculation projects (Chien, 2013), especially in China where eco-city became the most popular development concept.

Therefore, it is crucial to provide a common understanding of what this thesis is looking at. In this part, an investigation on the characteristics of these projects will be conducted. It aims at providing a better understanding of differences between eco-city theory and practice, as well as a common ground for discussion and research in depth.

Fig 7
'Humpty Dumpty'
Dilemma
Through the Looking
Glass
Lewis Carroll

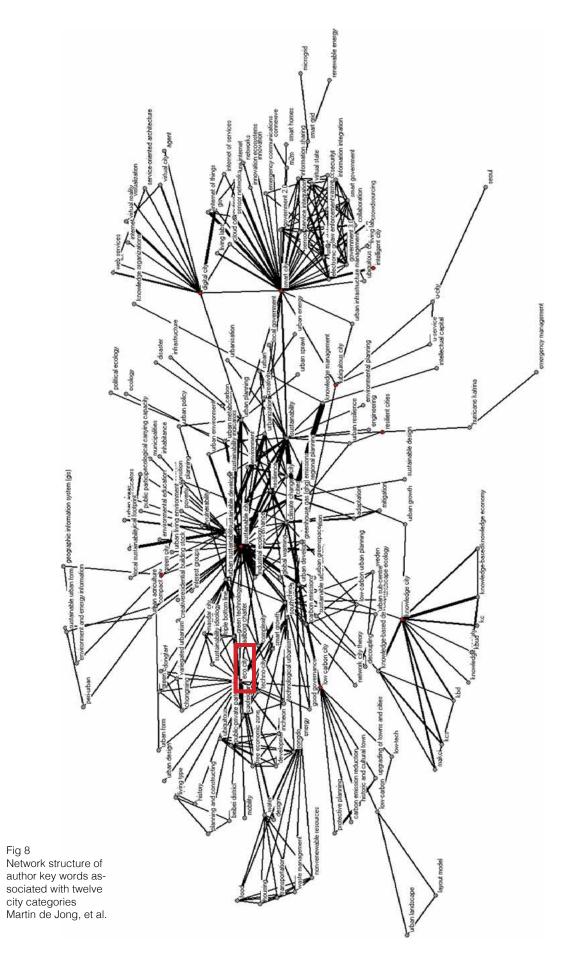


In the essay 'Sustainable-smart-resilient-low carbon-eco-knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization' by Martin de Jong et al., a bibliometric analysis is conducted to question whether different categories related to sustainable development embody distinct conceptual perspectives, and how are they interpreted differently in theory and practice. Cities and metropolitan areas around the world are engaged in a multitude of initiatives variously aimed at upgrading urban infrastructure and services (de Jong,. et al, 2015) in an effort and to enhance cities' attractiveness as well as their competitiveness (Yigitcanlar and Velibeyoglu, 2008; Caragliu et al. 2011; Campbell, 2012; Joss et al. 2013; Newman, 2013; Viitanen and Kingston, 2014; Ni and Jie, 2014). Reflecting these developments, a plethora of new city categories has entered the planning and design discourse. Eco-city is one of the heated terms related to sustainable development. Among the articles reviewed by Martin de Jong et al., 133 articles' key words include 'eco-city'. Fig 6 demonstrates the network structure of article keywords associated with the

twelve categories. 'Sustainable city' and 'Smart city' turn out to be the most connected node. 'Eco city' also occupies a similarly central position, albeit with lower frequency than those two.

What are exactly the differences between those terms, and how does it affect the world of practice? Originally the ecocity category was rooted concurrently in the environmental (natural) sciences and in the (humanities oriented) deep ecology movement, proclaiming a return to a lifestyle in harmony with nature. However, over time the term has been embraced by a growing number of academic and policy specialists, with the attempt to translate the general definition into workable principles for construction, production and consumption (De Jong, et al. 2014).

The category's range of application is as wide as for instance: completely carbon-neutral and renewable energy supply; a well-planned city layout and public transportation system; resource conservation; water and waste recycling; green roofs; restoring environmentally damaged urban areas; local urban agriculture; decent and affordable housing for



CHAPTER 1 ECO-CITY PROFILE

all socio-economic and ethnic groups; and voluntary simplicity in lifestyle choices (Roseland, 1997; Harvey, 2011). Over time, the eco-city has, thus, acquired a variety of conceptual meanings and interpretations of which the ecological may be the main, but certainly not the only, one. The growing connection of the concept with real-life urban building and development processes, the adoption of it by mainstream policy with wider economic and social issues, have arguably led to a softening of its environmental standards, or even its wholesale incorporation into mainstream real estate development projects (De Jong 2014). However, eco-city still holds potential as an attractive marketing term for largescale urban development projects with attractive green surroundings and conspicuous devices to reduce consumption of non-renewable energy, the use of "eco-city" concepts in the academic literature has never surpassed the popularity of 'sustainable city'. Nevertheless, with more popularity and investment in 'eco-city' over time, it is necessary to understand and investigate how this term is being interpreted in the practice or policy making process. Conduction more detailed fieldwork in a number of carefully selected cities embracing these ideas, and monitoring the short and long term impacts, will all be important in this process. Such research could bring us closer to an answer to the question whether they are underway to become a true 'city of harmony' (De Jong, 2014).

Fig 9 Eco-city Descripptors Formed Using the 'Eco' Prefix Simon Joss

Term	Meaning
Eco-city / Eco-town	(1) To describe a sizeable mixed-use new sustainable development, which is not a direct urban extension.  (2) Attached to the name of a particular area of (or extension to) an existing city which has been or will be developed or retrofitted in a sustainable way  (3) Attached to the name of the city as a whole, to denote an eco-initiative in one particular are of that city  (4) By local authorities, as umbrella label for various sustainability initiatives which are taking place across a city (which do not necessarily involve building work)
Eco-district / neighbourhood	Synonymous with the second meaning of 'eco city/town' above. The term is not be used to describe stand-alone developments or the city as a whole.
Eco-community	Usually signifies a development in a suburban or rural location, built or aspiring to ideals of sustainability.
Eco-village	Two meanings:  (1) Similar to an 'eco-district' (see above), reflecting the notion of urban villages.  (2) A rural community with an eco-agenda, perhaps a commune - often very small in scale and scope.
Eco-region	Two common usages:  (1) To denote an area encompassing human settlements of various sizes (rather than just one city), across which collective efforts are made to minimise negative impacts on the environment.  (2) To indicate an underlying perspective which foregrounds a particular city, but positions it in relation to a broader hinterland. It therefore prioritises an understanding of a city's sustainability as primarily dependent on its interaction with the natural flows and systems in its eco-region. This usage draws on earlier 'bioregional' schools of thought.
Eco-(industrial) park	Eco-industrial parks are typically mixed-use developments with a significant residential presence; mono-zoned developments are are in any type of 'eco-city'. Their promoters usually aim to attract hi-tech and/or green industries, often as part of a wider attempt to diversify a local economy away from traditional polluting industry.

### 1.3 Eco-city phenomenon in China

In the past years, the cities around the world, especially in China, have been engaged in the discourse about sustainable development by diverse initiatives. From the previous research we can see eco-city concept is one of the major discourse worldwide. Even though there is no standard to quantify what exactly an eco-city must be, there are certainly some trends, and the contemporary ecocity wants you to know it is an eco-city. As a marketing feature, eco-cities usually are full of 'green'. Literally. If you take a look at the rendering or proposals (Fig 8), grass rooftops, large public gardens or parks, wetlands and trees help to visually communicate the city's pedigree. Consequently, the number of critical reviews of its actual policy intentions and implementation has grown significantly in recent years, especially with regard to its implementation in China (Cugurullo et al. 2013). Hence, it is crucial to explore eco-city not only just as a sustainable development concept, but also an urban phenomenon, especially in the context of China.

Therefore, this chapter will explicitly investigate how eco-city process is taken place in China, and use certain criteria to characterize eco-city as an urban phenomenon. By doing so, it will be clear what is the motivation of eco-cities construction, why eco-cities in China have a certain pattern or form, and partially why some eco-cities are destined to fail.

Fig 10 Eco-cities Illustration Pictures from Google search































### 1.4 Eco-city as land-speculation-oriented local entrepreneurialism

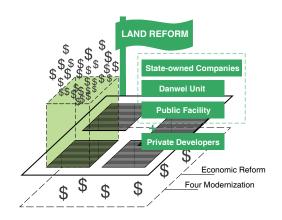
An article from a Taiwanese researcher Chien Shish-Shen critically investigated Chinese eco-city phenomenon. According to her description, the recent phenomenon of eco-cities in China can be understood as land-speculation-oriented local entrepreneurialism (Chien, 2013). What she especially looked into are the new large scale land development projects on the outskirts of municipalities. She referred to the impetus behind the Chinese 'new-town-style' eco-cities as post-Mao land development isomorphism, which are shaping modern Chinese cities.

In this paragraph, motivation and reason behind this 'new-town-style' land development will be examined. As mentioned before, eco-cities started out as small scale retro-fitted projects where local initiatives are more bottom-up and self-organized. As we have seen now the eco-cities among Asia, especially in China, are large scales, with huge investment and ambitions, founded by national government and adopting cutting edge technologies. What has contributed to this change? Under what circumstances and mechanisms have these eco-cities been formulated and implemented in China

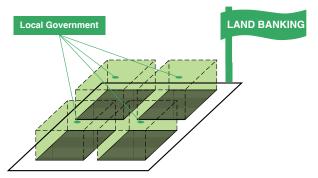
and by whom? Can Chinese eco-cities, which are mainly based on land-related spatial expansions, produce similar 'sustainability fixes' as adopted by Wester eco-cities in addressing environmental challenges? In this paragraph, in order to have glimpse of the answers to these questions, a history analysis of land development in post-Mao era will be looked into trying to explain Chinese's 'new town fever' and its effort on addressing sustainability.

New-town-style eco-cities can be viewed as part of a land development strategy evident in Chinese local entrepreneurialism, which has been well known for its innovative flexibility in promoting economic growth over the past three decades. After the communism party took over China in 1949, land was publicly owned and not considered a commodity, the assignment of land free of charge reflected neither economic nor social opportunity (Li and Ma, 2008). This was changed in 1988 when the 'land-use rights' system was established. This was made official by an amendment to the Constitution of the People's Republic of China, stating 'The right of land use can be transferred in accordance with the

1988-1995 The establishment of <u>Land-use Rights</u> system

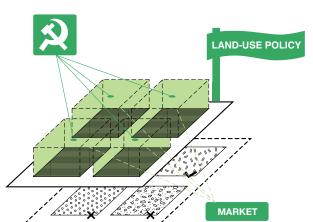


1996-2003
Land supply market mechanism and <u>Land Banking</u> system



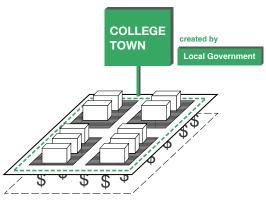
2003-present

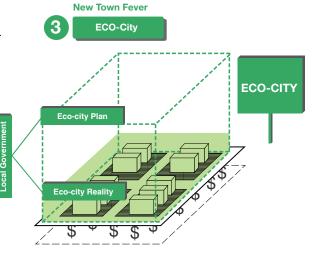
Land policy as a part of <u>national macro-control</u> system











CHAPTER 1
ECO-CITY PROFILE

relevant legislation'. This marked the emergence of China's real estate market as the political situation and economic growth stabilised and foreign investment further increased. This also leads to the first round of 'new town fever' - 'Zone fever' (Fig.9). The concept of development zones was first adopted in Shenzhen soon after China opened up its economy to globalisation. Due to the success of Shenzhen Special Economic Zone, many entrepreneurial local authorities along with private sectors who gained allocated land free of charge during planned economy era started to construct their own zones. However, not all zones performed as good as Shenzhen. The failed zone projects incurred many negative externalities, such as over-investment and over-production, limited technological innovation, and low-level environmental sustainability.

This situation changed again when first land banking agency of China was established in Shanghai in 1996. Realising the substantial increase of land value, various de facto landholders, such as state-owned enterprises, danwei, collectives and army organisations started to formed a development partnership

with the private sector to initiate massive urban development, which has caused chaotic land supply and weakened the ability of municipalities to control land markets and city development. So the land banking system was initially proposed for price stabilisation and enhancing the ability of government to control land supply. Ironically, it has also been argued that the increasing monopolisation by the government have resulted in the rise of land prices, making housing unaffordable for many Chinese families. This leads to the second land-speculation by local governments - 'College Towns'. In 1998 the central government proposed a policy of 'revitalizing the nation through science and education'. An incomplete survey in 2012 identified more than 60 college town projects, most of them are established in the first half of the 2000s (Chien, 2013). This can't not be achieved without land banking systems. It cannot be denied that a few college towns are en route to becoming clusters of higher education. However, many, if not most, college towns are only duplicates of the education infrastructure, and the accompanying real estate values are what the local government truly care about.

Since the early 2000s, the Chinese economy has entered a new period of development. In September 2003, the central government announced that land policy, along with fiscal and monetary policy, would be applied as a major part of national macro-control measures. Government has to take series of measures to deal with the overheated economy as well as the degrading environment. China is also being criticised on its pollutions problems since it surpassed the US becoming the world's biggest carbon emitter in 2007. That is when eco-city started to flourish in local municipalities responding to national macro control policy and ecological modernisation policy. It is also argued in Chien's article that the local entrepreneurialism behind Chinese local government has a lot to do with the institutional mechanisms in China and the relationship between local and central government (Chien, 2013). Even though it is current a heated discussion about sustainable development in China, but the blind construction of eco-cities without reflection in this land speculation way will indeed bring negative externalities. As Chien concluded in the article, 'as long as economic growth

remains a core objective of the central government and as long as extra budgetary revenue remains a pressing necessity for local authorities to fulfil economic 
indicators assigned from the top, entrepreneurial projects of land speculation 
and the related economic demands of 
the built environment will continue to define and express the needs and powers 
of the local state'. In order to achieve true 
sustainability and ecological protection, 
the institutional mechanism needs to be 
changed in China to prevent eco-cities 
from land speculation projects.

Fig 11 (page25) Land use change in relation to eco-city development

### 2. ECO-CITY PROFILE

### 2.1 Global eco-city research

Before looking into Chinese eco-city projects, a global eco-city research has been taken as reference. The International Eco-city Initiative published its first global survey in 2009, covering some 79 initiatives. Building on that, Simon Joss and his team conducted a more extended and holistic survey. Both surveys are aiming at identifying and documenting the scale and diversity of current ecocity initiatives from an international perspective.

The methodology of Joss's survey was based on a comprehensive 'horizon-scanning' of recent eco-city initiatives. For each development project identified as eco-city, a brief profile is compiled, including information about the nature of development, key actors involved, and availability of data. Furthermore, in order to be able to identify various types of eco-cities and discern current trends and patterns, the sampled eco-cities were categorised according to the following variables:

Type of eco-city development:

- 1. new development
- 2. expansion of urban areas
- 3. retro-fit development

### Development phase:

- 1. pilot/planning stage
- 2. under construction
- 3. implemented

### Key implementation mode:

- 1. technological innovation
- 2. integrated sustainability vision/planning
- 3. civic empowerment/involvement

In this way, the global survey conducted by Joss can be a resourceful database for this thesis research. However, in this chapter, more focus will be put on the process and planning products on three specific eco-cities development in China. The objective is providing more insight and motivation behind the eco-cities, and looking for a general characteristic of such 'new-town' style eco-cities in China.

Fig 12 'Eco-cities - A global survey' Joss, S., 2010.

INTERNATIONAL ECO-CITIES INITIATIVE

# Eco-Cities — A Global Survey 2011

# **Eco-City**



# **Profiles**

Simon Joss, Daniel Tomozeiu and Robert Cowley
University of Westminster
www.westminster.ac.uk/ecocities

September 2011



Fig 13 Eco-cities projects around the world (by 2010)

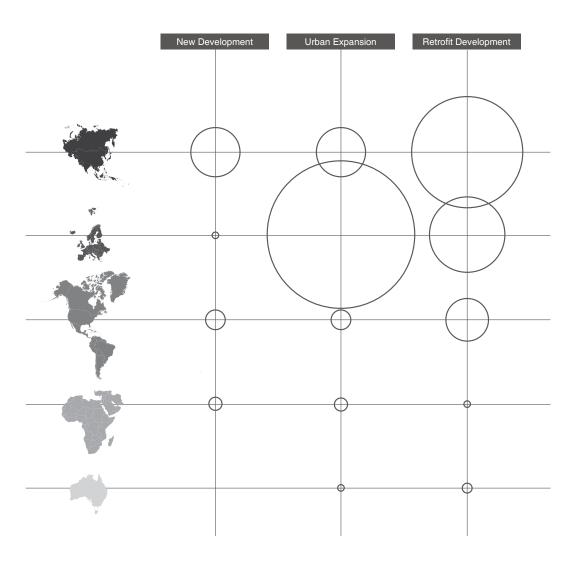


Fig 14 Eco-city development types among continents

### 2.2 Eco-city practice in China

With the pressure of Chinese government to adapt to the environmental challenges the country is facing, eco-city became one of the most popular development concept. China has already witnessed a few pilot projects of eco-cities being implemented in the past 10 years. With the increasing popularity of the concept 'eco-city' in China, the massive amount of urban development branded as 'eco-city' is also highly visible in the media.

It was decided in the Fourth Plenary Session of the 16th Chinese Communist Party Central Committee to pursue the Harmonious Society (Xinhua News Agency, 2004) as the consequence of realising that the economic development should not be at the cost of increasing the negative impacts of global climate changes nor of enlarging disparities and inequality. The new approach embraces economic development that have less impact on environment, improvement of the existing environment and positive effect on protecting non-renewable energy resources. These policies were further clarified at the 18th National Congress of the Communist Party of China through adoption of the policies of Ecological Progress and Striving for Green, Recycled and Low-carbon Development (Hu,2012).

From the central government of China, two major mechanisms were adopted to promote ecological human settlement development. The first mechanism is to compose relevant policies by circulating government documents, such as defining carbon emission targets for each provincial and municipal government, or encouraging low carbon, energy efficient or environmental protection projects and programmes with appropriate financial support to ecological friendly programmes or projects. The second one is to award demonstration projects and best practices to encourage other cities to follow their experiences and principles. Due to the opposite condition in the reality, this thesis will take a deeper look into these 'best practice' and try to identify the similarities and experience from the existing projects.

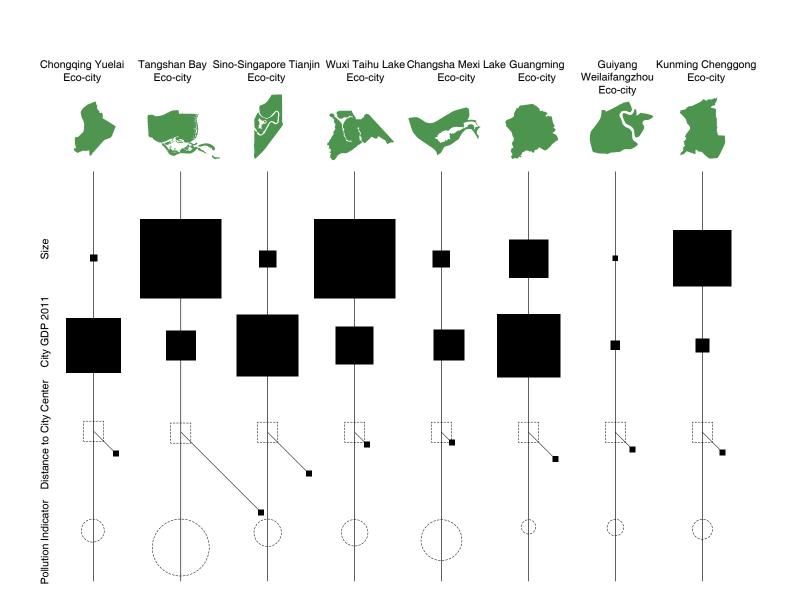
Fig 15
Major Eco-cities map
Including eight demonstraion eco-urban areas (In red) Mentougou Eco-City Wanzhuang Eco-City Shenyang Gaokan Eco-City Beijing Changxing Eco-City Nanhu Eco-City Tangshan Bay Eco-City Sîno Singapore Tianjin Eco-City Shandong Yellow River Eco-City Zhengzhou Xintian Eco-City Wuxi Taihu Lake Eco-City <del>(i'an</del> Chanba Eco-City Suzhou Western Eco-City Guiyang Weilaifangzhou Shanghai Dongtan Eco-City Changsha Meixi Lake Eco-City China-Finland Gongqing Eco-City Beibuwan International Eco-City Shenzhen Guangming Eco-City

In November, 2012, Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD) announced eight eco-city or eco-district (Fig 16) are being promoted as demonstration projects. The promoting concept is green ecological urban area which include eco-city and eco-district. Those eight projects received 50 to 80 million yuan as subsidy, at the same time they will benefit from incentives like tax reduction, mortgage etc.

However, are those eight demonstrating projects really best practices of Chinese sustainable development? How do they perform so far after most pilot areas being implemented already? If this green ecological urban development will dominate Chinese urbanization in the near future, isn't it crucial and urgent to reflect and investigate the opportunities and challenges in front of us?

Hence in this chapter, the Tangshan Bay Eco-city, Sino-Singapore Tianjin Ecocity, and Shenzhen Guangming New Town will be investigated, as a summary and reflection of current eco-city development in China. This research believes these projects illustrate a general and holistic eco-city development picture. By looking into the plan, intistutional support and current situation of these projects, to some extent, it brings us to a deeper understanding of the dilemma and challenges that Chinese government is facing in front of searching for a 'green future'.

Fig 16
Eight Eco-city demonstration projects announced by
Ministry of Housing and Urban-Rural Development of
the Peoples's Republic of China and their status





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Caofeidian eco-city (1) is a land reclamation-converted economic development zone in Bohai Bay located in the eponymous district of Tangshan, China. It locates 200 kilometers from Beijing, and spans 60 square kilometers. According to the plan, Caofeidian eco-city is expected to have a population of 80,000 by 2010. Caofeidian Eco-city project draws the attention of the world with an exhibition called B.A.R.C. held at Shanghai Expo in 2010. B.A.R.C stands for beyond architectural regulations in Caofeidian. It is part of the Dynamic City Foundation's initiative to plan and conceive a sustainable longterm vision for Caofeidian. According to them, the mission is to set out to develop a planning model viable within challenges like planning city from scratch overnight. The objective is to move beyond standard top-down planning strategies, and they developed and employed a collaborative planning method, based on evolutionary or time-based planning principles to kick start a transformation of planning process and its outcome. In a unique collaboration with five Dutch and 5 Chinese progressive design companies, a long-term growth strategy for caofeidian was developed, not by designing

all at once, but in relay; each team adding to the previous proposal. The result is a simulation of thirty years of sustainable expansion: the city as the product of an accumulation of evolving ideas, able to emulate the complexity and organic logic of a slowly maturing city.

(1) Tangshan Bay Eco-city is also known as Caofeidian Eco-city

Fig 17 (page 36-37) Tangshan Bay Eco-city and its location

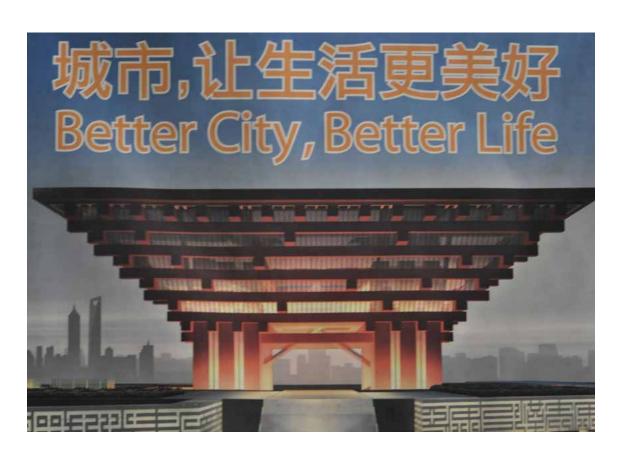


Fig 18 Shanghai Expo slogan 'Better city, Better life'





















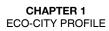




Fig 19 Genetic City Caofeidian Proposal by Mars

Fig 20 Gnetic City Caofeidian exhibition at Shanghai Expo

Fig 21 Five Dutch and five Chinese teams proposals for Genetic City Caofeidian



These ten progressive designers 'think tank' is composed by world-known designer firms like MVRDV and ZUS. Besides, the Why Factory from TU Delft is also part of the research team. Interesting and innovative the proposal is, this progressive planning system was, of course, never implemented, nor being seriously treated by the local officials. All it did was like throwing a stone to the river, made a big splash but afterwards just sank to the bottom of the water.

For me this is more like a show, a very deliberately organized carnival, which fits right in the Shanghai Expo's agenda to show China's determination and ambitious response to the triple-challenge of explosive growth, environmental pressure, and healthy human desires for the future.

The real plan, the serious one is initiated again by the local officials when they made another round of international consultancy including ARUP from UK, which also was responsible for Dongtan Ecocity project in Shanghai, DHV from the Netherlands, EDAW from the USA, ArchA

from Italy and local Chinese planning institute like Tsinghua Urban Planning and Design Institute.

In the end, the final master plan is mostly based on the proposal from Tsinghua Planning Institute. (Figure 22 & 23) The biggest character of Caofeidian Eco-city is probably that all the land development is reclaimed from sea. It requires a lot of investment on eco-system rehabilitation. The challenges like how to provide drinking water, how to desalting land and how to restore vegetation are crucial, and premise of development. Then the major doubt will naturally be is it feasible to make so much effort on a distant area reclaimed from sea and into a ecological friendly new system? Why the local initiatives is so confident this top-down almost utopian-like city will be successful?



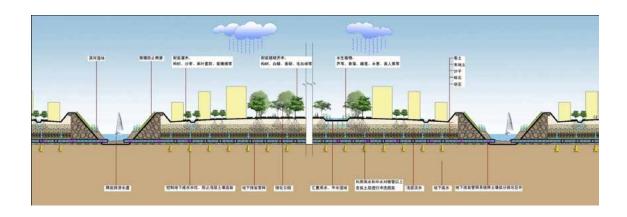
Fig 22 Caofeidian statutory plan road structure

Fig 23 Caofeidian land use plan



CHAPTER 1 ECO-CITY PROFILE

Fig 24 Fig 25
Caofeidian storm water management plan Fig 25
Caofeidian eco-city





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'As precious as gold' That was how then-president Hu Jintao described Caofeidian during his visit in 2006. It was pledged to be 'the world's first fully realised eco-city' – yet 10 years and almost \$100bn later, only a few thousand inhabitants have moved to this land reclaimed from the sea. - 'Caofeidian, the Chinese eco-city that became a ghost town - in pictures', the guardian, 23 July 2014.

This news from the Guardian shows the reality of this ambitious plan. Neighborhoods being built will be highly possible left empty. The ecological features are all put on hold.

A journalist travelled himself to Caofeidian. In an interview with him, he described the current situation of Caofeidian as dumped town, where investment has already pulled off and people are moving out. When he travelled from Beijing to Caofeidian, he has to took a 2-hour train to the center of Tangshan, and a 2-hour bus to Caofeidian. As told from him, the key stakeholder of Caofeidian is the Shougang Group, a national owned enterprise. The decision from central government of moving Shougang Group to Caofeidian is the major boost for the ambitious plan of Caofeidian. A new paradigm of industrial development and circular economy became the major

topic of Caofeidian's ambition. But the reality seems not matching the ambition. According to the journalist's interviews with local residents, most of the people living there are employees of Shougang Group. They are also complaining the development process in Caofeidian is happening too slow. According to statistics, a newly built housing unit, less than 5% of the apartments are inhabited.

As for ecological aspects, local inhabitants said the have no clue what they are. All they know is this is a newly built heavy industrial area, which now is put on hold.

Fig 26 - 29 Caofeidian ecocity current situation photos





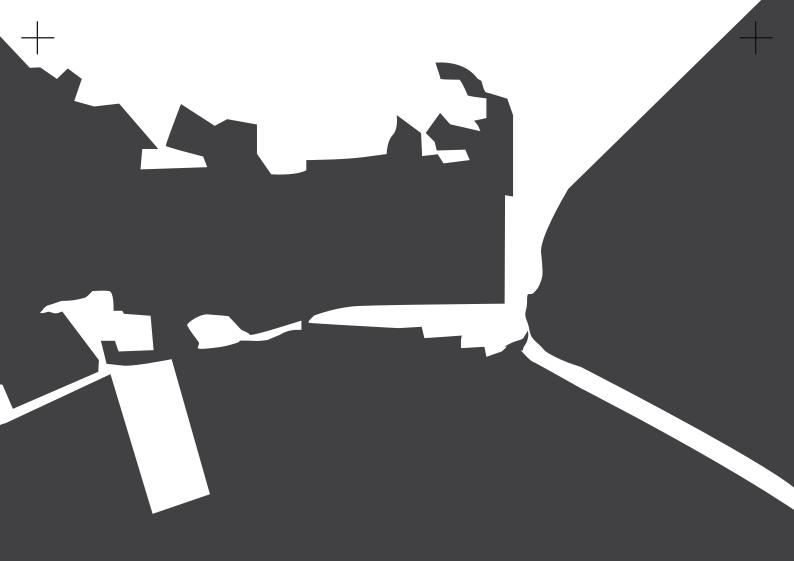
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CHAPTER 1 ECO-CITY PROFILE





Status: Under Construction

Planned Area: 32 square kilometers

Expected Residents: 350,000

Design Firm: China Academy of Urban Planning and Design, the Tianjin Urban Planning and Design Institute, and the Singapore planning team led by the Urban Redevelopment Authority of Singapore

Type of Development: Expansion of urban area





Fig 30 (page 49-50) Fig 31-32 (page 50-51)
Tianjin Eco-city and its location Tianjin Eco-city satellite arial photos in 2007 and 2015

Fig 33 Shexian Tianjin Iron and Steel Plant near Tianjin eco-city



GREEN IS THE NEW BLACK THESIS REPORT

The strange tale of the Sino-Singapore Tianjin Eco-city began in early 2007 when Singapore's Senior Minister, Goh Chok Tong, took the opportunity provided by a state visit to China to propose a collaboration between the two governments in the form of a city which could provide a model for sustainable development. After a fierce competition, Tianjin was finally chosen as the site for this experimental cooperation. It was chosen for its heavily polluted land and serious water shortage problems. The idea was that an ecocity constructed in a harsh environment could provide a working model for future developments in any kind of landscape (Keenton, 2014). Therefore, Tianjin ecocity is built on a 'wasteland' of salt flats and marshes on the coast of the famously polluted Bahai Bay, 40 km southeast of downtown Tianjin. Not far away from the site, you can also find some most polluted industries like Shexian Tianjin Iron and Steel Plant (Fig 33), which stands ironically opposite side of this 'green, ecological friendly' city. Despite Tianjin Ecocity's scale and ambition, the New Town only makes up a small part of the massive development planned for this section of the Bahai Bay coastline (Fig 34).

Although Tianjin is thousands of kilometers away from Singapore, the eco-city project represents a cooperative effort between the Chinese and Singaporean governments to plan and construct what they call a 'truly sustainable' city. As master developer, Sino-Singapore Tianjin Eco-city (SSTEC) therefore represents a public-private partnership between various international actors. Singaporean government is officially contributing 'proven experience and know-how in large-scale urban design and master-planning, environmental protection, resource conservation, recycling economy, ecological infrastructure development, use of renewable energy, reuse of wastewater, sustainable development and promotion of social harmony'. Meanwhile, China contributes more tangible aspects: land, resources and financial support.

Fig 34 Tianjin New towns strategy with highlight of eco-city

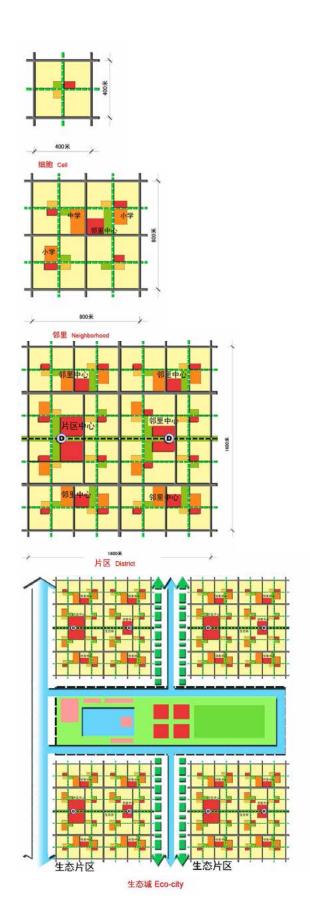
Fig 35 (page 55) Tianjin Eco-city planned structure



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SSTEC's master plan was jointly developed by the Chinese Academy of Urban Planning and Design, Tianjin Institute of Urban Planning and Design, and the Singaporean Urban Redevelopment Authority. Together, these bodies form a design team that continues to make decisions at both urban and architectural scales. In order to incorporate the various proposals from earlier the international consultancy, the planning team broke the city down into seven different districts, Lifescape, Eco-valley, Solarscape, Urbanscape, Windscape, Earthscape and Eco-corridor. Each district has a different architectural and urban character, creating seven unique areas within the city, and giving designers freedom to experiment with new urban forms. Tianjin Ecocity uses its large site to test architectural alternatives.





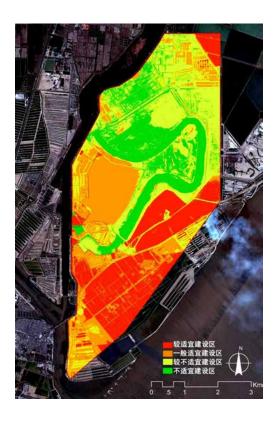


Fig 36 'Cells' planning concept of Tianjin eco-city

Fig 37 Ecological conditions of Tianjin eco-city

Within the Eco-city, and in contrast to the tight grid of older Chinese cities, SSTEC's streets are organized by a looser, waving grid structure. Plots of varying sizes have been sold off to developers, resulting in semi0uniform urban blocks. By creating 400m x 400m 'cells', four cells form a neighborhood, four neighborhoods form a district and between districts there are ecological corridors with public functions separating them, and it constructs the whole eco-city.

The 'eco-valley' stretches 12 km through the city in a north-south direction, connecting different transit nodes and public facilities. This large open green space will also incorporate 'water-sensitive urban design elements, such as eco-swales and dry streams'. The 50 m wide 'green spine' will serve as one of the SSTEC's main public spaces. According to a press release from SSTEC, the development will include 'premium waterfront villas, garden terraces, mid- to high - rise apartments, retail and street malls, schools and neighborhood centers... unique features such as hydroponic gardens, greenhouses for organic farming, green spa, yoga and Pilates deck, tai chi platform and youth park to embrace this healthy and

sustainable lifestyle.' In reference to the curvilinear pathways weightlessly suspended in renderings: 'communal decks will be introduced to connect human activities and green spaces connecting the apartments and offices, allowing future residents to walk or cycle within the entire development. This modern concept of eco-decks brings to life the joy of connecting community has been a key traditional value for the social harmony of Chinese society.'

Fig 38 Tianjin Eco-city rendering



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In an effort to quantify and define what it means to be an eco-city, the SSTEC Joint Committee has identified 26 key performance indicators that fall under three categories: Ecological & Environmental, Social and Economic. These Indicators guide the planning and development of the Eco-city. They stipulate that residents should not consume more than 120 liters of water per day, should not produce more than 0.8 kg of domestic waste per day, and that they should cycle or walk rather than use their cars within the Ecocity (Keeton, 2014). On the contradictory side, the city's marketing literature also states that: by 2013 the city intends to provide employment opportunities for at least 50% of employable residents. Being employed in the same city in which one lives is a reasonable way to reduce transportation needs, and the pollution related to that transportation. However, the goal of providing employment for just 50% of the residents is remarkably low. Without enough job possibilities, this city will quickly deteriorate into bedroom communities, or worse, and that is the current trend now. More than half of the residents indicate that they will not work within the eco-city due to their current

jobs etc, which means most of them will choose to drive their cars to work.

Tianjin Eco-city also plans to provide 12 square meters public green space per person, and at least 70% of the plant species in this green space require fewer pesticides and they promote natural biodiversity. But when one realizes that the EU norm is 26 square meters per capita, and that the World Health Organization recommends at least 50 square meters per capita, the number 12 seems positively claustrophobic.

From a lot of aspects in contrast to their advertised goal of creating a model for future eco-cities in China, Tianjin Eco-city falls short of expectation. Looking at all these harmonious rendering, one couldn't help asking, is Tianjin Eco-city really ambitious enough in terms of contributing to a new paradigm for ecologically friendly urban planning in China? Or are these green elements here and there merely the promotion for a generic new town projects oriented real estate development?

Fig 39
Tianjin Eco-city construction site (billboard shows 'live in the same land, build beautiful home together)

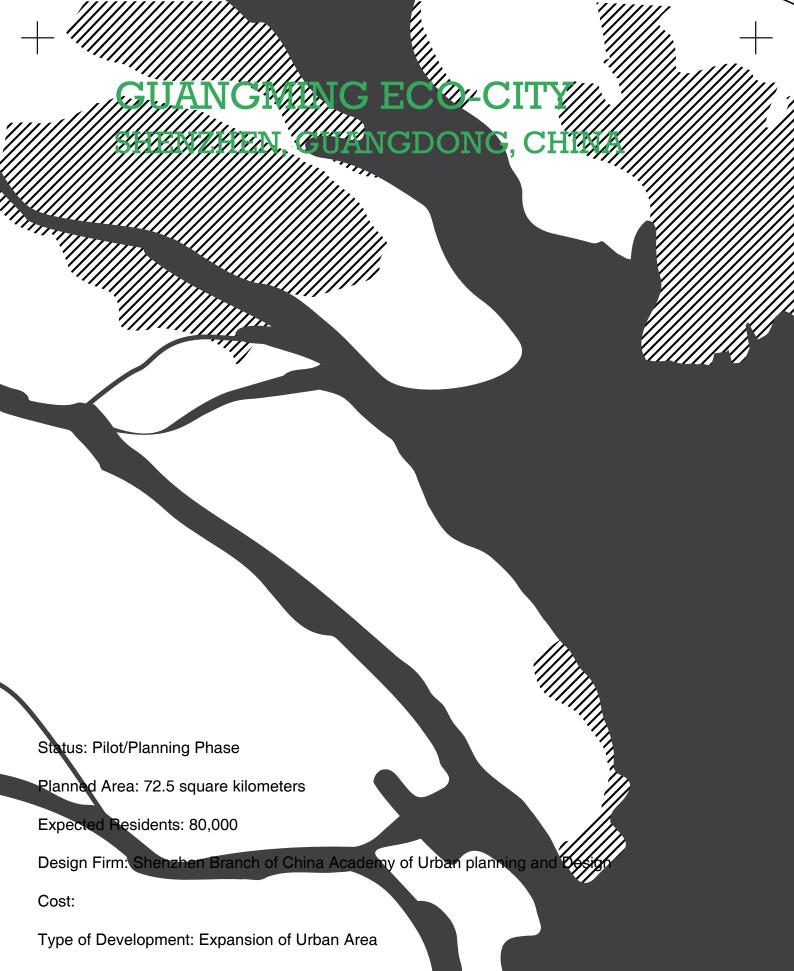


Some also claim that Tianjin Eco-city's appeal for many people is financial, rather than environmental. When Wei Qian, a 32-year-old sales manager, saw sales information six months ago in Tianjin for its Eco-city development, she was intrigued by the novelty of the project. According to Qian, 'A 70 square meters apartment in Beijing is 2 million yuan (293,000 euros) at least, and I heard rumors that the price here will be 45% cheaper. And of course, I noticed that the city will go green, I think it's a fashion trend and could save a lot of money'. (Lu, G, "Home buyers cuing up for Tianjin Eco-city", Global Times, 2010) The real estate conditions in Tianjin Ecocity is clearly more successful than Caofeidian Eco-city, but until now it was still unclear how the 'green ambitions' of this city will be fulfilled.

While some critics disparage Tianjin for its accessible targets, the question for all eco-cities remains: How to balance eco-ambitions with realistic proposals? And where is the line between a true eco-city and a city with some environmentally friendly aspects? How to move beyond branding and the implementation of only some environmentally friendly aspects and achieve a holistic sustainable eco-

nomic and social environment?

To judge the New Town by its own stated goals, it seems that a city that only provides employment for 50% of the inhabitants will inevitably be dependent and struggle for autonomy. If Tianjin Eco0city is truly meant to be 'scale-able, replicable and practical', it would do better to focus on creating a sustainable economic and social environment where 'green' behaviour is a natural result, rather than a demand (Keeton, 2014).



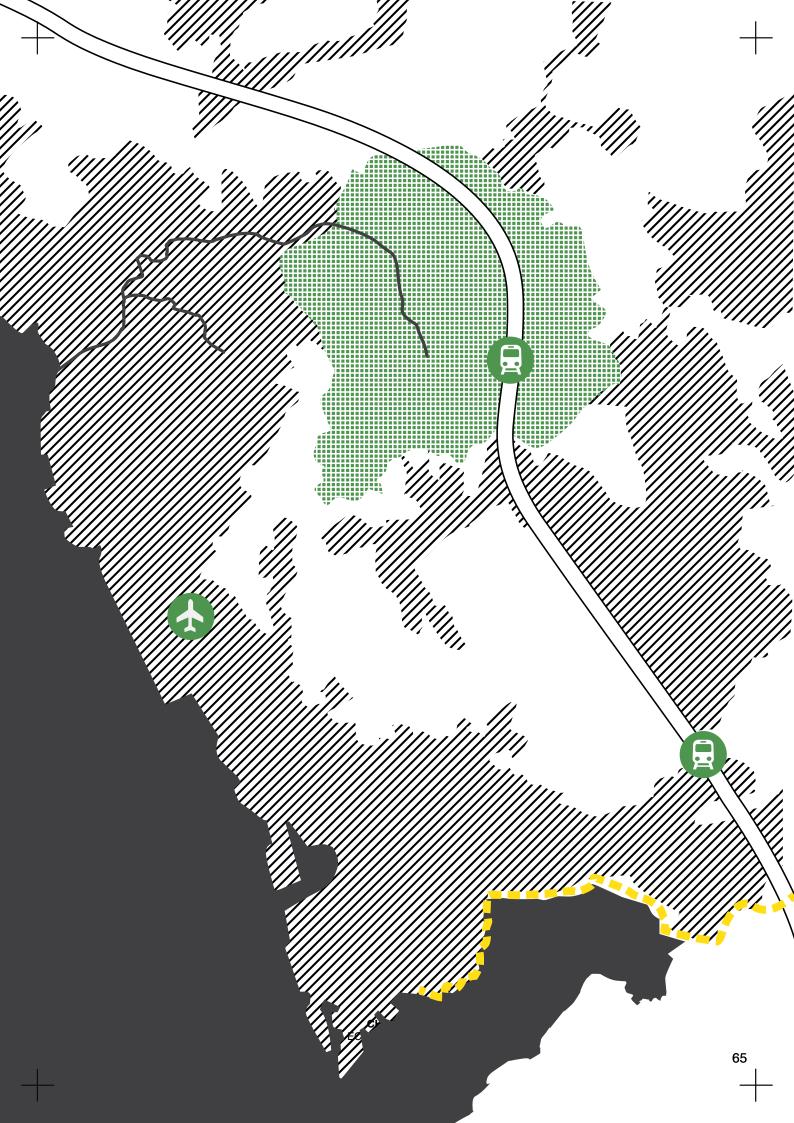




Fig 40 Guangming Eco-city and its location Fig 41 Photo of Shenzhen's fast urbanization and environmental pollution Shenzhen is one of the first four Special Economic Zones when China first opened its doors to the outside world and introduced the market economy. After 30 years of unprecedented fast urbanization, Shenzhen along with Pearl River Delta became the fastest growing metropolis of China. Shenzhen now is expected to deliver a new experiment for ecologically friendly social and economic transformation, in the position of its similar role in the late 1970s. (Yu, 2014) China's central government is promoting three major themes among cities at this moment: Ecological civilization, Newtype urbanization, Creative development. Shenzhen as the core of pearl river delta, the closest connection to Hongkong, and the 'Design Capital' of China, is under the national mission to deliver and demonstrate a new urbanization. Apart from the heated urban regeneration discourse within the built environment in the main part of Shenzhen, the new town development also draws a lot of attention national wise. Therefore, Guangming is like a shiny new born baby expected as a rising star of Shenzhen, even of China.

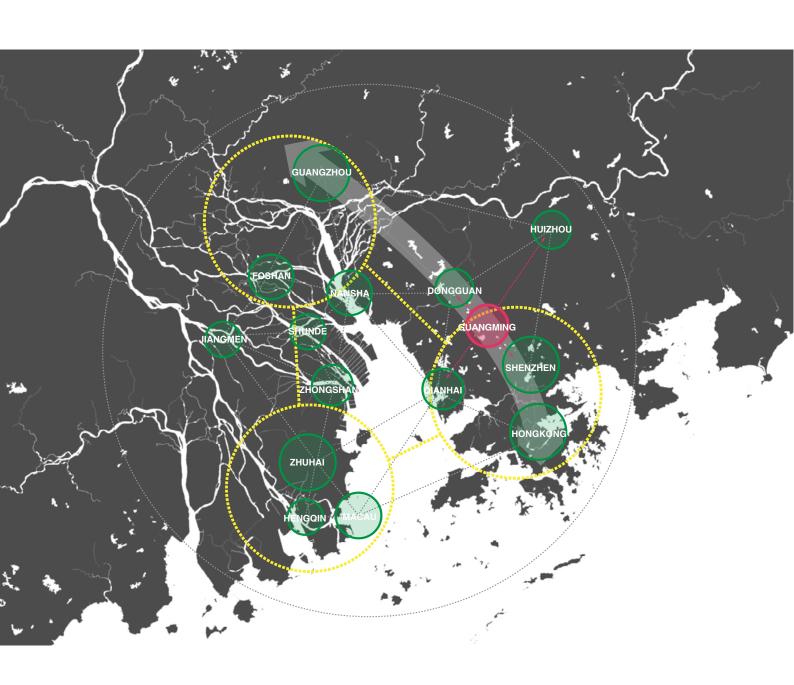




Fig 42-43 Urbanization of Pearl River Delta (1979 and 2003)

Fig 44 Urban development regional strategy of Pearl River Delta

Fig 45 Guangming New Town location in Shenzhen





Guangming New Town used to be a state owned farm. It is located to the northwest of Shenzhen. Its location makes it the gateway linking Guangzhou-Shenzhen-Hongkong. The defined areas for development within the new district cover 340 ha, among which, 67 ha are the built-up areas. The land uses include industry, rural housing, administration and office plots, road, infrastructure and public utilities.

Guangming New Town, before it actually gets implemented, has already been named as national green demonstration district, national green building demonstration district, first sponge city project, national circular economy demonstration district, national new-type urbanization experiment district etc. All these branding behind Guangming, are certainly driving Guangming to explore and ex-

periment a 'green future'. However, under such pressure, will Guangming become like Tianjin Eco-city or Caofeidian Eco-city, just another generic new town project which disappoint us again? What effort Guangming has been put in, and where have those efforts lead it to until now?

Undeniably, when Guangming started an international urban design competition in 2006, this area is already on the spot light of Chinese urban planning profession. Local design and planning institute spent years trying to translate the fruitful outcome of the international consultancy and workshop into a workable statutory planning document, but how did it turn out?

Fig 46 Guangming New Town planning history from 2008 to 2015

	Planning Area	Name of the Plan	Initiatives
Oct 2006		Shenzhen City Master Plan (2010-2020)	Shenzhen Municipal Government
Nov 2006		Guangming Central Area International Urban Design Consultation	Shenzhen Urban Planning Bureau
2006		Statutory plan of the east Guangming Hi-Tech Industrial Park	Shenzhen Branch of China Academy of Urban Planning and Design
Jul 2007		Planning of the develop- mental guide of the Guangming central area	Shenzhen Urban Planning Bureau ↓ Singapore Pradesh City Planning Consultants Ltd.
Sep 2007		Guangming district plan (2007-2020)	Shenzhen Branch of China Academy of Urban Planning and Design
2010		Guangming new town overall urban design	Guangming Branch of Shenzhen Urban Planning Bureau ↓ Shenzhen Branch of China Academy of Urban Planning and Design

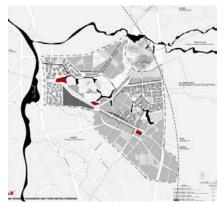
	Planning Area	Name of the Plan	Initiatives
Mar 2010		Urban design of the surrounding areas of the Guangzhou-Shen- zhen-Hong Kong Express Rail link Guangming Station	Urban Planning, Land and Resources Department organized an international consultation  Zhubo Design got selected
2011		The Guangming gateway district urban development planning outline	Guangming Branch of Shenzhen Urban Planning Bureau and Shenzhen Urban Planning and Land Research Center
2011		Low-carbon ecological demonstration zones planning and implementation of programs of the gateway district of the GZ-HK express rail link Guangming station	Urban Planning and Design Institute of Shen- zhen
Feb 2012		Planning of the Huaqiang cultural creativity and export base project	???
Mar 2012		Sub-development 01 preliminary planning program (The China Merchant plot)	Developed by China Merchant Group
2012		Internet R & D headquarter	Designed by Architecture Research Institute of the South China University of Technology

CHAPTER 1 ECO-CITY PROFILE In 2006, Guangming started the first international design competition for its central area. The theme of the competition is 'Towards a New Radiant City', Guangming tried to incorporate the modern definition of Le Corbusier's ideal city model from 20th century. Top three winning entries are rpaX from Austria, MVRDV from the Netherlands, Studio 8 from the United Kingdom. After the design competition, Guangming along with Urban planning and Design Institute of Shenzhen organized several workshops to translate the creative ideas to workable statutory plan.

After years of effort from local government, the central area of Guangming remains quite undeveloped. As shown in Fig 48, the current situation of this area is far from the way it was planned six years ago. The biggest struggle for local government to implement this plan is that the already built areas. According to a designer who participated in making the statutory plan, this plan will work well if this is a empty area. Because the plan suggests a TOD model, that is high density development in strategic public

transportation node, other areas' FAR remain low. That leads to low motivation for those plots to initiative renewal proposals, because there is no profit in the development. Another reason is that there are a lot of illegal construction in this area, which also makes the infrastructure implementation harder than imagined.

All in all, this case in Guangming taught us that it is crucial to understand the local conditions and adjust the strategy accordingly. A fixed statutory plan without deep understanding of local conditions can't push the development forward. No matter how well thought the design is, the capability of dealing with uncertainty, complexity and diverse fabrics is crucial. One plan can fix everything that kind of ideology needs to be changed.





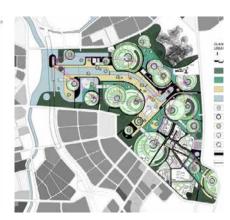
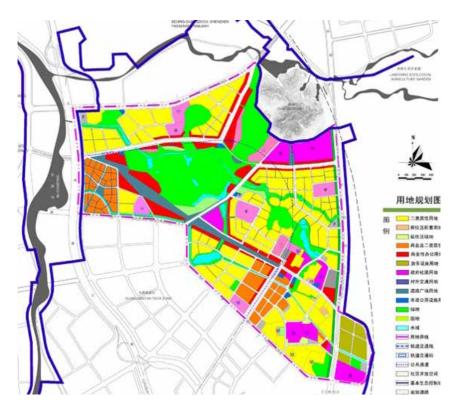


Fig 47 Winning entires for International Design Competition for Guangming central area.

Fig 48 Statutory plan of central area of Guangming (2007)





Guangming has been a periphery of Shenzhen for the past years, not until 2007 Guangming New Town was established along with another three new towns representing Shenzhen's next step towards a new economy and industry. Guangming New Town is the fastest growing district out of these four, and due to its valuable ecological and natural resources, Guangming is aiming at exploring a more environmental friendly way of urbanisation. From an agricultural oriented periphery, Guangming wants to transform into a 'green district', a innovative green industry oriented area. After the Guangzhou-Shenzhen-Hongkong Express Rail Link decided to set a station in Guangming, it boosted Guangming's ambition to become a sub-centre of Pearl River Delta. In 2015, Zhongshan University decided to put a new campus in the north side of Guangming. A few months ago on 20th, December, 2015, a landslide happened in the south part of Guangming, destroyed dozens of buildings and at least 190 people are still missing.

# Guangming Major Events

Guangming Central Area international urban design consultancy

Guangming New Twon was established

Guangming LED Screen Industrial Park was set up

GZ-SZ-HK Express Rail Link opened, Guangming station was put into use

Guangming New Town
was selected as a national
demonstration green district

Guangming New Town cooperated with INTI to create "sponge city" urban design

Zhongshan University set up a new campus in Guangming

Massive landslide buried a industrial park in the southern part of Guangming

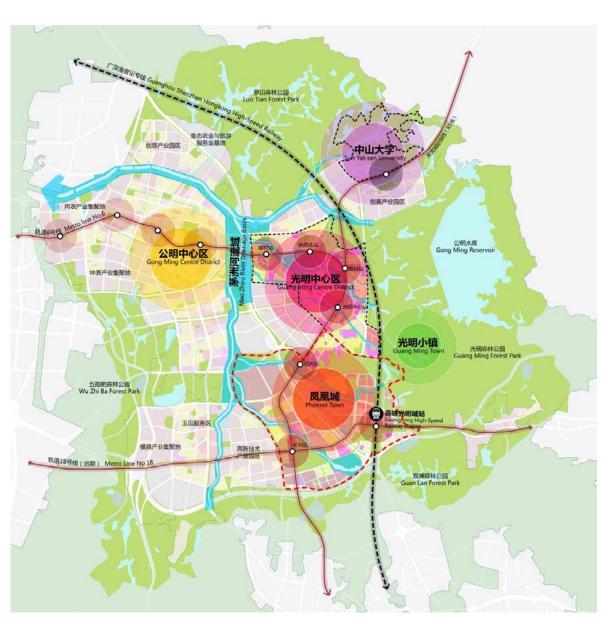


Fig 49 Guangming central area satellite image of 2014 (page 72)

Fig 50 Guangming New Town spatial development strategy

Due to the constant changing conditions, the development priority of Guangming also changes accordingly. When Guangming New Town was established, the central district was the most focused area. After a few years, the development is not as fast as it was expected due to the complicated existing conditions. Then the development focus was shifted to the station area after the Guangzhou-Shenzhen-Hongkong Express Link was established. Guangming saw this opportunity as a ice-breaker for its long stagnated development. Hence an international consultancy and urban design was done in 2013 focusing on the station area of Guangming. With the success of getting the 'National Demonstration Area of Green Cities/Districts', Guangming's ambition is growing bigger. A Phoenix-Town planning was conducted, to extend its development beyond the central station area towards the west including a few high-tech industrial park planned. Besides, a strategy of utilising rain storm water, known as "sponge city" concept was adopted for the development of Phoenix Town. An open design competition calling for an 'urban green ring' was held in 2015. In the late 2015, Zhongshan University decided to put a new campus in the north part of Guangming. This university is famous for its agricultural and medical research, hence this 'green' branding of Guangming also fits in their agenda. On 20th of December, a tragic landslide happened in Guangming, a industrial park was totally destroyed by the sudden collapse of a man-made hill storing soil. Dozens of people are still missing according to the latest news report. Guangming New Town has witnessed the complexities and constant changing conditions of a city, the conflict of human activities and natural process, and the cost of it. As a demonstration district of green development, Guangming needs to cope with these uncertainties and complexities, not just by proposing a fixed landuse plan. Apart from that, Guangming's ambitious proposal seems a bit plain and unreal without a clearly defined path towards it. The beautiful rendered scenario seems perfect, but the key question remains: how do we get there?

# 2.3 Three Stages of Eco-city Development in China

Based on the research of these three most representative eco-city projects in China, we can conclude that eco-city in practice is also continuing evolving. They represent the changes and development of Chinese urbanization.

From the first failed project Dongtan Ecocity to the Guangming Eco-city in progress, the concept of land-use changed from development on green ecological land to polluted brownfield and finally to urban renewal project. The development type also changed from the pure residential suburb-like urbanization to more divers mix-use and then to indus-

trial upgrading. The financial support also changed from central government lead investment to more local oriented project.

Based on these observations, these three projects can represent three different stages of eco-city development in China. Hence this research also chooses Guangming Eco-city, the newest type of eco-city development as a case study to explore the future of eco-city development.



Dongtan Eco-city

Planned in 2005

Aimed to be 'World's first eco-city'

84 KM2

Planning population: 10,000 by 2010; 80, 000 by 2020; 500,000 by 2050



Tianjin Eco-city

Planned in 2007

Aimed to be the model for future Chinese urban development

32 KM2

Planning population: 350,000 by 2020



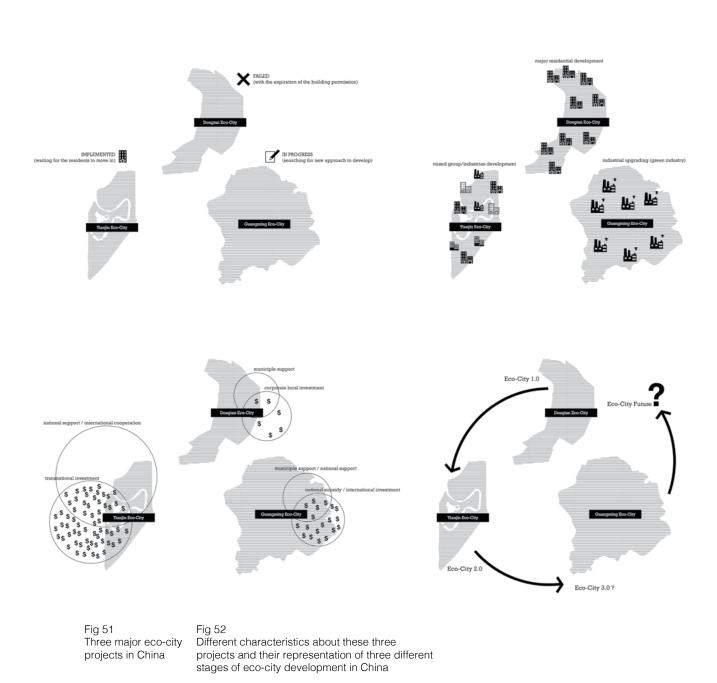
**Guangming Eco-city** 

Planned in 2011

Seeking for a green future under the theme of industrial transformation

156 KM2 (Urban area: 72.5 KM2)

Planning population: 800,000



CHAPTER 1 ECO-CITY PROFILE

## 2.4 Externalities of Eco-city Development in China

China is a firmly believing that the idea of 'the faster is the better'. To the majority, China's speed is one of the vital elements of Chinese success. On the other side, the quality of Chinese products, including urbanization, is often criticized as bad quality. This phenomenon is reflected on every aspects of Chinese society, from the national 5-year plan to the manufacturing factories in Shenzhen. Fast decision-making, fast urban development, fast response to market, all these are done with passion, eager and commitment. There are some 'golden slogans' said by various leaders can clearly reflect China's ideology, like "Time is money, Efficiency is life", "groping for stones crossing the river", "no matter if it's a black cat or a white cat, as long as it catches mice it's a good cat". This also leads to the experimental approaches to new development in the realms of Chinese urbanization (Schoon, 2014), such as eco-cities.

This pragmatic and experimental ideological can be easily found from the ecocity development practice. The adoption of cutting edge technology shows China's effort on seeking 'fast fixed plan' for its future development and pollution problems. In the age of fighting against climate change globally, a new perspective of viewing our cities is urgently needed. The fast urbanization process has neglected the natural ecological process. Just by creating an enclosed system with less carbon emission, less energy consumption seems not enough to deal with the serious problems in front of us.

As Risser, Karr and Forman argues in 'Landscape Ecology', the focus of land-scape ecology is on human actions as responses to, and their reciprocal influences on, ecological processes (Forman, 1995). The fast eco-city development and construction totally ignored the ecological process, and human actions' impact on it. Hence, it is hard to say whether the highly profiled eco-cities projects have contributed to the environmental conservation or exacerbated the impacts of climate change.

Moreover, from the social perspective, the large scale construction of new towns means the original residents will be removed form the area. This violent way of changing social structure may disturb the social cohesion of one area. From the media reporting 'nail household' (people who refuse to move from their house), we can get a grasp of this negative impact on the social cohesion.

In conclusion, it is difficult to identify the negative externalities of eco-city practices in China since most of them are still in the initiating phase. However, from the existing experience, eco-cities offer very limited environmental benefit. They lack consideration of long-term sustain-

ability, social cohesion and the capability of dealing with future uncertainties. The fast-speed urbanization has led to low-quality construction, and it may lead to even more waste and pollution in a larger context.



Fig 53 High-speed railway passing through old resendential buildings waiting to be torn down

### 2.5 Observations, Conclusions and Problem Statement

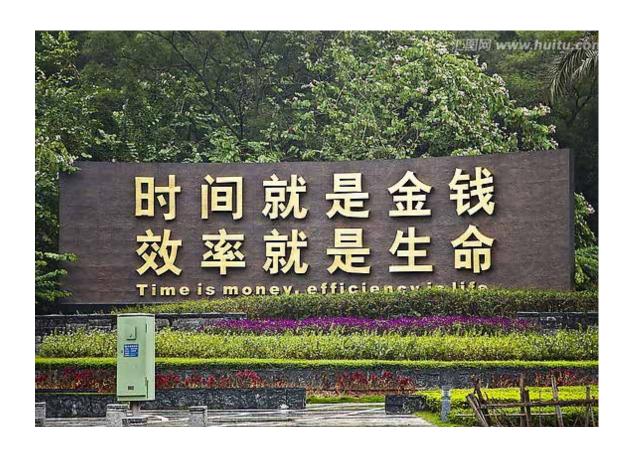
As said by Roelofs in 2000, "We need less sets of principles derived from experience, and more descriptions of those experiences". After looking into three major eco-city projects in China, it is still blurry where Chinese ecological urbanisation is going. However, by examining the past experience, Chinese eco-cities' similarities and unique characteristics are identified. Learning from the past experience and reflecting on it is crucial but often neglected in China's planning and urban development practice. What China urgently needs is a reflection, one that looks back it's a decade's effort in sustainable development.

Based on the research of the previous three eco-cities, four major observations are drawn, to some extent, to describe the eco-city phenomenon in China. Of course in reality, the situation is much more complex, but here these observations offer this research a starting point of thinking an alternative vision and strategies to improve what has been not successfully achieved in the past experience.

To conclude this chapter, eco-city China

as a unique urban planning phenomenon may lead to a not so sustainable future as it promised to the society. Based on literature review, study on past experience and current ongoing trend, the motives and challenges of eco-city development become more clear. The main conclusion of this chapter will be the problem statement (p.88), to sum up the eco-city practice in China and its challenges. In next chapter, eco-city theory and its history will be examined to offer a deeper understanding of ideologies and intentions behind the practice.

Fig 54 Slogan 'Time is money, efficiency is life' in Shekou industrial area in Shenzhen



Eco-cities in China are grand top-down new town projects master-planned by pretigious international architects

Land policy is one of the key elements determining new-town-style Eco-cities in China. Chien argues that eco-cities in China have in fact become entrepreneurial land development projects (Chien, 2013). Local authorities are developing new towns to secure additional local land revenue to fulfil economic indicators assigned from the top.

Fig 55 Tianjin Eco-city rendering

Eco-cities shows
China's belief in
that technology,
engineering and
built solutions can
provide a pathway
out of environmental
destruction

The investigation found that the existing eco-city development has been overemphasising technology and economic development but ignoring social equality and protection of the ecological environment. An eco-city is not only to minimise the use of energy and natural resources (Wong & Yuan, 2011), it should emphasise social development, and environmental protection (Lehmann, 2010) to service as a place for quality of life (Kline, 2000).

Fig 56 Solar power panel in Afica

What differs ecocities from work on broadly sustainable development is its attempt to create a comprehensive and transferrable model

The primary themes discussed in the literature on urban sustainability are compactness, sustainable transport, density, mixed land uses, diversity, passive solar design and greening ( Jabareen 2006), all of which are also commonly mentioned in discussions of eco-cities. There is one thing, however, that distinguishes the two bodies of literature. In contrast, much of the broader literature on sustainable cities is analytical, attempting to test various propositions about what makes a city sustainable, until recently, most of the literature on eco-cities focused on normative prescriptions for achieving eco-city status (Girardet 2008; Kenworthy 2006; Register 2002).

Fig 57
'Cells' planning concept of Tianjin eco-city

Eco-city initiatives
often have high
developmental
ambitions for not-yet-soprosperous peripheral
towns and hoping to
achieve envrionmental
goals by phasing out
manufacturing activities
and introducing a 'green
economy'

In China, eco-cities are not sold by motivated citizens to their peers and governments as major contributions to sustainable production and consumption, but by local governments to future developers, high-tech corporations, and highly educated inhabitants as attractive green areas where they can generate extra GDP, produce new technologies, and live comfortably and safely. (De Jong, 2013) Introducing the greening of performance indicators as incentives measurement for local governments has proven a hard nut to crack given the continued belief that growing prosperity is what Chinese citizens really need and environmental damage can be cleaned up with money earned through economic growth.

Fig 58 Green technology

### **Problem Statement**

China's rapid urbanization has resulted in extraordinary resource consumption and serious environmental degradation. In order to cope with these new challenges, China has been seeking for a new approach to urbanization. Thus, 'Eco-city' has become the most popular and widely adopted urban development concept. However, in Chinese eco-cities practice, there is still a missing link between sustainable visions and the implementation process. Hence, eco-city projects have witnessed a few failed projects. The currently ongoing projects are also challenged and guestioned about its ecological value and social inclusion. Eco-city is not a concept that offers means of mitigating environmental impact of our cities. It should be a process of shifting our urbanization approach towards a resource-conserving, ecological viable and inclusive one. This research questions the core of the eco-city concept, focuses on the challenges in Chinese practice, and aims at bringing new ideas to this significant yet complex discourse.

Fig 59 Illustration of Dongtan eco-city

Fig 60 Chongming island (where Dongtan eco-city is proposed) in reality after 10 years





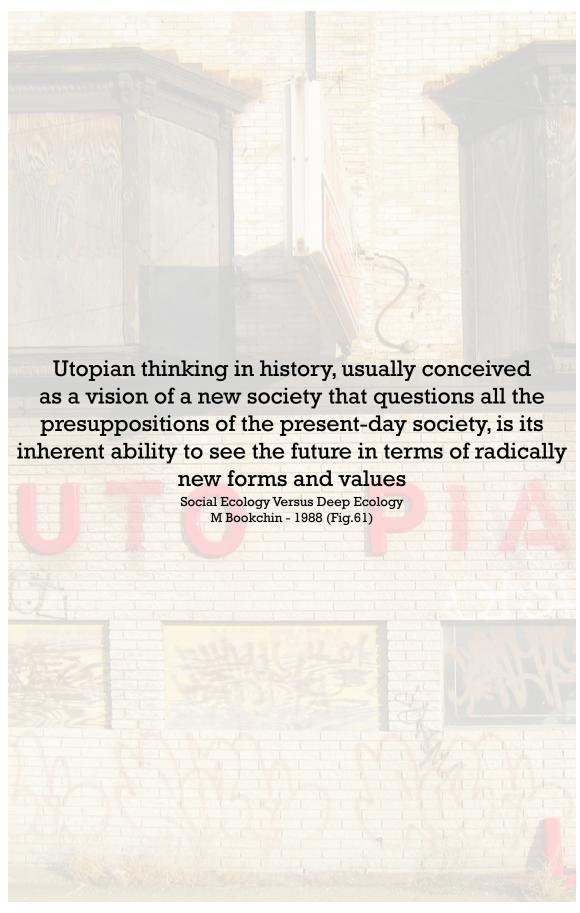
CHAPTER 1 ECO-CITY PROFILE

# **CHAPTER II**

# An Alternative Future

Envisioning a New Vision for Guangming New Town

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CHAPTER 1 ECO-CITY PROFILE

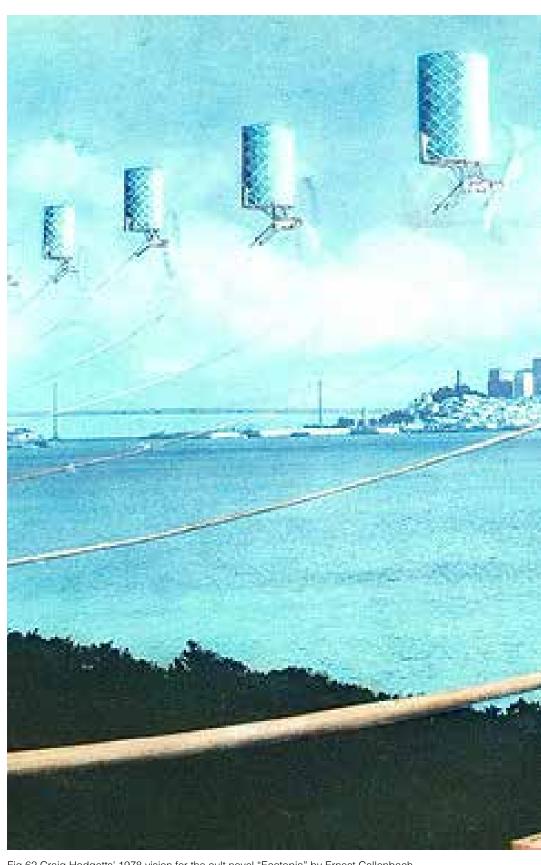


Fig.62 Craig Hodgetts' 1978 vision for the cult novel "Ecotopia" by Ernest Callenbach

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CHAPTER 1 ECO-CITY PROFILE

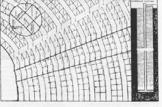
# 3. ECO-CITY THEORY & ECO-TOPIAN VISIONS

Anarchist activist and author, Marie Louise Berneri wrote in her book Journey through Utopia, says 'Our age is an age of compromises, of half-measures, of the lesser evil. Visionaries are derided or despised, and "practical men" rule our lives. We no longer seek radical solutions to the evils of society, but reforms. At a time when man is so concerned with what is practicable and capable of immediate realisation, it might be a salutary exercise to turn to men who have dreamt of Utopias, who have rejected everything which did not comply with their idea of perfection.' (Berneri, 1950.). Also Bookchin argues that utopian thinking in history, usually conceived as a vision of a new society that questions all the presuppositions of the present-day society, is its inherent ability to see the future in terms of radically new forms and values (Bookchin, 1988). Utopian concepts can assist constructing a new future of alternatives, and it helps question the models or concepts driving the current development. Planning is not just about delivering the outcome and organizing the built environment. Planning can also offer imagination about the future, a persuasive story that can empower the change of people's lifestyle and perception of it.

Therefore, in this chapter, the history of eco-city concept and its evolution will be traced to re-examined the current phenomenon in China. In addition, important questions will be raised: eco-city as a bold and revolutionary urban planning concept, what differs it from work on sustainable development in general? Is the ideology of solving environmental destruction through technological methods we have seen from the current Chinese practice inheriting the original concept of eco-city from Richard Register? What are the other ecological urban design concepts have influenced or been influenced by eco-city concept? Is eco-city concept a utopian model? By asking such questions, the ideas of eco-city as a planning principle will be more clear, and the generative power of envisioning a utopian vision will be explored.

Fig 63 Twelve Cautionary Tales for Christmas SuperStudio

# Cautionary Tales FREMONITIONS OF THE MYSTICAL REBIRTH OF URBANISM SUPERSTUDIO evoke twelve visions of ideal cities, the supreme achievement of twenty thousand years of civilization, blood, sweat and tears the final haven of Man in possession of Truth, free from contradiction, equivocation and indecision; totally and for ever replete with his own PERFECTION



# 3.1 Origin and Development of Eco-city Concept

The term 'eco-city' was first coined in the 1980s by Richard Register, who defined an eco-city as 'an urban environmental system in which input (of resources) and output (of waste) are minimized' (Register, 1987). Over the past 30 years, this concept has been embraced by a growing number of academic and policy specialists, with the attempt to translate the general definition into workable principles for construction, production and consumption. However, couple of literature on eco-cities showcased that there is still no commonly agreed definition has emerged to date (De Jong et al., 2014). By tracing the history of eco-city development, and how the meaning of this concept has evolved through time, a more clear understanding of eco-city development will appear.

Eco-city initiatives started as locally oriented, citizen activists led, small scale projects focusing on improving environmental conditions during the environmental movement in the 1960s and 1970s. These included the establishment of a number of 'eco-villages' combining communitarian living with a low-impact lifestyle, integrating various aspects of ecological design, permaculture, ecological building, green production alternative

energy and community building practices (Rapoport, 2014).

Rapoport argues that two major events in the 1990s have shifted the direction and dimensions of eco-city development, and in general, sustainability discourse. The first was the publication of the Report of the World Commission on Environment and Development (commonly known as the Brundtland Report) which introduced the concept of sustainable development into the common lexicon. The second was the United Nations Earth Summit in Rio de Janeiro in 1992. The concept of 'sustainable development' proved popular and contributed to the marginalization of the more pessimistic environmental discourses of the 1970s (McManus, 1996). These two events shifted people's idea on that environmental protection and economic growth can't go hand in hand. 'Sustainability' proposed an ideal future that as long as technological development continues to improve, the environment protection and prosperity of mankind can be both achieved.

This concept becomes extreme appealing to Chinese government at that moment. After a decade of economic reforms, China has witnessed a huge economic growth as well as the impact of

environmental degradation. Hence this concept was adopted as the main objective of eco-city initiatives, in particular the idea of a tripartite definition of sustainability in which economic, environmental and social factors are equally important. The developments of eco-city in the west during 1990s and early 2000s were not explicitly labelled as 'eco-city', but they can be seen as precursors to the more recent eco-city initiatives. Besides they were relatively small, usually are in the neighborhood and district scales. Today, the most ambitious eco-city projects are occurring primarily in Asia (Joss et al., 2013; Keeton, 2011). Especially in China as we know from the previous research. From the exploration of eco-city concept's historical development, we can see eco-city as original concept and its implications in Chinese practice are rather different. This leads to the next discussion on two different ideologies behind this difference.



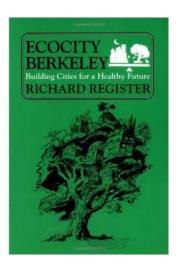
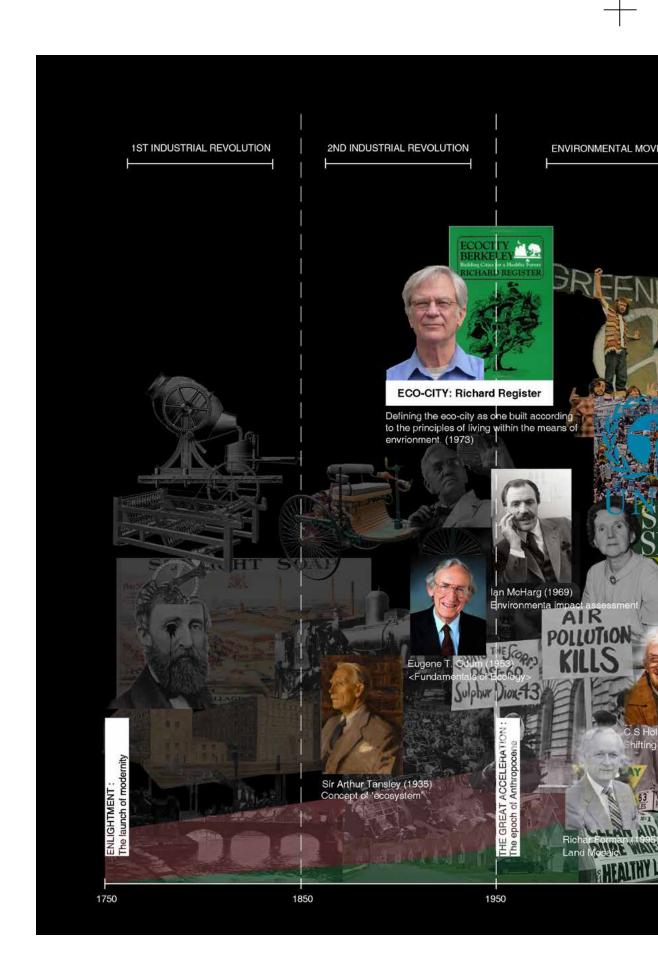


Fig 64 Richard Register and his publication 'Ecocity Berkeley: building cities for a healthy future' in 1987

Fig 65 (page 98-99) Hisotical evolution of eco-city theory and implementation in China with related national environmental policies





CHAPTER 2
AN ALTERNATIVE FUTURE

# 3.2 Utopian Ideologies Behind Eco-city Concept

Even the term 'eco-city' was officially coined by Richard Register in 1979, the planning ideas which reflect the relations between urban development and environment have long history. From McHarg's ecologically sensitive approach to land use planning, to the codified principles of 'neotraditional town planning' espoused by the New Urbanists (Calthorpe, 1993; Katz 1994). In this sense, eco-city is not a brand new innovative concept, it is rather an umbrella concept which representing the ideology of creating harmonious relationship between built environment and nature (Rapoport, 2014). To trace back to the history, the discussion about man and nature can be found significantly in the utopian literature, it also extends to the field of urban planning. Most wildly know utopian idea in urban planning history is Ebenezer Howard's Garden City, which was intended to be a cure for the environmental and moral hazards of cities of the Industrial Revolution (Hall, 2002). In the light of utopianism in planning tradition, eco-city can be regarded as a model of utopia, an effort was conducted to deal with the greatest challenge of our time climate change. The implementation of eco-city in China explicitly reflects the utopian ideology, which will be argued in the following part.

Eco-cities in China are argued as 'techno-utopian eco-desire', the belief that technology, engineering, and built solutions can provide the pathway out of environmental destruction (Sze, 2014). The biggest different aspect which differs current Chinese eco-cities from the early eco-city pioneers who respected ecological constraints, is that the belief in their capability of transcending conventional notions of ecological constraint with the help of technology.

This debate on two opposite ideologies on eco-city can also be traced in a broader scope in utopian visions. A distinction was made by de Geus to identify the utopias that aim at the conquest and domination of nature and those that aim at a reintegration and partnership of nature and society (de Geus, 2002). According to him, the former is described as 'utopias of abundance' and the latter is 'utopias of sufficiency'. In the utopian literature, the work of Bacon, Owen, De Sain-Simon, and Bellamy is considered as utopias of abundance, the technological utopias where the quality of life is achieved by satisfying desires and affluent lifestyle. Nature is viewed as an instrument to satisfy the incessantly increasing desires of human kind (de Geus, 2002). On the contrary, the work of More, Kropotkin, Morris, Howard, Skinner, Callenbach, and Bookchin is considered as utopias of sufficiency, the ecological utopias where happiness is achieved by limiting needs and the implementation of a relatively austere lifestyle. The quality of life is to be determined by simplicity, self-restraint, and moderation. (de Geus, 2002)

As argued before, the transformation of eco-cities from early stage to current practice in China can clearly reflect these two opposite streams of ideology. In the current China's constructing of eco-city, it clear shows the belief in technological solutions and the ultimate goal of economic growth. By identifying these two opposite streams of thoughts, a more fundamental question we need to ask eco-city is: to what extent ecological friendly cities can contribute to our happiness and what kind of happiness we are searching for the future?

Fig 68 (page102-103) Utopian Ideology of Sufficiency and Abundance, and urban planning theories which inherit these ideologies

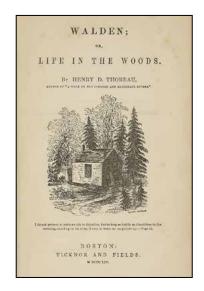


Fig 66 Walden: or Life in the Woods Henry D. Thoreau

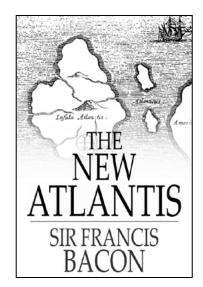
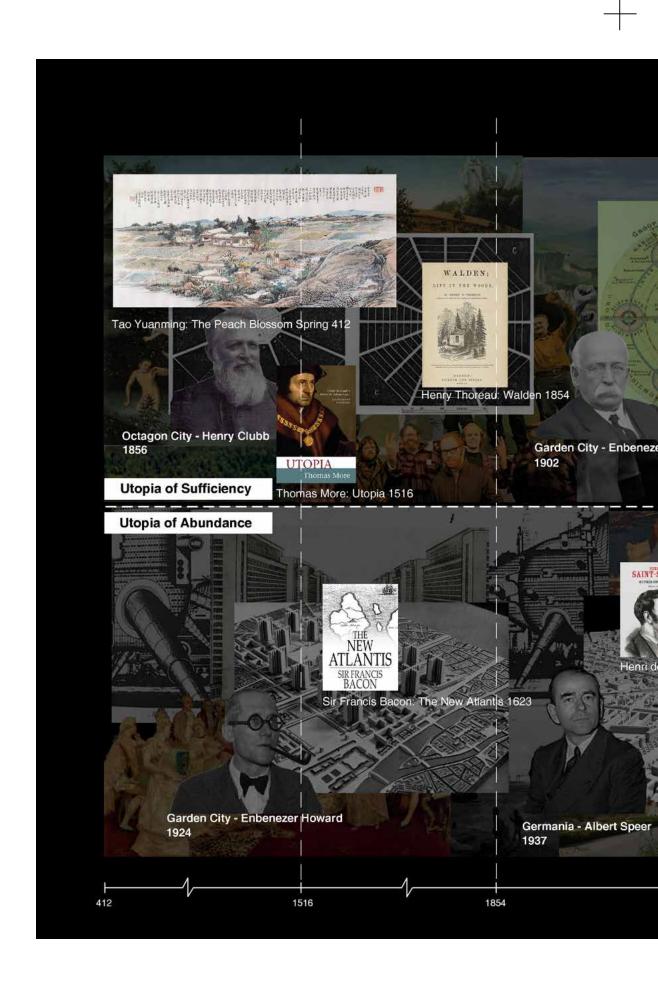
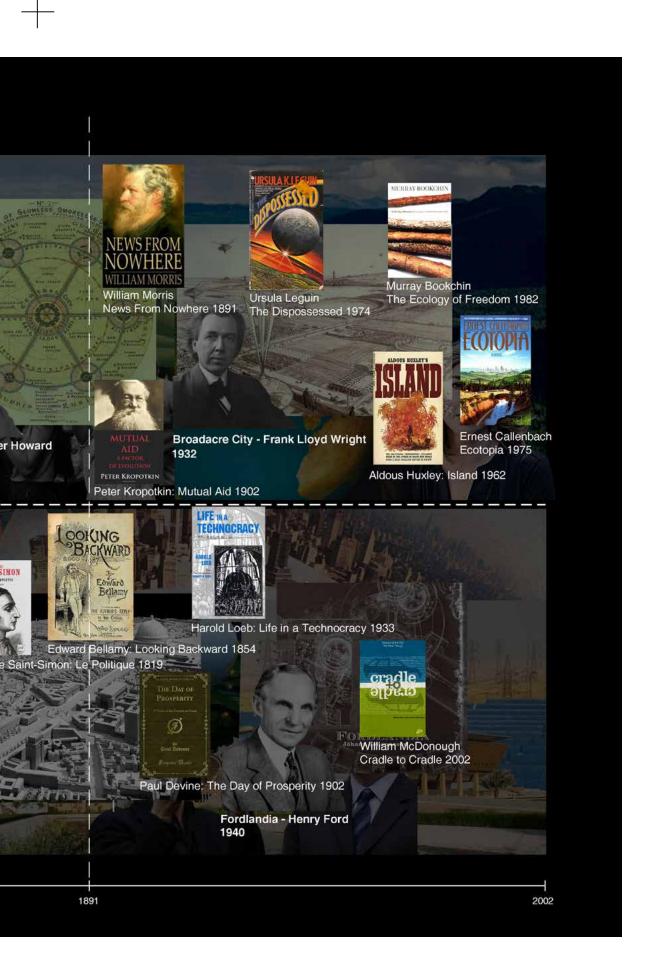


Fig 67 The New Atlantis Sir Francis Bacon



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CHAPTER 2
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Nowadays, utopian thinking has become discredited to an increasing degree, it is often seen as a daydream - a dangerous, romantic, and unfeasible fantasy. However, Bookchin argues that utopian thinking in history, usually conceived as a vision of a new society that questions all the presuppositions of the present-day society, is its inherent ability to see the future in terms of radically new forms and values (Bookchin, 1988). Also anarchist activist and author, Marie Louise Berneri wrote in her book Journey through Utopia, says 'Our age is an age of compromises, of half-measures, of the lesser evil. Visionaries are derided or despised, and 'practical men' rule our lives'. Utopian thinkers have challenged the societies they lived in, especially the ones have envisioned of bringing about a completely new world that man and nature coexist in harmony. Eco-city started as one of these utopian thinking, dreamed of constructing urban environment within the limit of the nature. The problem lays in the effort in making a detailed 'workable' blueprint to be realized. This is also one of the main reasons why utopias have often been criticized: the belief from many utopian thinkers that it is necessary to work from a 'total vision' to design a comprehensive

model.

In contrast to this blueprint approach, de Geus proposed a more modest model to use utopian ideas as a navigation compass for the construction of a future sustainable society (de Geus, 2002). In this model, the genre of the ecological utopia is primarily interpreted as an instrument that serves to guide society's general direction. Besides, it is understood that cities are extremely complex and uncertain. A well designed 'perfect' future will inherently lack the capability of dealing with the the unforeseen 'new' situations. Utopian ideas and way of thinking often offer us meaningful questions, ideas and perspectives, which indeed will contribute to constructing our society to a desirable future. Constructing a truly ecologically friendly city is far from simple application of a set of principles or indicators. It is crucial to study and understand which experience can be transferred to a different context, and to what extend it can be applied. A universal model for a sustainable city has not yet emerged, and in my opinion, it never will. Therefore, the discourse on ecocity should shift from aiming at creating blueprint to using the power of utopian visions as navigation compass.

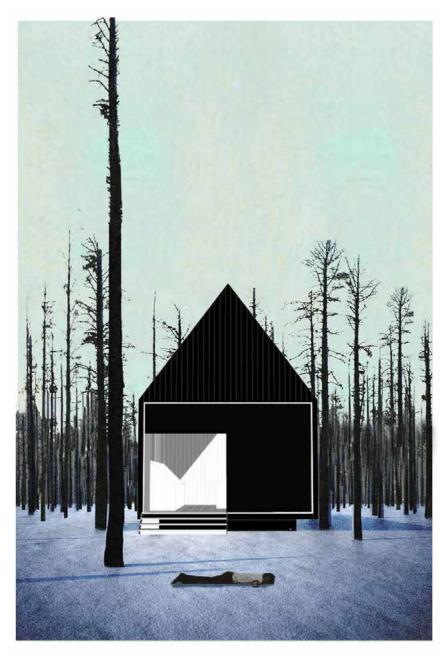


Fig 69 Illustration inspired by 'Walden: or Life in the Woods' Henry D. Thoreau

# 3.3 Ecosystem Services and Natural Capital

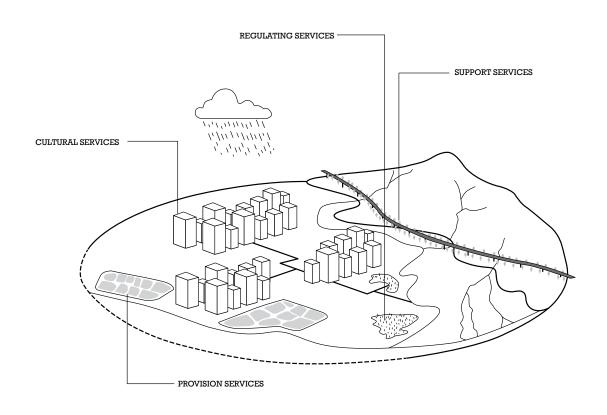
The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. Human's civilization is based on the ecosystem services, especially our urbanization. Cities are dependent on the ecosystems beyond their limits. Because ecosystem services are not fully 'captured' in commercial markets or adequately quantified in terms comparable with economic services and manufactured capital, they are often given too little weight in policy decisions (Costanza, R. et al., 1997) Even in the eco-city development as we have seen in the previous part, the concentration of the eco-city practice is still on the economic growth rather than environmental protection.

Based on the previous discussion about the 'sufficiency utopia', ecosystem services research provides an approach that restrains our urban development, and utilizes the natural resources in a more efficient way. In this thesis, ecosystem services are taken as guidelines to review the opportunity of incorporate the parameter into eco-city planning and development to ensure the quality of ecology within the urban area. Cities are often considered as a global network of ecosystems. If compared with true,

natural ecosystems, the man-made ones are however immature due to features like their rapid growth and inefficient use of resources such as energy and water (Haughton and Hunter, 1994). Odum (1971) even observes cities to be 'only parasites in the biosphere.' Therefore, study and research on ecosystem services within urban area and how to design eco-city based on the conclusion from the perspective of ecosystem services seem urgent, necessary and promising. In the process of constructing vision for Guangming Eco-city, this thesis utilized ecosystem services as guiding principles to explore the opportunity and challenges of incorporate urban ecosystem services and re-think our urban environment in relation to nature. Four major categories of ecosystem services are used to build up the vision.

Fig 70 Illustration of four major ecosystem services

Fig 71 Four major ecosystem services











PROVISION SERVICES

wood/fiber

freshwater

groundwater recharge

fuel

carbon flood ristk

REGULATING SERVICES

air quality
water quality
urban tempreature

water resource

CULTURAL SERVICES

recreation
cultural heritage
religion
education

noise reduction amenity/ quality of space

SUPPORTING SERVICES

biodiversity soil formation nutrient cycling

CHAPTER 2
AN ALTERNATIVE FUTURE

PROVISION REGU

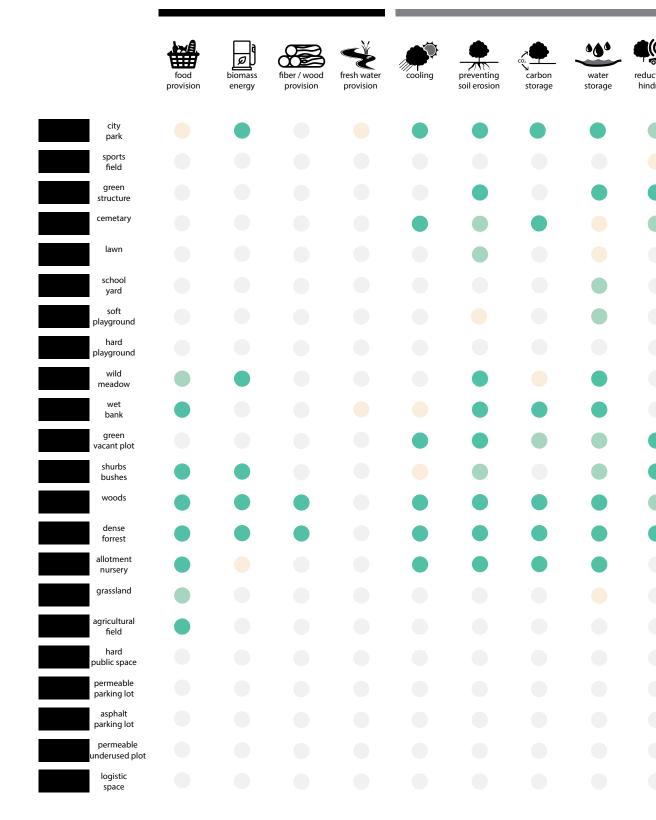
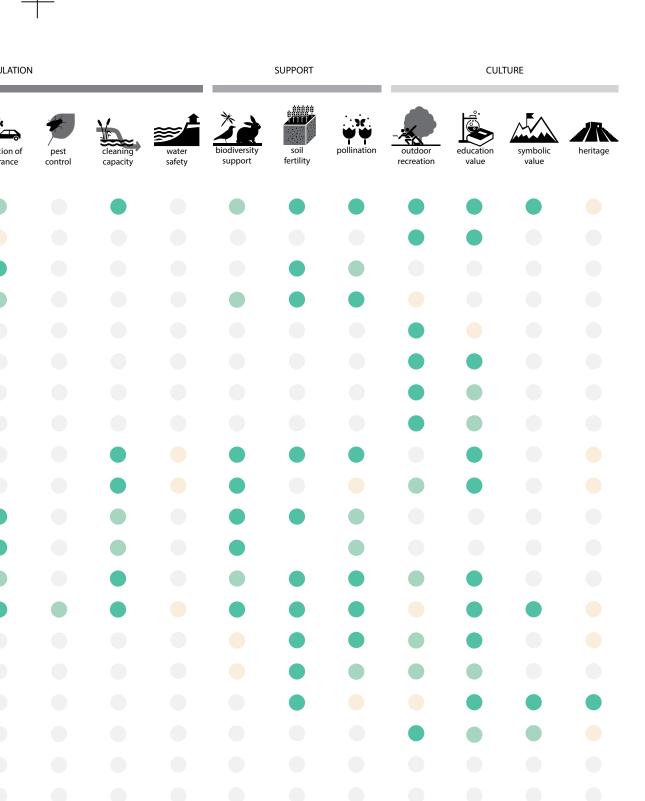


Fig 72 Ecosystem services in different open spaces in the urban environment

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# 3.4 Wellbing, Livibility and Ecosystem Services

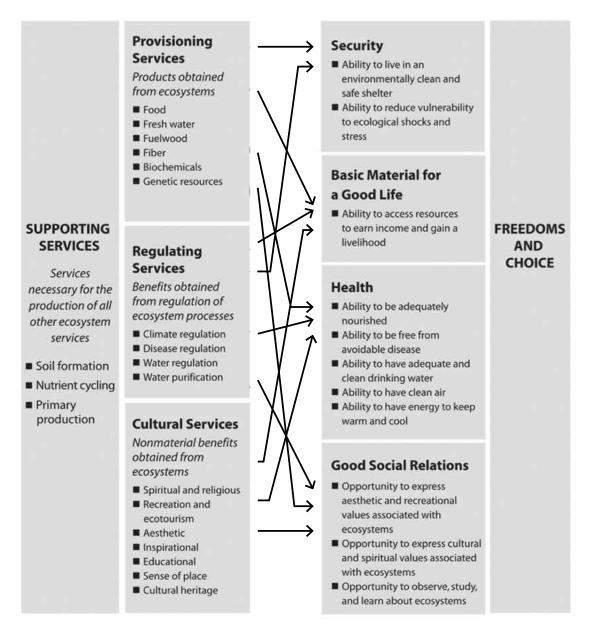
Human well-being has several key components: the basic material needs for a good life, freedom and choice, health, good social relations and personal security (Butler, Colin, et al. 2003). Together, these provide the conditions for physical, social, psychological, and spiritual fulfilment. With the increasing impact of human activities on ecosystems in the last few decades, it has been proved that the lost ecosystems and their services has growing negative effects on human well-being. There has been a lack of research on actual built environment and its relation to human well-being. Hence the study ecosystem services under the topic of eco-city is crucial for the general research on well-being and quality of life. All four ecosystem services are directly or indirectly connected with determinants and constituents of human well-being (Fig 73).

Therefore, ecosystem services not only have the economic dimension of providing support for all trades and economic activities. Ecosystem services also have big impact on human well-being, and they at the same time share a complex relationship. The overexploitation of ecosystems may temporarily increase material well-being and alleviate poverty, but it is proved to be unsustainable (Butler, Colin, et al. 2003). That is, to solve today's pressing problems, society is often tempted to deplete tomorrow's ecological resource base. With the increasing challenge from climate change, that future status might approach us in an increasing pace.

Fig 73 Ecosystems in relation to human well-being

### **Ecosystem Services**

# Constituents of Well-being



# 3.5 A Future of Sufficiency?

Quality of life is a broader concept than economic production and living standards. It includes the full range of factors that influences what we value in living, reaching beyond its material side. In China, the measurement of GDP is still considered as the major indicators of a region or city's level of development. In some senses, the obsession of Chinese government's targeting on high growth rate of GDP causes a series of problems. One reason for the governmental officials' determination of reaching high GDP growth rate at any stake is because their promotion mechanism is highly connected with the indicator of the economic growth. Therefore, even in the development of eco-city, the economic performance is still the priority in the process of policy making and decision making. To change the paradigm of working on sustainable development in China, the change of evaluation of a city's performance is crucial and necessary.

From the report of 'Measurement of Economic Performance and Social Progress' (Commission on the Measurement of Economic Performance and Social Progress, et al. 2009), one of the key recommendations is to shift our measurement system from measuring economic production to measuring people's well-being. And the

measures of well-being should be put in a context of sustainability. Changing emphasis does not mean dismissing GDP and production measures. They emerged from concerns about market production and employment; they continue to provide answers to many important questions like monitoring economic activity. But emphasizing well-being is important because there appears to be an increasing gap between the information contained in aggregate GDP data and what counts for common people's well-being. From the conclusion of the report, the changing value and measurement of our status is crucial for sustainable development. To reflect back to the utopian ideologies of sufficiency and abundance, the one dimensional of the measurement of economic activity will ultimately leads to over production and extraction of existing resources and hinder the process of delivering a sustainable future. By changing the value and standards of measurement, it may lead us to a sufficient future, a truly sustainable future.



Fig 74 Illustration inspired by 'Island' Aldous Huxley

### 3.6 Theoretical Framework

The structure of theoretical framework (Fig 75) for this thesis are composed by three topics that have supported to understand the eco-city phenomenon from different perspective. Eco-city as a discipline coined by Richard Register has broader and longer history of discussing the environmental friendly urban settlements.

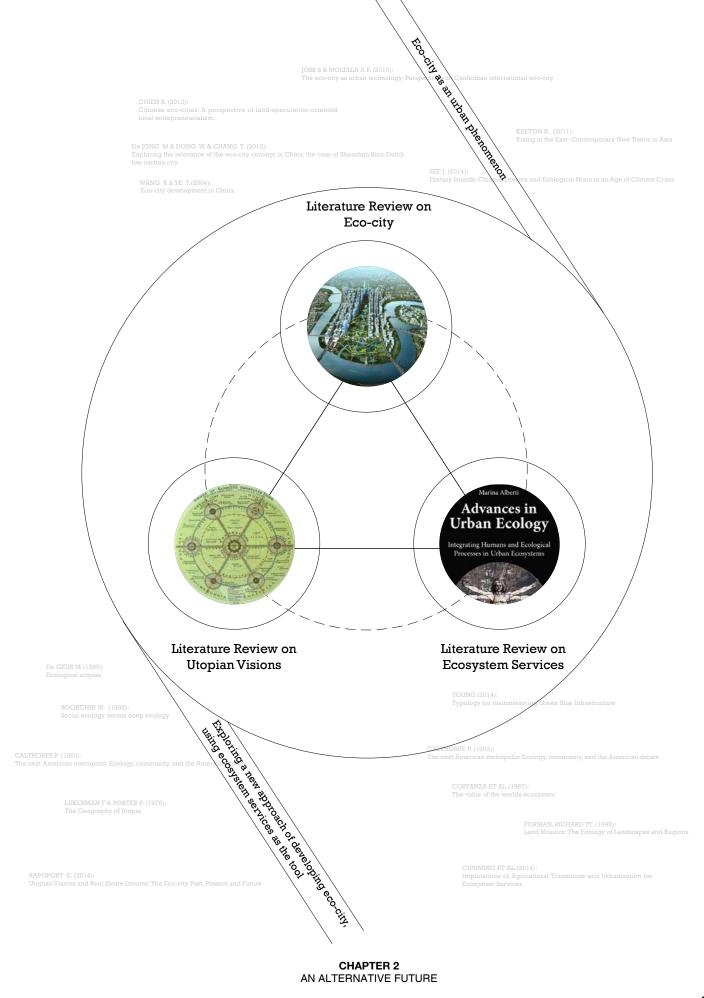
As a discipline itself, eco-city theories vary from the discourse on the ecological urban form to principles of utilizing green technology. It also expands the discussion to different interpretation of eco-city. For example, from the article by Chien, it explores the understanding of eco-cities in China as land speculation local entrepreneurialism (Chien, 2013). Different observations and discussions on modern eco-cities in China will contribute to in depth understanding of this new urban planning model both in theory and in practice.

On the other hand, in the history of utopian thinking, ecological friendly urban environment has also been discussed in various literature on utopias. From Thoreu's utopia of ultimate simplicity to Howard's utopia of garden cities, the visions of imaging a perfect urban environment in harmony with nature has been contributing to formulating the visions for the modern discussion on ecocity.

At last, in order to new approach of ecocity development towards an alternative future, ecosystem services are taken as guidelines and tools to develop new way of thinking our urban environment and its relationship with nature. A set of development principles and guidelines are derived from ecosystem services analysis and provides new approach of delivering an alternative vision.

Therefore, by connecting three realms of three theories, the vision, ideology and action of eco-city will be clear. From the theory, it will lead to further discussion on the future approach of eco-city planning, which Guangming eco-city in Shenzhen will be the case to be explored.

Fig 75
Theoretical framework



## 3.7 Research Question

How to integrate ecosystem services into Guangming eco-city planning process to provide an alternative vision that oculd reverse environmental degradation and put natural resources to sustainable use?

### Sub-research Question

- 1)How are the Chinese eco-cities developed in practice different from other sustainable development? To what extent do their implementation reflect the eco-city theories?
- 2) What are the motives, opportunities and challenges in Chinese eco-city development?
- 3)How are utopian ideologies reflected in the eco-city development? How can utopian visions function as a navigation compass instead of blueprint model?
- 4)How to move beyond tokenism in the application of eco-city concept towards an integrated spatial planning strategy that puts natural resources to sustaina-

#### ble use?

- 5)How can ecosystem services function as guiding principles for eco-city development?
- 6)How can the development strategy for eco-city to deal with uncertainties in the future and move towards an ecologically friendly urban environment?
- 7)How can the new vision for eco-city can improve the quality of life for local citizens both in short-term and long-term development?

Possible Product Method

How to integrate ecosystem services into Guangming eco-city planning process to provide an alternative vision that could reverse environmental degradation and put natural resources to sustainable use?

Goal

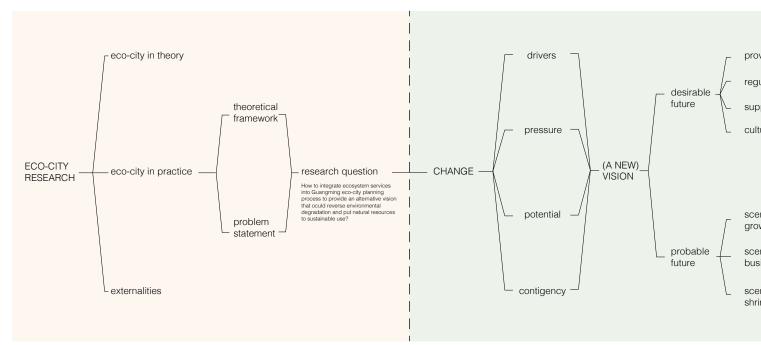
CHAPTER 2
AN ALTERNATIVE FUTURE

# 3.8 Methodology

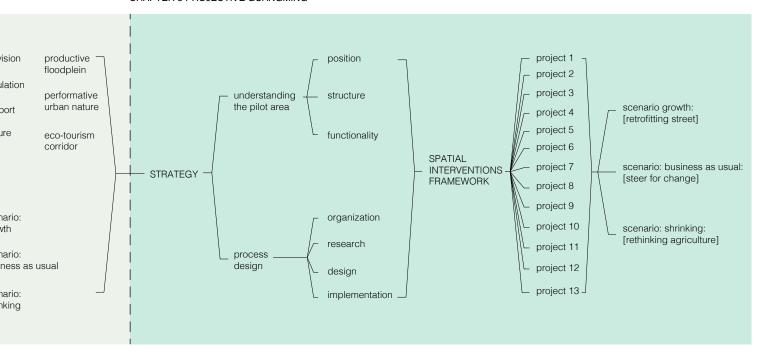
Fig 76 Methodology framework

#### CHAPTER 1 ECO-CITY PROFILE

### CHAPTER 2 AN ALTERNATIVE FUTURE



#### CHAPTER 3 PROJECTIVE GUANGMING



# 4. (A NEW) VISION FOR GUANGMING ECO-CITY

'True innovation derives from the vision: the ability to look at the world and see what others don't see. The construction of the vision is the most important asset and rare in our time. (...) The new frontier in understanding the roads that lead to innovation is therefore to study the construction mechanism of the vision. To do this we need new interpretive schemes, new perspectives. (...) A sustainable society can only arise from visions that look beyond today, beyond the immediate problem.'

- Norman and Verganti in Bocchi (2014:37)\*

Vision is essential for urban development. Vision is the value we share for the future of the society. It determines the direction towards the future. Vision can be understood as the desirable future, a future that is similar to the utopian state. As discussed before, utopian ideas cannot be taken as blueprint plan, instead it should function as a navigation compass. As for the vision, it shares the same ideas of how we use the vision.

For Guangming Eco-city, a new vision is constructed based on the four services of ecosystem. By investigating the local representation of these four functions and the priorities as well as the interconnections among them, an alternative vision is raised. It is a qualitative description of the desirable future. It highlights the essential ecosystem services within the local context.

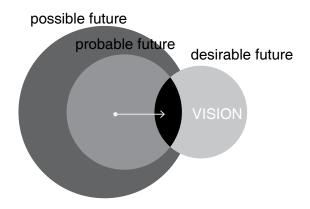


Fig 77 Vision and different futures

Fig 78 Guangming Phenix Town planning rendering Shenzhen Urban Planning and Design Institute 2014

\*This part of text is taken from the work 'Performative nature; urban landscape infrastructure design in water sensitive cities' (Doctoral dissertation, Delft University of Technology, UNESCO-IHE) by Kuzniecow Bacchin, T., 2015.



CHAPTER 2 AN ALTERNATIVE FUTURE

# 4.1 Change\*

#### Pearl River Delta

China's Pearl River Delta has overtaken Tokyo to become the world's largest urban area in both size and population, according to a report from the World Bank (the guardian, 2015). The megacity – which covers a significant part of China's manufacturing heartland and includes the cities of Shenzhen, Guangzhou, Foshan and Dongguan – is now home to more people than the countries of Canada, Argentina or Australia.

Urbanisation which took place over a period of several decades in Europe and North America is happening in just a few years in East Asia, which already contains eight megacities (with populations above 10 million) and 123 cities with between one and 10 million people. The satellite images from NASA showcases the urbanization process happened in PRD (pearl river delta) from 1979 to 2003.

Due to the massive industrialization and urbanization at such rapid pace, the environmental concerns became the priority in PRD. The future relations among urban, rural and industrial land are facing great challenge. Restructuring of regional network became the opportunity of Guangming's development.





Fig 79
Urbanization of Pearl River Delta (1979 and 2003)

\*The concept of describing change through drivers, pressure, potential and contigency is developed by Kuzniecow Bacchin, T., 2015.

### Shenzhen

Shenzhen is one of the first four Special Economic Zones when China first opened its doors to the outside world and introduced the market economy. After 30 years of unprecedented fast urbanization, Shenzhen along with Pearl River Delta became the fastest growing metropolis of China. Shenzhen now is expected to deliver a new experiment for ecologically friendly social and economic transformation, in the position of its similar role in the late 1970s. (Yu, 2014) China's central government is promoting three major themes among cities at this moment: Ecological civilization, Newtype urbanization, Creative development. Shenzhen as the core of pearl river delta, the closest connection to Hongkong, and the 'Design Capital' of China, is under the national mission to deliver and demonstrate a new urbanization. Apart from the heated urban regeneration discourse within the built environment in the main part of Shenzhen, the new town development also draws a lot of attention national wise. Therefore, Guangming is like a shiny new born baby expected as a rising star of Shenzhen, even of China.





Fig 80-81 Urbanization of Shenzhen and its environmental degradation

### **Drivers**

PRD, along with metropolitan cities like Shenzhen, Hong Kong, Dongguan, Macau and Ghangzhou, is home to more than 42 million people. PRD as one of China's economic jewels (estimated GDP: \$690bn) is spread across a flood plain threatened by all manner of natural disasters: it is the number one metropolitan

area for storm surge, with 5.3 million people affected, the third-highest for cyclonic wind damage (17.2 million), and the fifth riskiest city for river floods.

The vulnerability of the region and increasing threat from climate change constitute the main drivers for the change of pattern.



Fig 82
Earthquakes, hurricanes, cyclones and tsunamis: the world's 10 riskiest cities the gaurdian 2014

### Pressure

The spectacular story of Shenzhen is well-known: lying adjacent to Hong Kong in the Pearl River Delta, the former fishing village became a New Town in 1980 when the central Chinese government gave it the status of Special Economic Zone. Shenzhen soon became a metropolis and a prototype for both economic and

urban reform within China. Shenzhen is a city that has been raising eyebrows for years, because of its fast development and exceptional position. However, Shenzhen is also facing huge socio-economic as well as envrionmental challenges, similar to all major Chinese metropolis.

\*text source: http://www.newtowninstitute.org/spip.php?article1048

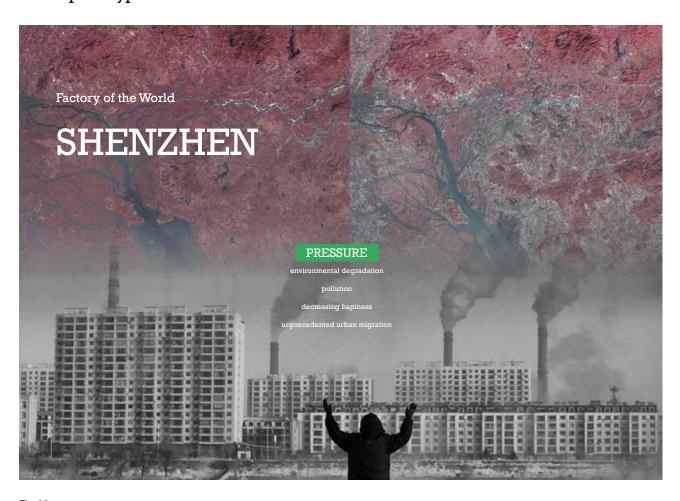


Fig 83 Shenzhen's industrialization and pollution problems

### **Potential**

Guangming as the third generation of eco-city development in China, represents the new opportunities for sustainable urbanization. Not only it focuses on increasing ecological performance in existing urban environment, it also receives high attention from national level to local level. With the precious opportuni-

ties presented to make a change, it is crucial to study Guangming as a case to explore the desirable future and potentials which leads the urban development to that direction.



Fig 84
Guangming as the third generation of eco-city development in China

### Contigency

Future offers us full of uncertainties. It is inevitable to consider the changing dynamics and unforeseen incidents in the development process of an eco-city. For Guangming, this unforeseen accident happened in December 2015 within the period of this project. A deadly landslide happened within the boundary of Guangming and destroys completely an industrial

park, killing more than 20 people. This proves the adverse impact on urban environment as a result of extracting natural resources without awareness of restoration and protection. The strategy and vision needs to adapt to all kinds of uncertainties including climate change to provide a resilient eco-city.

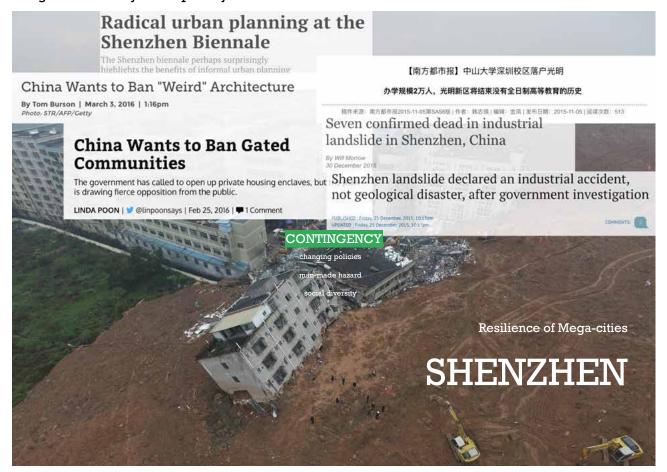


Fig 85
Guangming landslide accidents and the news about it

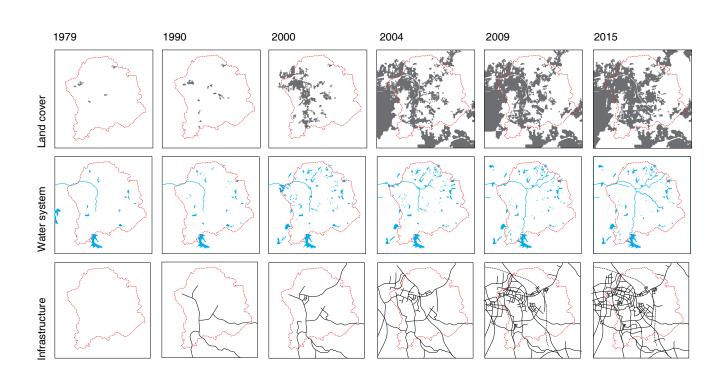
In order to provide a new vision based on ecosystem services for Guangming, analysis concerning the change of Guangming New Town from a major rural area to current ambitious eco-city was conducted. This part examines the ecological, infrastructural and socioeconomic systems in Guangming.

It is hard for one who hasn't been engaged in Shenzhen's rapid urbanization to understand the huge transformation of a small fishing village with 30,000 population to this metropolis of 12 million at this moment. The normative understanding of urban/environment transformation needs to take into account the fast pace of Shenzhen's development.

As suggested from the diagram 'heart-beat of cities', the changes of urban conditions showcase different frequency. From the change of the user to the change of ecological systems, it varies from 5 years to 200 years or even longer. In the case of Shenzhen, all aspects have been accelerated through various reasons. Urbanization leads to the development of infrastructure, the massive migration,

converting from rural landscape to urban landscape and the change of ecological systems. If we take a look at the water system in Guangming, through 30 years, the water body seems to increase a lot even though the urban fabric has grown in a great amount. The reason lies behind is because that due to the population growth of Shenzhen, there have been massive reservoir constructed to provide fresh water. However, the lost fish ponds along Maozhou river, and the reservoirs construction have caused the shrinking of river, and increasing pollution.

From this observation, it illustrates the importance of understanding urban development, especially in Guangming, from a process perspective. Often eco-city development in China was taken granted as 'building city from the scratch', but in reality the existing condition and the transformation process cannot be neglected.



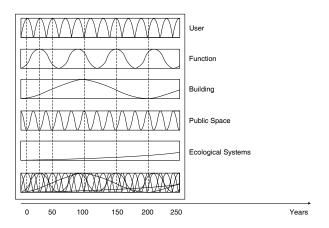
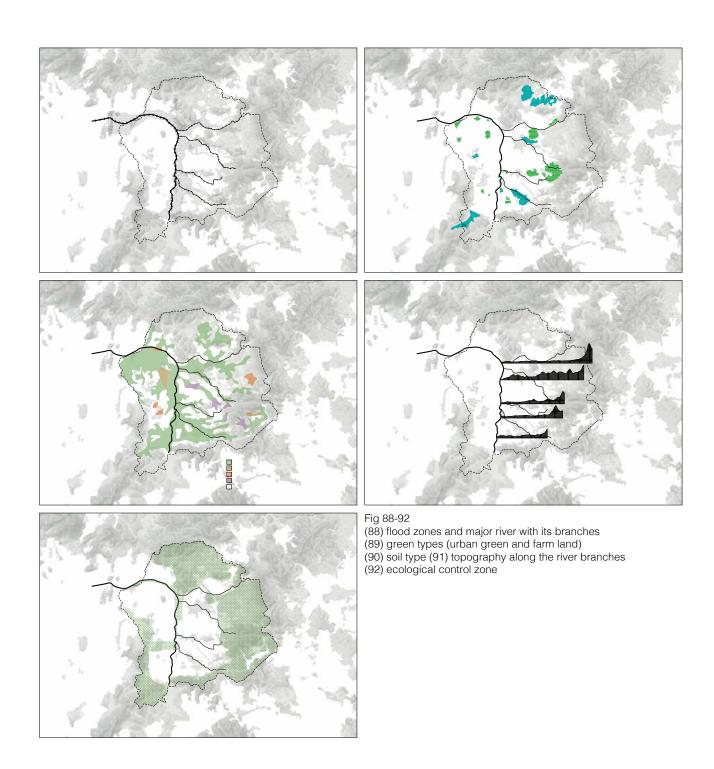


Fig 86 Infrastructure, water system and land cover transformation from 1979 to 2015 in Guangming

Fig 87
'Heartbeat of cities' indicates different changing frequency of different urban systems Uhrhanh, 2013

# Guangming - ecology

Guangming's major ecological component is the Maozhou river, which is the largest water body in Shenzhen. It is also known as the most heavily polluted river in the Pearl River delta, according to a recent report. This is primarily due to the 22,000 industrial enterprises that have set up shop along the river, 250 of which have been deemed "heavily polluting". It is hard to imagine a future 'eco-city' will still in such horrible conditions. Hence, by concentrating on the water structure passing through Guangming New Town, site study explored different urban/ landscape patches alongside the river, in association with soil type, green spaces, topography, ecological control zone and flood zone. Opportunities are found along the river that could be transformed into patches that increase the quality of Maozhou river. In relation to other layers and systems, a spatial framework of opportunities can be formed.



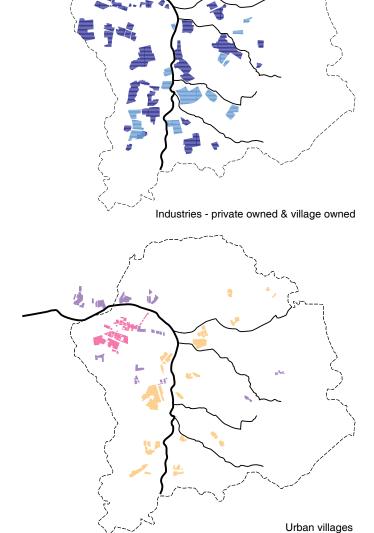
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# Guangming - urban fabric

As stated before, Maozhou river's pollution is majorly caused by the industries alongside the river. Besides, the household sewage is also twice the amount local water treatment facility can process due to the large amount of urban village settlements. Therefore, the study of urban fabric concentrates on the industries and informal urban settlement alongside the river.

The major industries are classified as private owned industry and village owned industry. Major private owned industry is composed by watch manufacture, module manufacture and fabric manufacture. Village owned industries are located in the urban villages constructed informally. Lack of basic infrastructure leads to direct flow of sewage into the river.

Meanwhile, industrial transformation is also happening in Shenzhen, when economic growth is aiming to shift from manufacturing to service oriented industry. Large amount of vacant factories, both private owned and village owned is present. The opportunity and challenges co-exist in the urban fabric along the Maozhou river.



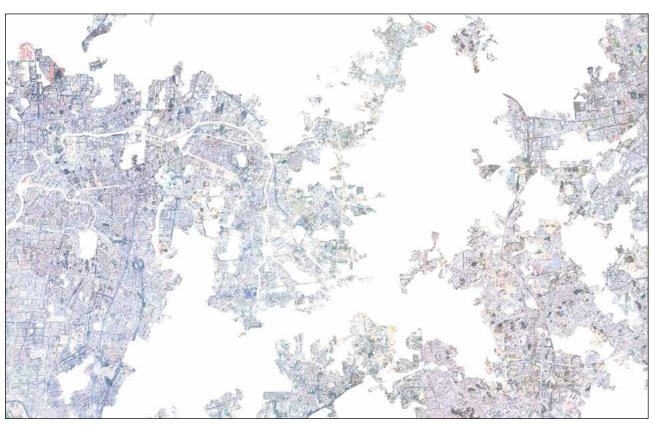


Fig 93-94 (page 132) (93) private owned industry(light blue) and village owned industry (dark blue) (94) hybrid urban villages(pink), market urban villages(yellow), manufacturing urban villages(purple)

Fig 95 Urban fabric in Guangming

# Guangming - infrastructure

Guangming's development is very infrastructure oriented. At first, Guangming New Town's development is highly boosted by the high speed railway station being chosen to set up in Guangming. This high speed railway is the fast connection among Guangzhou, Shenzhen and Hongkong. With this opportunity happened in Guangming, local authorities have decided to put focus on the 'gateway area' which is near the railway station.

However, if we take a closer look at the infrastructure planning in Guangming, it still remains very much generic Chinese new town planning road network, which didn't take into account existing conditions. The lack of basic infrastructure like sewage treatment plan is still holding Guangming from transforming towards a desired green scenario.

This situation also offers an opportunity for Guangming's future development because the environmental problems have become the priority of local authorities, and it has the potential to incorporate green and blue infrastructure into infrastructural design.

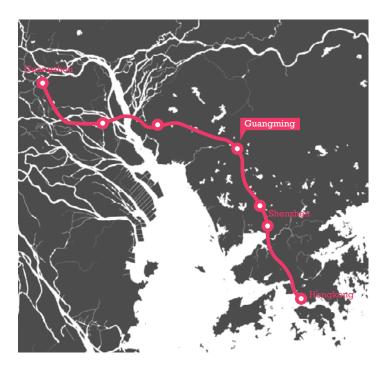


Fig 96
Road systems, metro system(blue and pink), and high speed railway(grey)

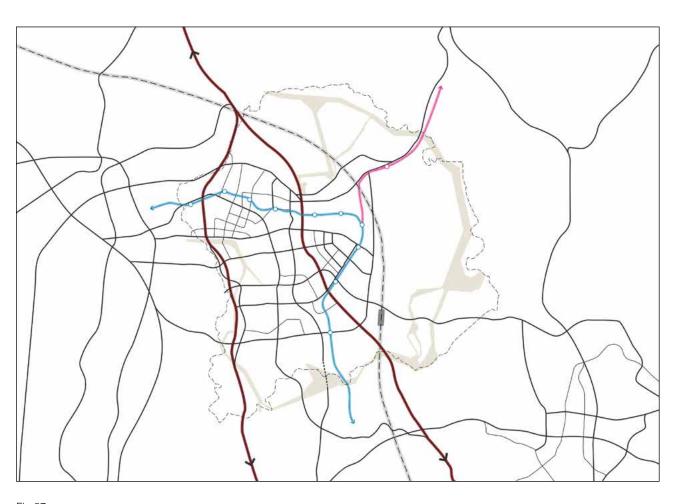


Fig 97 Road systems, metro system(blue and pink), and high speed railway(grey)

# 4.2 Investigation Through Four Major Ecosystem Services

Ecosystem services are neither isolated from the landscape structure, nor exist on their own.

As argued before, one of the key challenges of ecosystem management is determining how to manage multiple ecosystem services across landscapes (Raudsepp-Hearne, Peterson and Bennett, 2010). In this part, a method of utilizing ecosystem services is proposed to fill in the gap between Guangming Eco-city's ambitious vision and actual strategy towards creating environmental friendly urban landscape.

In order to better understand the local context, four major services including provision, regulation, support and culture are individually analysed. By looking into these four separately, a diagnosis of the loss of ecosystem services through the urbanization has been carried out. However, it is not enough to just understand the services by their own. Interactions among ecosystem services occur when multiple services respond to the same driver of change or when interactions among the services themselves cause changes in one service to alter the pro-

vision of another (Bennett, Peterson and Gordon, 2009). Therefore, a synthesis analysis of multiple ecosystem services is analysed to provide future opportunities and goals of restoration. By connecting different ecosystem services in the landscape re-organization within Guangming, three major new spatial structures were proposed to facilitate of the goal of restoration.

From three goals of the vision, multiple principles of development or strategies are proposed to further illustrate the concept of the vision.

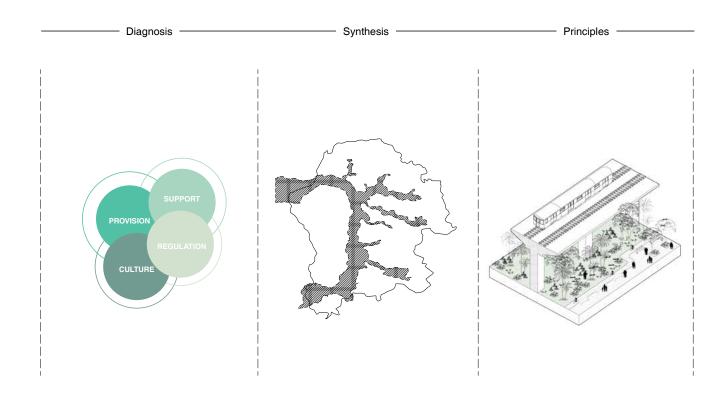


Fig 98 Process of investigation using ecosystem services as tool

### 4.3 Provision

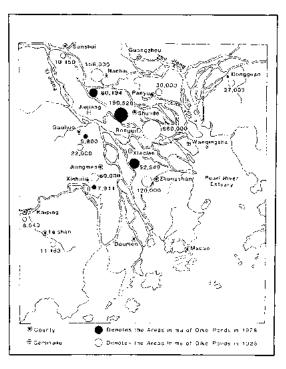
Guangming used to be the state-owned farm, and it has a long tradition of farming. It represents the typical farming typology in Pearl River Delta: the mulberry dike-fish pond system. It is a system developed by local farmers from this region to make full use of available land and water resources. It is an interrelated ecosystem that brings into full play the productive potential of humans and their environment and promotes the development of different branches of agriculture. It has long history of feeding local residents and providing silk for trade. Due to urbanization and industrialization, this circular system has been proved to be less economic efficient compared to manufacturing factories or just purely increasing land value. Hence large amount of farmland has been transformed into factories or housing development such as urban villages. The provision functions have been lost, but what if we could re-introduce this productive landscape back to the Guangming eco-city?

Fig 99 Mulberry Dike-fish pond system in history and typology Gongfu Z. 1982

Fig 100 Mulberry Dike-fish pond system from Google Earth

Fig 101 Ecotopian Vision: Productive Landscape

The Mulherry Dike Fish Pond Complex







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# Lost fish-dike ponds since 1990s

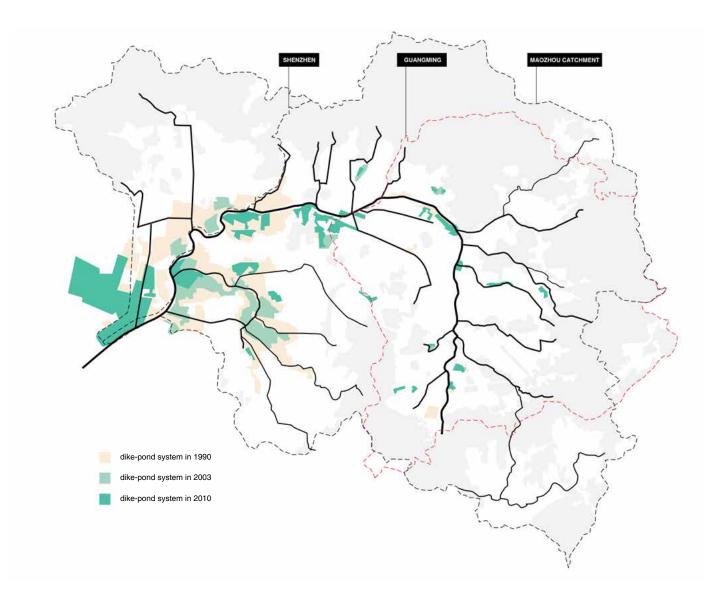


Fig 102 Lost dike-fish pond systems from 1990 to 2010

# mechanism of mulberry-dike fish-pond sysstem

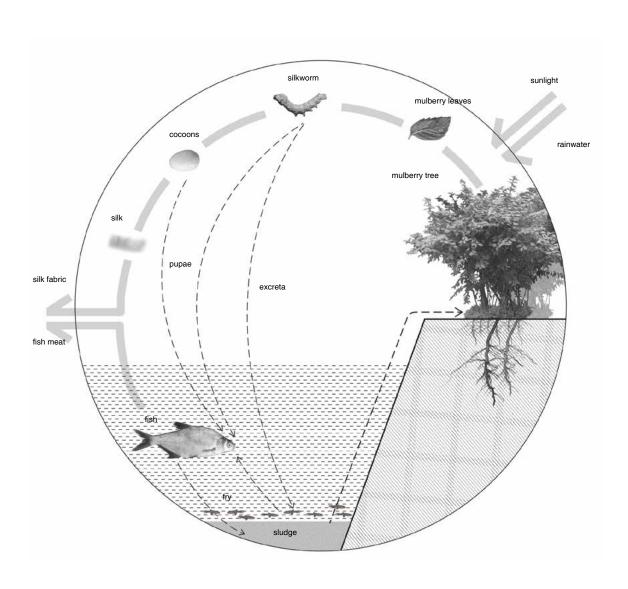
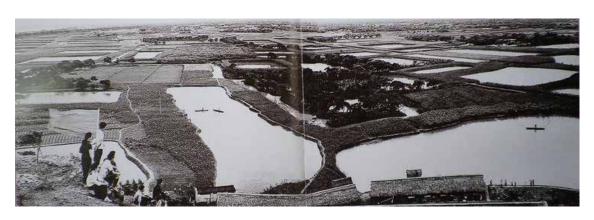


Fig 103 Circular material mechanism in dikefish pond system

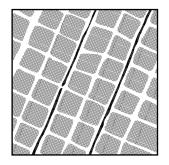




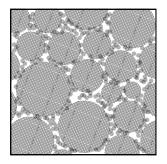
Besides its own circularity among different part of the agriculture branches, fish-dike pond systems can also function as floodplain. Traditionally, they locate near the river due to the need of water supply. Hence, when extreme rainfall happens, river will over flood to the farms, preventing the flooding destroys the villages. Besides, river water brings new sediment to the system, also increasing the fertility of the soil.

In conclusion, this traditional farming system inherits the wisdom of the farmers creation from their experience. It constitutes the cultural landscape of Pearl River Delta, and provided necessities like food and fiber for the residents.

Fig 104 Dike- fish pond farming in pearl river delta Fig 105 Dike-fish pond system's ecological value, as flood plain



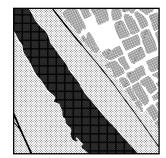
Dike-pond system + Urban public functions



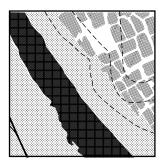


Dike-pond system + Housing





Dike-pond system + Floodplein

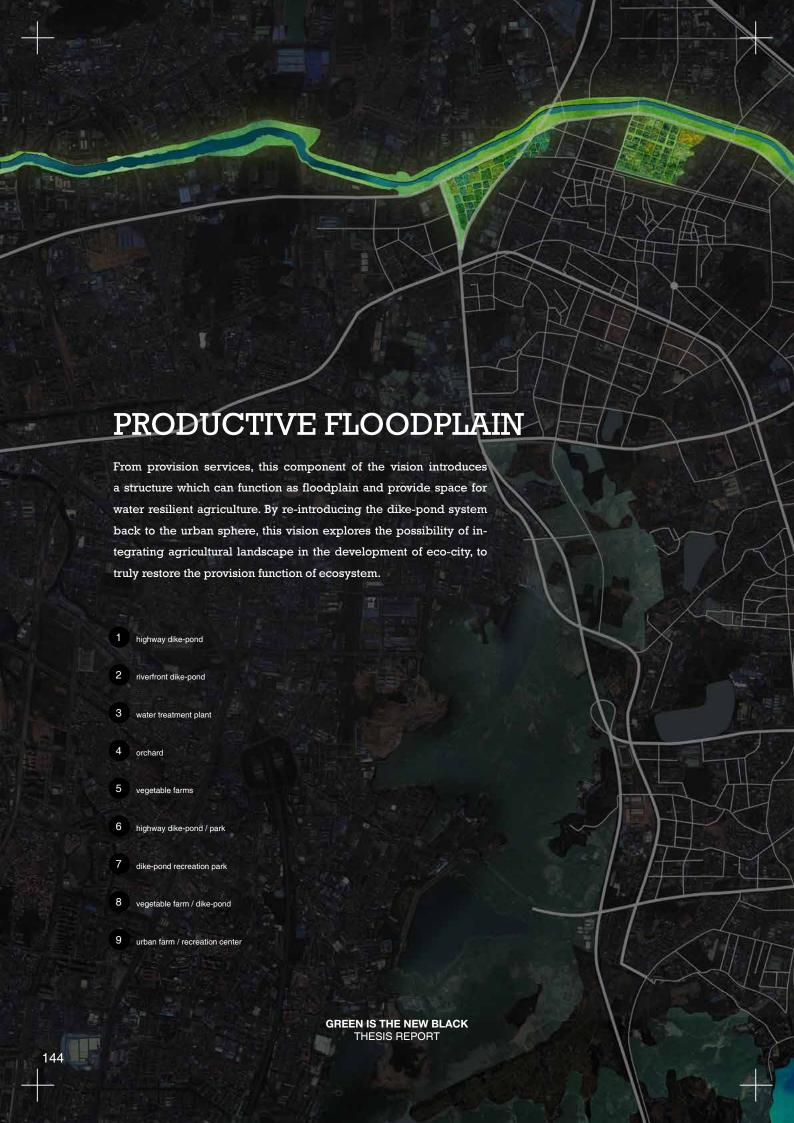


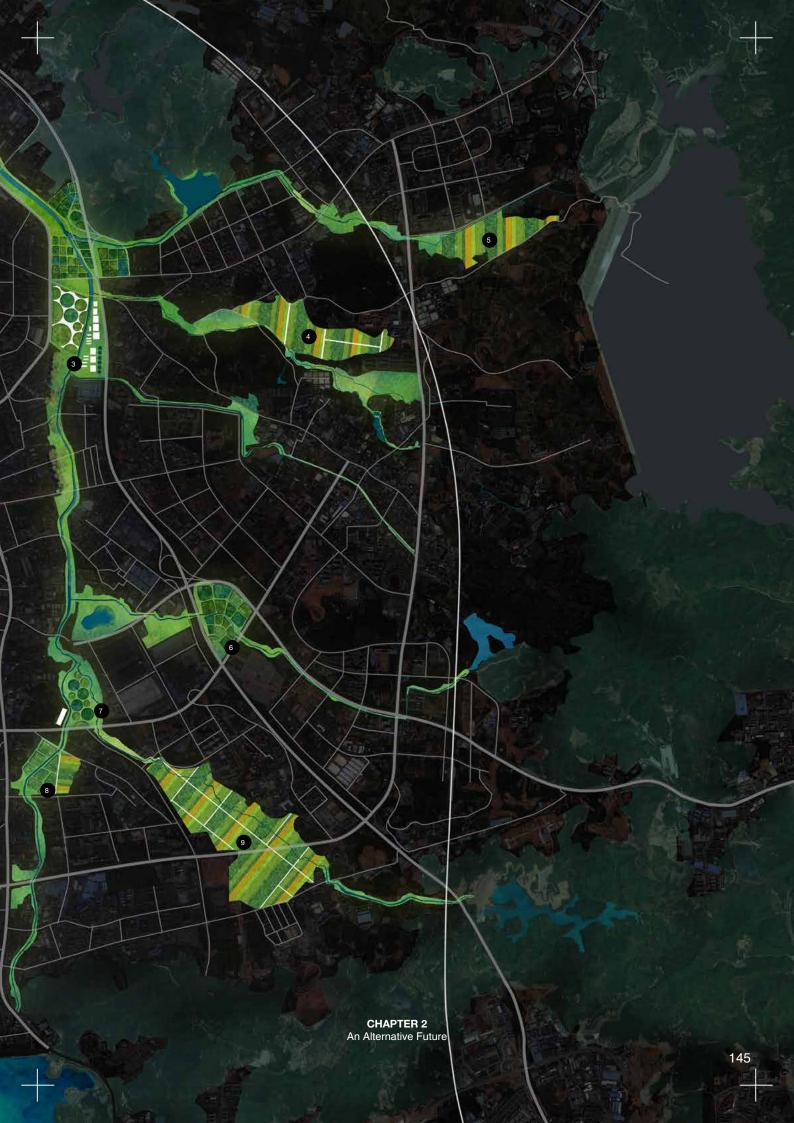
If we envision bringing this special productive landscape back to the urban sphere, what will it function? What new forms and position it might acquire? It might be too difficult to answer this question with little research on this topic. However, here this thesis provides some possible ideas. Fish-dike pond system can acquire a new form incorporating public functions like park, agricultural research center etc. It can also be combined with

housing projects, to achieve the true sense of 'Urban Village', providing urban-agricultural hybrid landscape. Last but not the least, the flooding prevention function for the urban environment.

Fig 106
Dike - fish pond system typologies (1)regular (2)
mixed with housing (3)near riverfront. And future
possible typologies of Dike-fish pond system in
the urban area

Fig 107 (page 144-145) Vision: Productive Floodplain





#### 4.4 Regulation

Guangming is threatened by the increasing rapid climate change, and sea level rise due to its location. As argued before, the main driver and pressure for Guangming to act on flooding risk control is due to its geographic location, and it is also one of the key elements for it to achieve a truly 'eco-city'.

In this part two major categories are examined. First of all, the ecological value of patches in Guangming. Guangming follows the rule of 'ecological control zone' of Shenzhen municipality, conserving more than 80 km2 area in its planning. However, in reality, a lot of illegal construction, utilization of barren land and informal settlements have invaded the ecological control zone. It will be crucial but also challenging to restore them. Meanwhile within the urban area, there is 754 ha of unbuilt land, which has potential to offer a better ecological network providing regulating services and increasing the quality urban environment. Secondly, flood susceptibility within Guangming based on the sea level rise data and the density/compactness of the area.

With the challenges (flood risk) and opportunities (underused open space), this thesis questions: what if we could reclaim urban open spaces to regulate stormwater and provide a multifunctional urban nature? Bearing this idea, a stormwater management scheme is proposed to connect public open space and provide performative urban nature.

Fig 108
Ecotopian Vision: Performative Urban Nature



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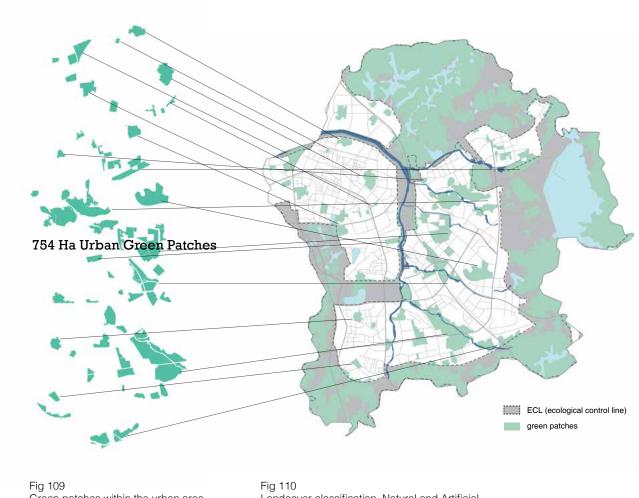
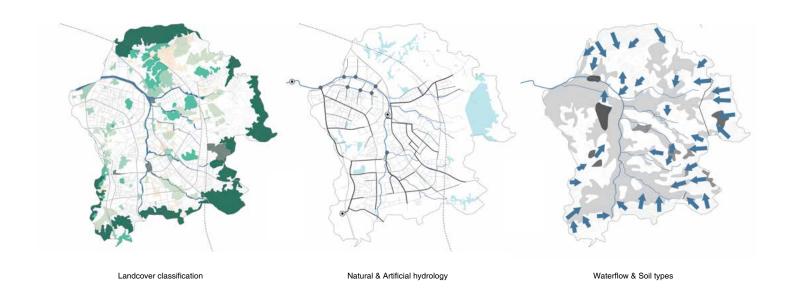
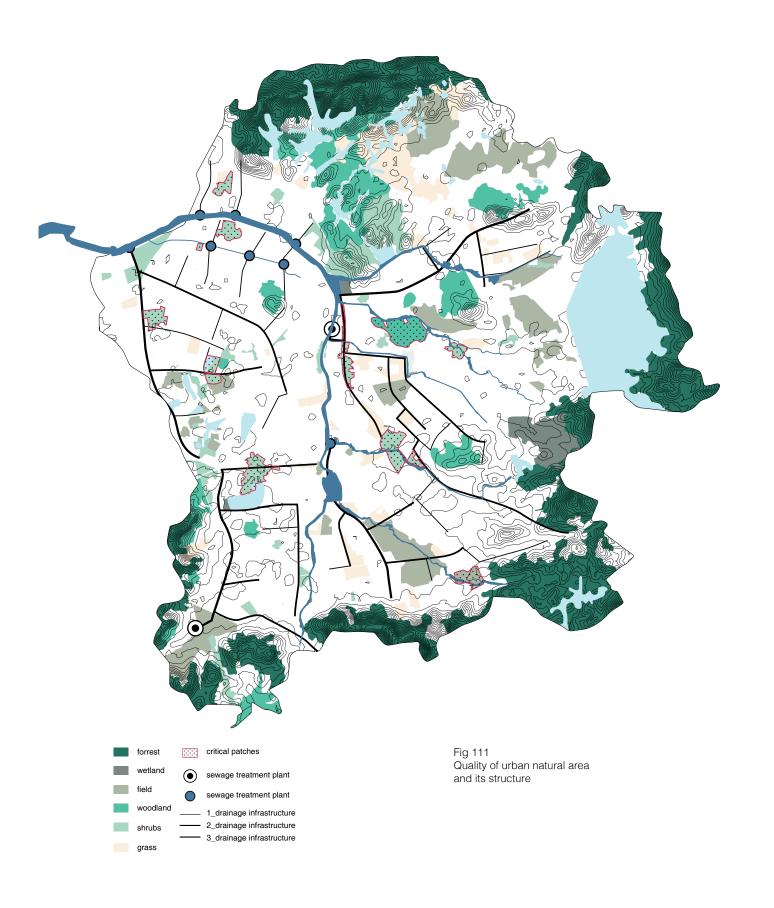
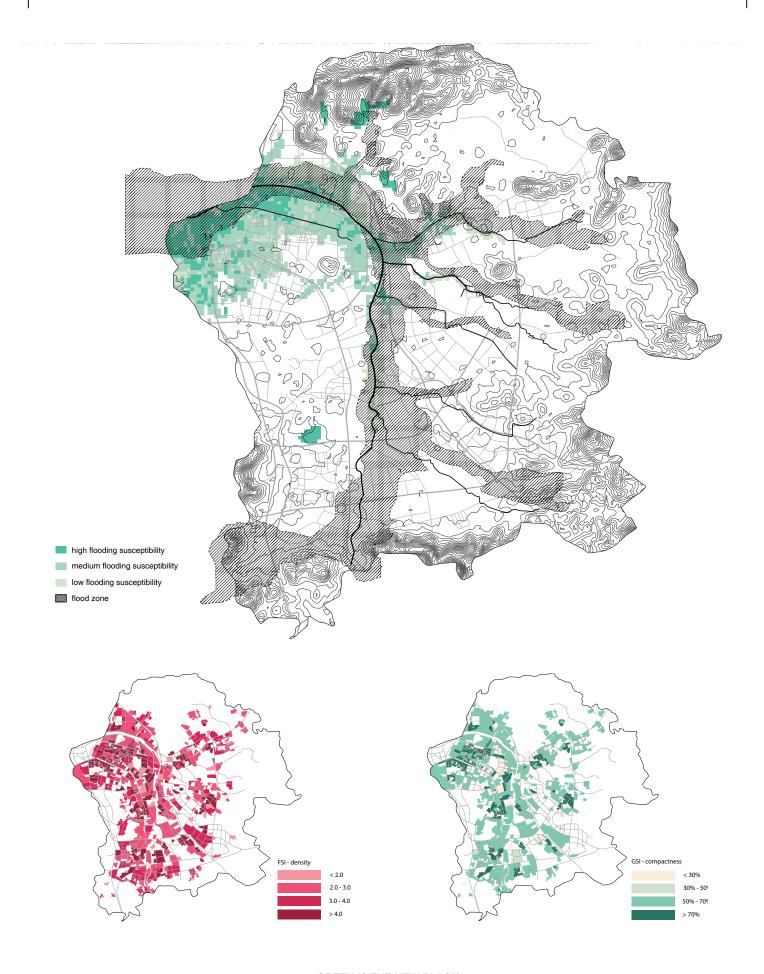


Fig 109 Green patches within the urban area outside of ecological control line

Fig 110 Landcover classification, Natural and Artificial hydrology, Waterflow and Soil type







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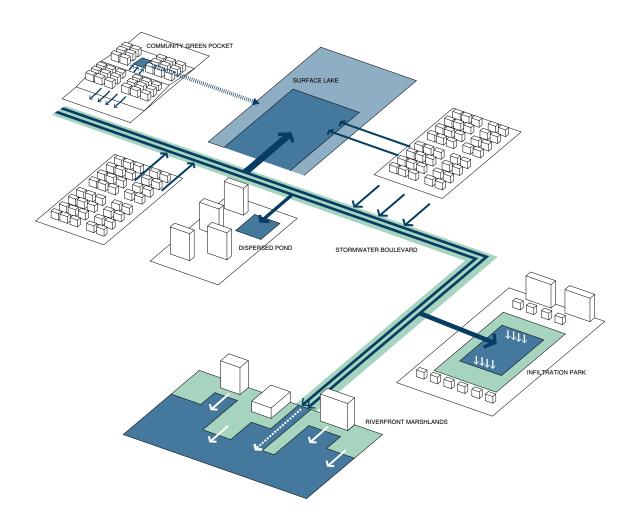
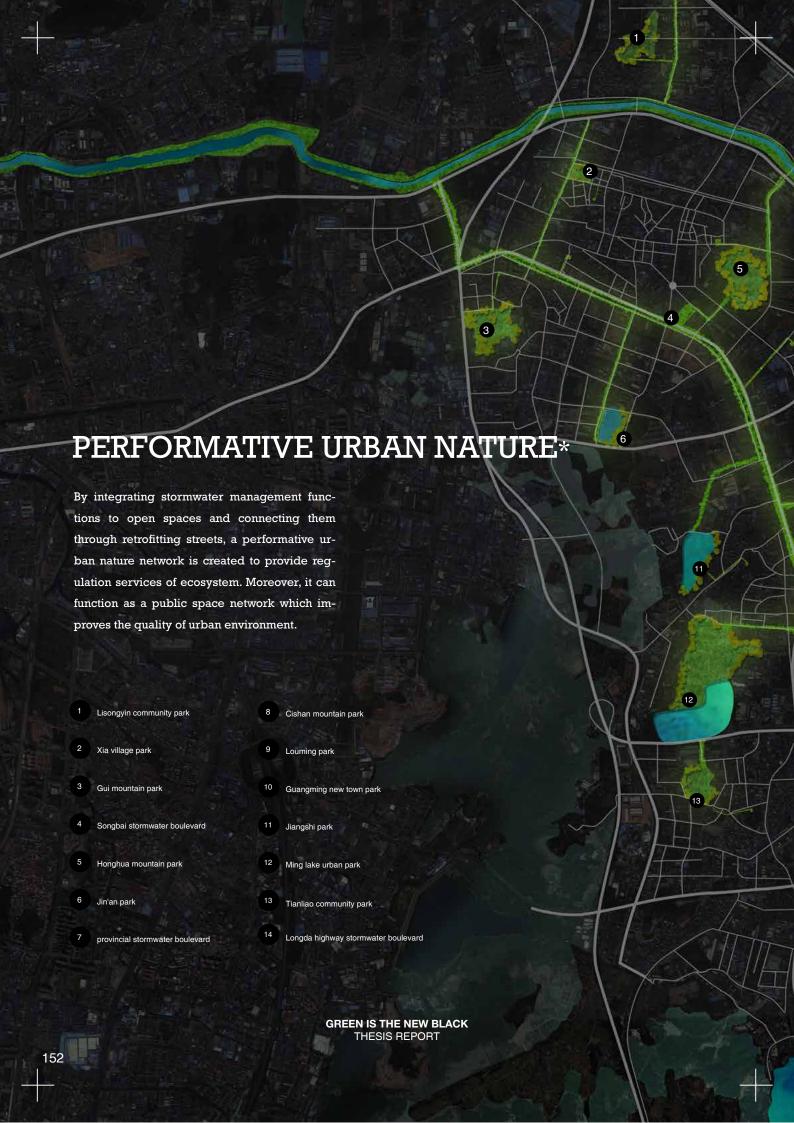


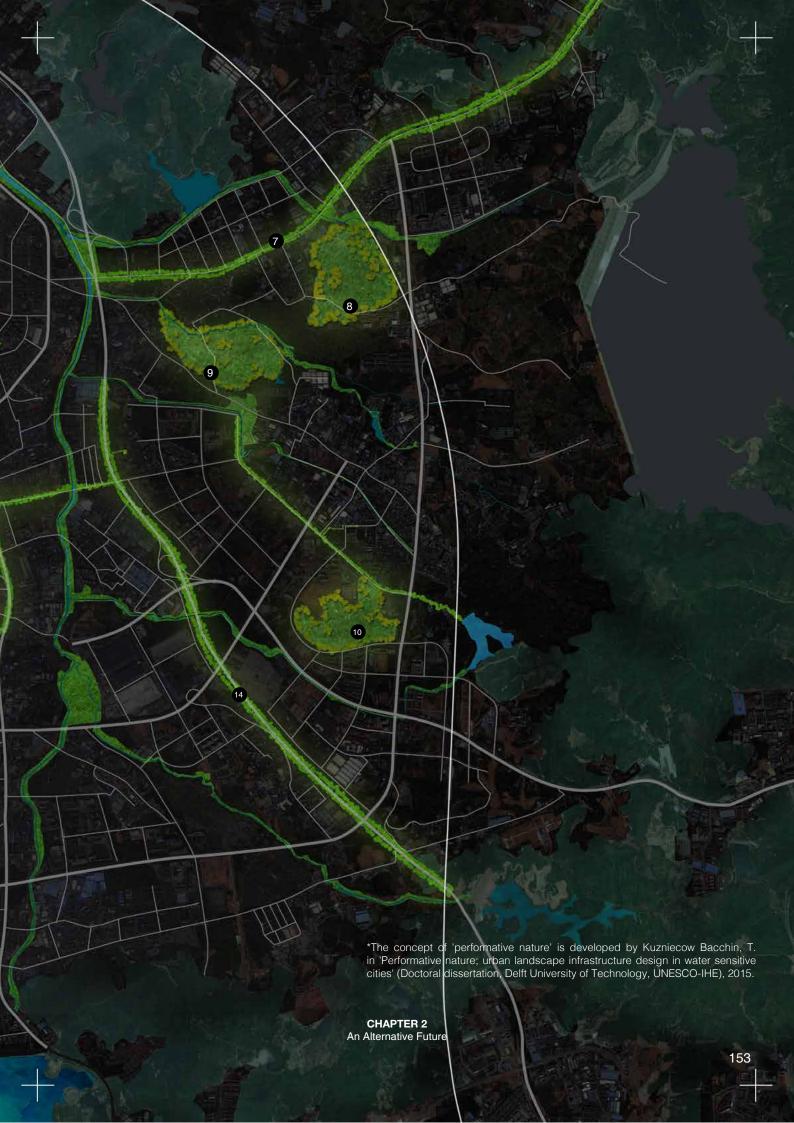
Fig 112-114 (page 150) (112)Flood susceptibility and flood zone (113)FSI index in Guangming (114)GSI index in Guangming

Fig 115 Proposed mechanism for storm water management network

Fig 116 (page 152-153) Vision: Performative Urban Network

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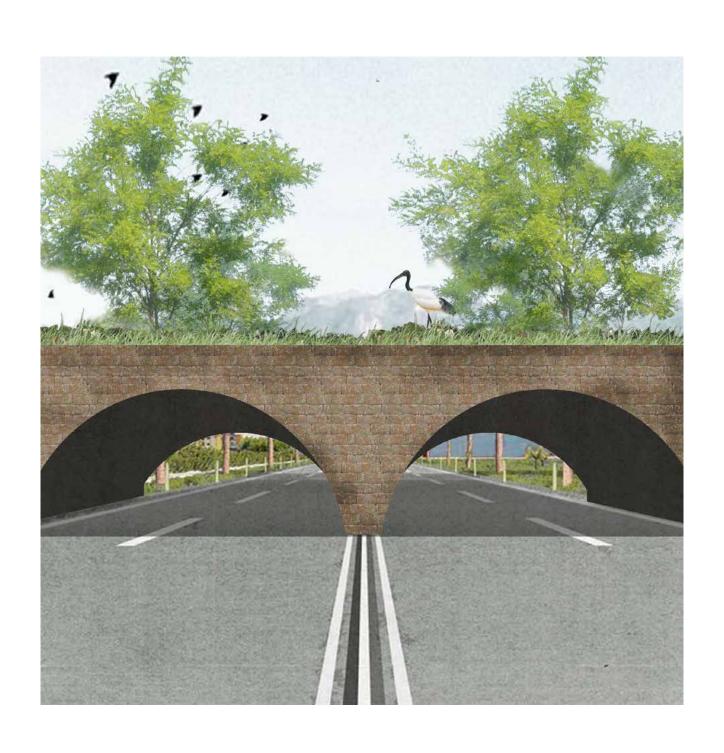


#### 4.5 Support

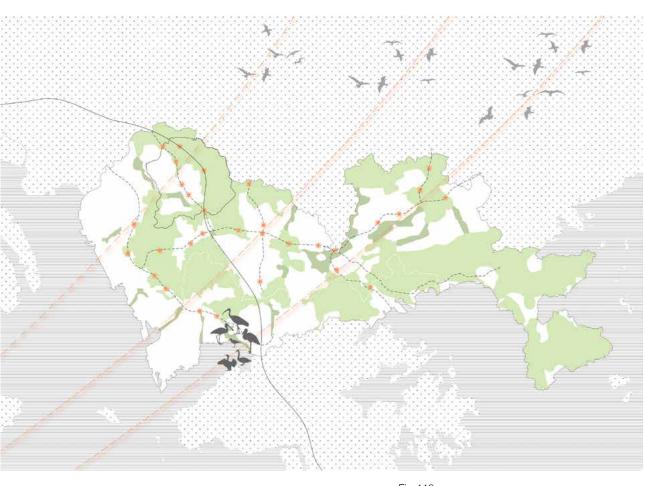
Globally, urbanization, agricultural intensification and deforestation are the main forces that cause biodiversity loss and ecosystem degeneration. Urbanization is often irreversible across the world; therefore, it is important to maintain urbanization at a rational scale and speed to mitigate the negative effect on the ecosystem. Biodiversity is an important support services of ecosystem, it also indicates the quality of the local ecosystem. Being an eco-city, it is crucial to maintain the quality of ecology within and surrounding the urban area by ecological restoration, which can be understood as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. The goal of this process is to emulate the structure, functioning, diversity and dynamics of the specified ecosystem (Lewis, 2005). In this part, this research focuses on the bird specie as the main ecosystem factor since Shenzhen locates on the migrant routes of migratory birds. Besides it provides important habitat for migratory birds due to the mangrove and wetland ecosystem. From Shenzhen scale, this

project investigates the important ecological patches, and its disturbance from the large infrastructure like highway and railway. Based on the findings from Yu, Deyong, et al. (2012), the crucial obstructive points are mapped in Fig 118. From this scale, it zooms in to investigates the conditions of these infrastructure and opportunities fro restoration, and exploration of added value like tourism for the ecological preserved area.

Fig 117 Ecotopian Vision: Habitat Restoration

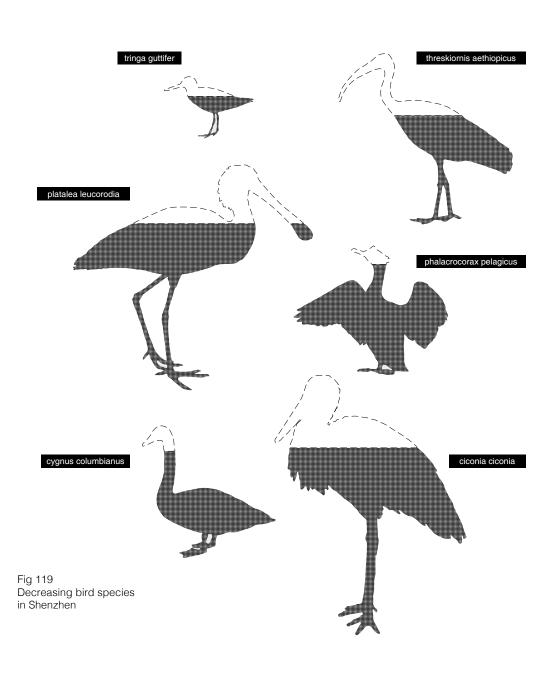


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core green patch
connecting green patch
dostructive point
migration routes
obstructive infrastructure

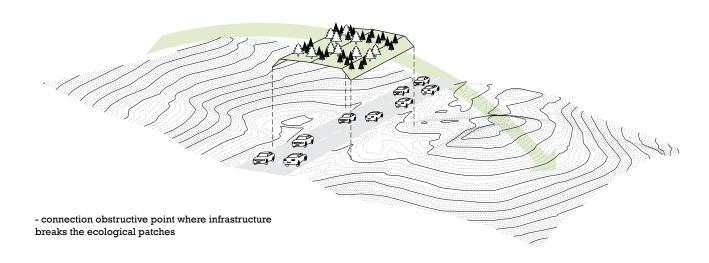
Fig 118
Ecological network and the obstructive infrastructure in Shenzhen; Bird habitat in the mangroove wetland located in the south part of Shenzhen

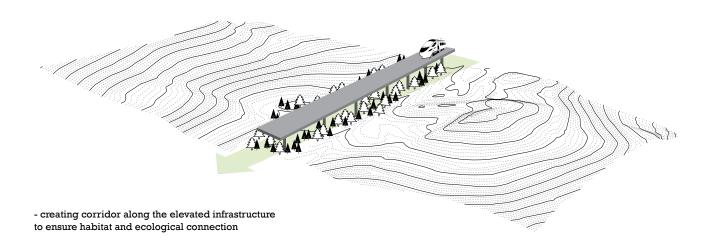


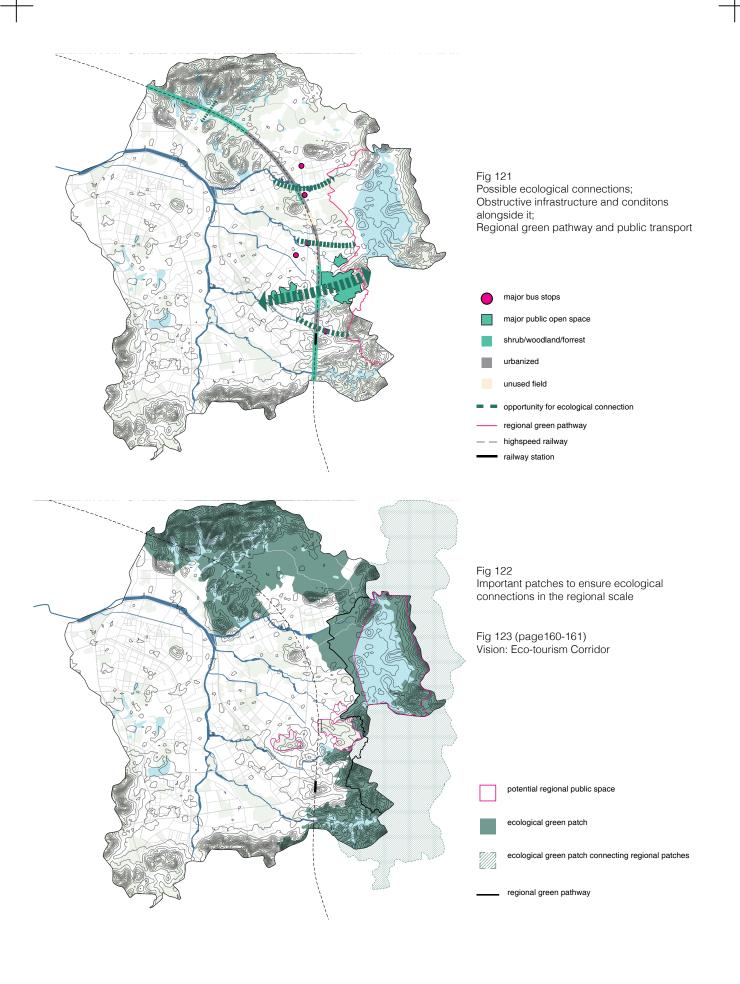
Two measurements can provide the ecological connectivity from the disturbance of large scale infrastructure. One is to connect two adjacent patches with suitable vegetation. The other is to provide

protected area alongside the infrastructure to provide linear ecological corridor.

Fig 120 Possible solutions to restore ecological connectivity







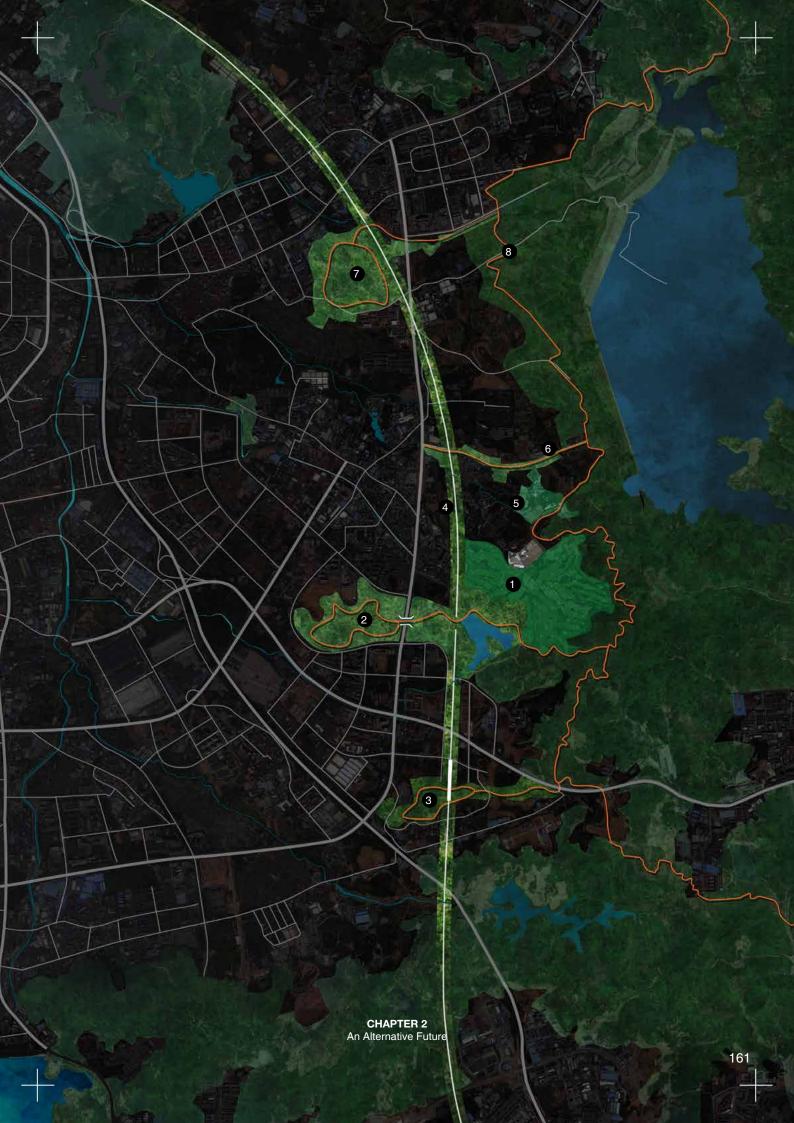
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## ECO-TOURISM CORRIDOR

By restoring the ecological patches which are disturbed by the large infrastructure projects, the ecological corridor again provides support for local species habitat. Besides, it strengthens the soil formation and prevents erosion. After the landslide accident from December 2015, the lesson needs to be learned to protect the ecological controlled area, and the ecological connectivity needs to be restored to support biodiversity.

- 1 Guangming golf club
- 2 Guangming new town park
- 3 railway station complex
- 4 railway eco-corridor
- 5 Guangming agricultural park
- 6 milk production base
- 7 Cishan mountain park
- 8 regional green pathway

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#### 4.6 Culture

Shenzhen is the largest factory providing products for people's daily life globally. Lots of people consider Shenzhen as an instant city, a city without history and culture. However, that is a common misunderstanding of Shenzhen. Before economic reforms and the urban development of Shenzhen, there was already more than 300,000 residents living in the villages scattered around within the boundary of Shenzhen now. The cultural identity of Shenzhen includes its farming system which inherits hundreds of years' local farmers' wisdom. With the industrialization, the landscape of rural and industrial became hybrid. More recently, with the huge wave of urbanization, the landscape of rural, industrial and urbanized staggered together provides the cultural identity of Shenzhen, and Guangming.

Hence, this project investigates this mixed identities in Shenzhen, exploring the heritage and cultural product: urban village as one cultural component of Guangming's eco-city vision.



Fig 124 Mixed landscape patterns with industies, urbanization and agriculture

Fig 125 (page 163) Ecotopian Vision: Inclusive Landscape



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Urban village as an urban phenomenon inherits the historical evolution of the urbanization process in Shenzhen, and also reflects the cultural identity in its complex landscape. Until now there is a huge amount of urban villages

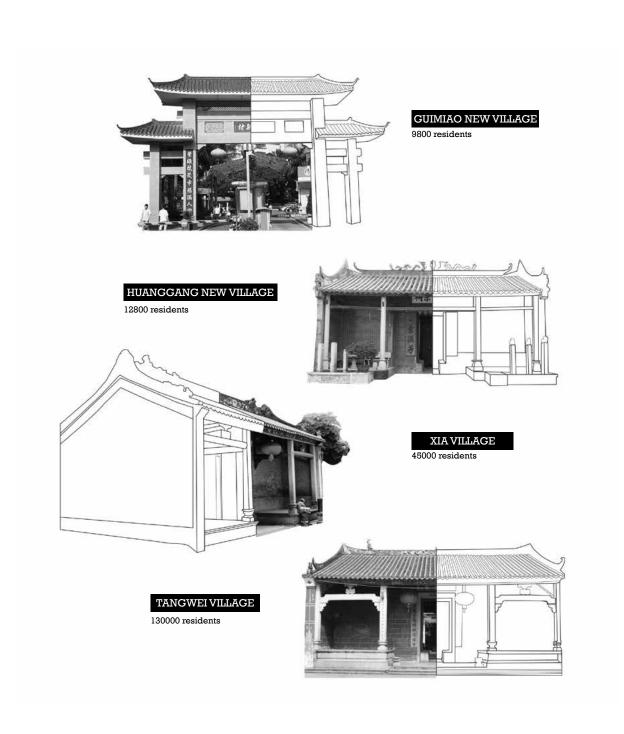
in Shenzhen providing housing for thousands of migrant workers. All villages also include their own culture (like the temples) and creates a complex but symbolic urban landscape for Shenzhen.



urbanized area urban village

Fig 126 Urbanization and Urban villages in Shenzhen

Fig 127 (page 165) Temples buit by local residents in urban villages of Shenzhen



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#### 4.7 Constructing A New Vision for Guangming Eco-city

Having looked into four ecosystem services of Guangming, new opportunities and challenges have been identified. Ecosystem services provides a set of principles and categories for understanding ecological conditions of an area and can truly provide goals that will guide eco-city development towards a more environmental friendly direction. Hence by combining these elements and goals, an alternative vision based on four ecosystem services for Guangming Ecocity has been proposed.

Based on the vision, a bundle for ecosystem services which are important for Guangming Eco-city is created (Fig. 128). The concept of 'ecosystem bundle' is developed by Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M. in 'Ecosystem service bundles for analysing trade-offs in diverse landscapes'. It investigated the method of managing ecosystem services across landscapes, by utilizing the synthesis of various ecosystem services.

In this part, similar method is adopt-

ed to deliver guidance from the vision for strategy and spatial interventions to achieve the ecological goals of the vision. The specific ecosystem services can be quantified with the chart in the appendix. Due to the lack of data, in this research only qualitative analysis and design interventions are provided. In the future research a more quantitative based design and specific goals can be made based on available data, and giving a more specific design goal.

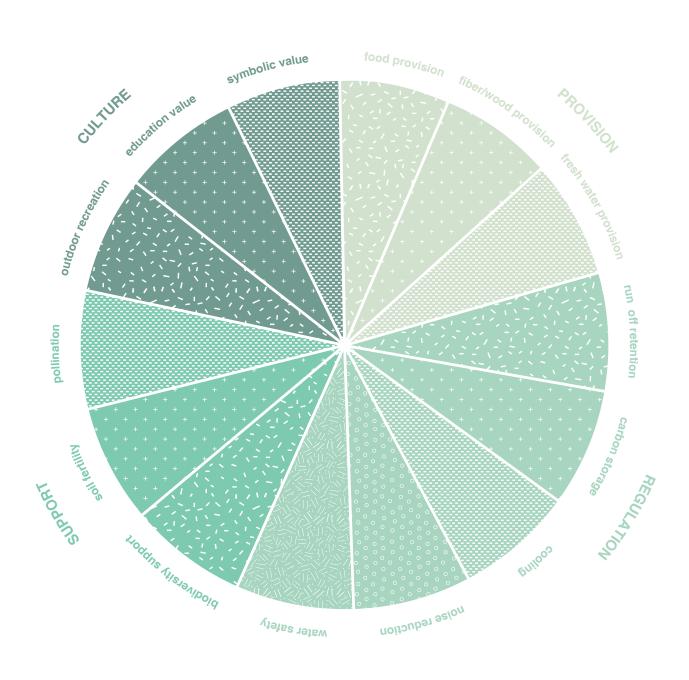


Fig 128 New vision for Guangming Eco-city

From the investigation of four components of ecosystem services, the relevant aspects are identified. After studying the spatial implication and synergy between these ecosystem services, three major goals of the vision are made: productive floodplain, performative urban nature and eco-tourism corridor. Based on the synthesis of these components, the priorities of different services being restored are showcased in this 'ecosystem bundle'. All relevant ecosystem services, in term of specific context of Guangming, are listed in this diagram.

Therefore, for different parts of the goals, the priorities of different services will be different. They combine together illustrating the synergy and trade-off of ecosystem services restoration in different parts of development or in different scenarios (which will be explained in next chapter).

Fig 129 Ecosystem bundle created to assist the strategy and policy making in the process of delivering the vision



### CHAPTER III

# Projective Guangming

Strategic Framework to Deliver the Vision under Different Scenarios

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Seeking the eco-city is a process designed to deliver integrated social, economic and environmentally sustainable development, to explore the harmonious relationships among human beings and their natural environment, among people themselves. Although it may not be possible with our present knowledge to build the perfect eco-city, we must begin to follow the path that will lead to this perfection.



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Fig.131 Vision rendering of Guangming New Town by Urban Planning and Design Institute of Shenzhen



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#### 5 STRATEGY AND AN UNCERTAIN FUTURE

A desirable future has been provided in the previous chapter to describe an alternative development goal focusing on restoring ecosystem services and delivering an eco-city vision that rebuild the relationship between urban development and nature. In this chapter, a workable plan is proposed to facilitate the concepts and ideas raised before.

In this chapter, the importance of a coherent strategy including scenarios building, process design and small interventions will be emphasized. In order to make the strategy feasible, the specific institutional context will be taken into consideration. It will be too ambitious to change the approach of Chinese planning system. Therefore, the strategy and interventions proposed in this chapter will be 'add-on' for eco-city development in Guangming, Shenzhen.

The strategy focuses on the uncertainty of future, and utilizing small projects and interventions to steer the change of mentality of planning and design in China. In this way, the utopian vision will be the guiding principles instead of being implemented as blueprint plan, which has been argued before that it contains the high chance of failure like Dongtan eco-city project in 2005.

To briefly summarize, three major tools here are used targeting at complementing the exist-

ing planning system in China: scenarios building, process design and small spatial interventions. With the guidance of three major goals being proposed before in the vision, specific strategies will be proposed in order to illustration the concept of delivering the vision in this chapter. However, there will be much more ways of constructing strategies which can lead to the same outcome or even better ones. Here this project only proposed one possible method and the predicted outcome. In this way, this project intends to re-think the shortage of current planning system and initiates changes.

In last chapter, an investigation from four ecosystem services perspective has been conducted. By connecting landscape patterns with different ecosystem functions, the synthesis between different services are identified and finally lead to spatial vision with three major goals. However, the vision itself is not enough to guide the development, hence a comprehensive spatial strategy will be provided to illustrate the pathway towards the vision. Before that, the vision has come to a conclusion that certain aspects, or goals need to be achieved in order to realize the restoration of ecosystem services and providing environmentally friendly development. Therefore, in this part, the principles derived from the three major goals of the vision are provided, to summarized the guiding value of the vision and providing framework for the development of strategy. These strategic principles can be categorized based on spatial aspects, restoration goals and scale of implementation. These principles will also be linked to the projects development, which will be introduced in the next part.

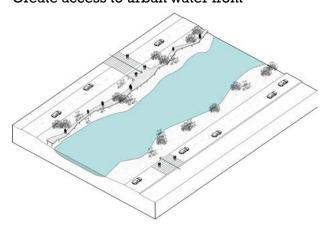
Fig 132-136 (Page176-177) Principles of 'Productive Floodplain'

Fig 137-141 (Page178-179) Principles of 'Performative Urban Network'

Fig 142-146 (Page180-181) Principles of 'Eco-tourism Corridor'

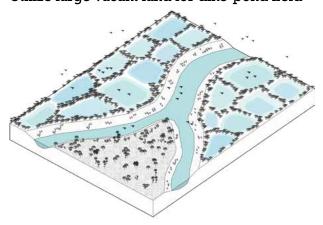
#### Productive floodplein

#### Create access to urban water front



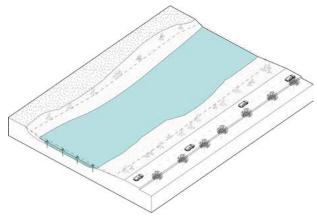
In more urbanized part of Maozhou river, access to riverfront should be provided in order to re-integrate the river back with the urbanized area. River was one of the major components of daily lives of residents from Guangming, and it is crucial to activate the riverfront space by increasing its accessibility.

Utilize large vacant land for dike-pond field



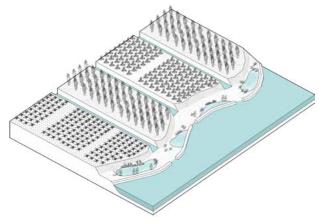
In large vacant land next to the main river and located in low land, the vacancy could be the experiment land for re-introduce the dike-pond system back to Guangming eco-city. By inserting this type of farms, it could also function as the floodplain in crucial point of the river.

#### Enlarge waterbed



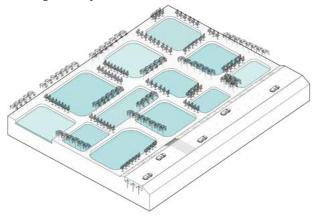
In critical part of Maozhou river, with availability of more space, the water-bed could be enlarged to allow more water. In this way, the threat of the water flooding the urbanized area will be decrease.

#### Treatment of aricultural waste water



When agricultural land is directly linked to the river or sub-stream, the waste water will partially flow to the river (Most part will end up in the ground water). By giving space to purify the water from the agricultural land utilizing natural vegetation, the impact of agriculture on water quality of the river will be decreased.

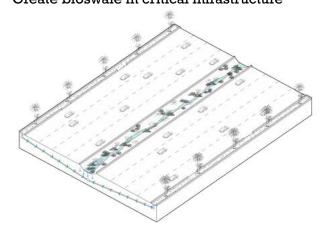
#### Dike-pond system in urban context



In more urbanized area, especially the part between infrastructure and river, the new forms of dike-pond system can be implemented. In the form of leasing individual pond and partially the dikes, this strategy can incorporate the participation of local residents as well.

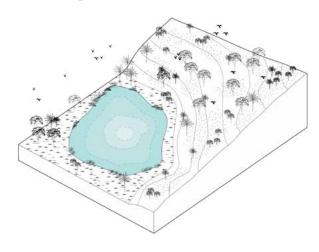
#### Performative urban network

#### Create bioswale in critical infrastructure



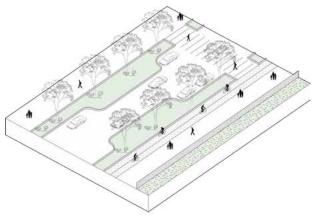
In the process of constructing Guangming eco-city, some large scale infrastructure was provided. In some critical area, large scale infrastructure offers opportunity for retrofitting green infrastructure, such as bioswale. It can redirect and purify the urban runoff. The bioswale connects to rainwater treatment plan, water storage and surface water.

#### Retention pond in critical area



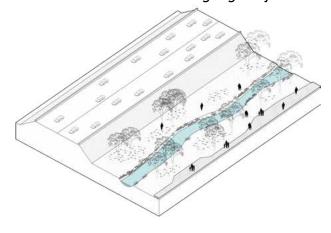
Guangming is surrounded by mountains. In order to secure the safety of the down stream area of Guangming from flooding, water retention function needs to be provided in critical area. There has been already reservoirs built in certain area, with the provision of retention pond, the flood risk of Guangming will be decreased to a rather safe state.

#### New street profile in certain area



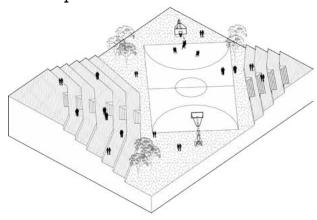
By adding street parking and separating cars and slow mobility, the safety of pedestrians and cyclers will be secured. Meanwhile, more infiltration area will be provided. Measures like tree pit bio-retention can be added to this model of new street profile.

#### Storm water boulevard along highway



Along Longda highway, a critical infrastructure identified, functions like water storage and runoff retention need to be provided to secure the water safety. Meanwhile, this highway is the barrier between two major neighborhoods. By activating the public edge with the better quality of public space, spaces along the highway could provide more value to the urban district.

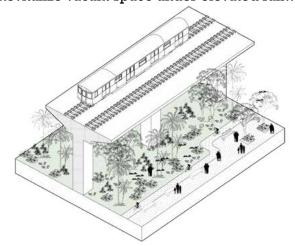
#### Water square in urban context



In urbanized area, water retention function and public space can be combined. In certain area, water square can be the concept for public space building. Such concept can be found in cities like Rotterdam, which has been searching for more adaptive solutions for future urban development. (Reference project: Water square, Benthemplein, Rotterdam by de Urbanisten)

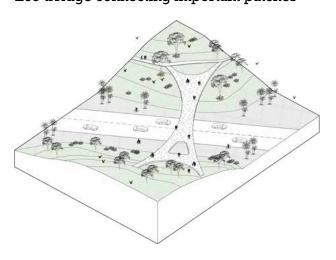
#### Eco-tourism corridor

Revitalize vacant space under elevated railway



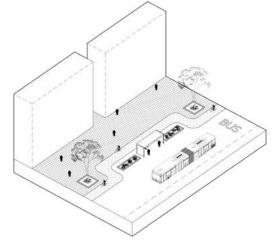
Guangdong-Shenzhen-Hongkong high-speed railway is the most important and dominating infrastructure across Guangming eco-city. The elevated railway infrastructure left a strip of vacant space and separate the urban fabric. By revitalizing the space under the infrastructure, public activities can be re-introduced, and the high accessibility and connectivity the infrastructure offers will contribute attracting visitors.

Eco-bridge connecting important patches



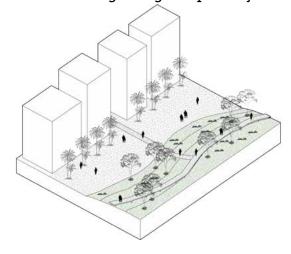
Important patches in Guangming are separated by infrastructure in some cases. Hence, in crucial area the connection between patches in terms of human accessibility and landscape connectivity needs to be restored. The eco-bridge can be a design tool to provide pathway both for human being and animals. It also contributes to the pollination and connecting habitat.

# Slow mobility and public transportation



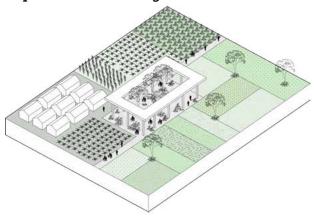
In order to increase the tourism value of Guangming eco-city, and utilize its advantage of maintaining natural environment, public transportation/ slow mobility network needs to be provided. Measures like providing bike lanes connecting major public spaces and separate bus lane to secure the efficiency of public transportation can be adopted.

### Connection to regional green pathway



The regional green pathway, as a regional strategy for nature restoration of Shenzhen, is crossing through the natural area of Guangming in the east. However, the connection from this regional pathway to inner city of Guangming is still no provided. By connection urban network to the regional pathway, it will attract more visitors from the region to Guangming.

Explore the value of agricultural tourism



Guangming has its long tradition as farmland. In other parts, it is also argued that the importance of restoring the agriculture provision function both in terms of food provision and ecological functions. Here, the tourism value of agriculture should also be explored. By preserving the existing farmland within the urban area instead of phasing it out, more functions such as agricultural research, community gardens, tourist's gardens can be implemented.

#### 5.2 Scenarios

Scenarios have been known as a powerful tool in integrated assessment and policy analysis for climate change. Socio-economic and climate scenarios are often combined to assess climate change impacts and vulnerabilities across different sectors (Berkhout, Frans, et al. 2014). In this chapter, a strategic framework is provided for the pilot area of Guangming to develop under the guidance of the vision. Due to the deep uncertainty of the future, three scenarios were considered to assist constructing the adaptability of the strategy. In this way, the combinations of scenarios and strategy can also play a role in enabling the interaction between stakeholders, making explicit of the challenge and goals. In this way, the strategy can adapt to different uncertainties that future provides, and also provide a more flexible framework for the constant changing Chinese institutional structure and government's priorities.

Developing scenarios that generate information useful to different social actors requires a clear understanding of their frames and decision-making contexts. Frames are mental knowledge structures that capture the typical features of a sit-

uation or event sequence, defining a set of relevant concepts and problems, and thereby shaping knowledge and experience (Barsalou 1992; Bednarek 2005). For Guangming New Town, or Shenzhen as a larger context, there has not yet research on defining clear future scenarios for urban development. Besides, it is also not the major task for this project to develop scenarios for Guangming. Therefore, the Dutch Delta Scenario scheme is adopted in this project to illustrate the ideas of introducing scenarios in strategy developing.

In this research scenarios do not present the most realistic future state. They are not prognoses, predictions, or forecast. Scenarios here focus on 'what will happen if' instead of 'what will happen'.

#### [scenario a: growth]

In this scenario, socio-economic status keeps growing. Global network is expanding, and industires in Guangming are majorly involved in the global economy. With more investment in urban development, the density and intensity of land use is also increasing. Climate change is increasingly threatening Pearl

River Delta. Hence in this scenario the urgently needed strategy is to mitigate the adverse impact of intensive urbanization with limited amount of land for retrofitting.

### [scenario b: business as usual]

In this scenario, socio-economic status and climate remains as it is now. The complex situation with urban and rural lands, formal and informal development splice with one and each other. In order to shift the development approach to a more sufficient and sustainable one, the strategy is to utilize pilot projects to raise the awareness and promoting sustainable development ideology and the value of ecosystem services. Public space making will be the key component to steer for the change.

# [scenario c: shrinking]

In this scenario socio-economic status is decreasing. With decreasing FDI, the major economic drive shifts from a global economy to a more local oriented one. More migrants are moving to Guangming and living in the urban villages. Social cohesion will also be an important

element of planning for this scenario. The intensity and density of urbanization is decreasing, leaving more spatial opportunities for experimenting integrating ecosystem services in the urban area. In this scenario, it offers the opportunity of shifting the ideology of 'utopias of abundance' to 'utopias of sufficiency. The strategy is to promoting agricultural and urban hybrid development to promote the value of local food economy, ecological conservation and provision services of ecosystem.

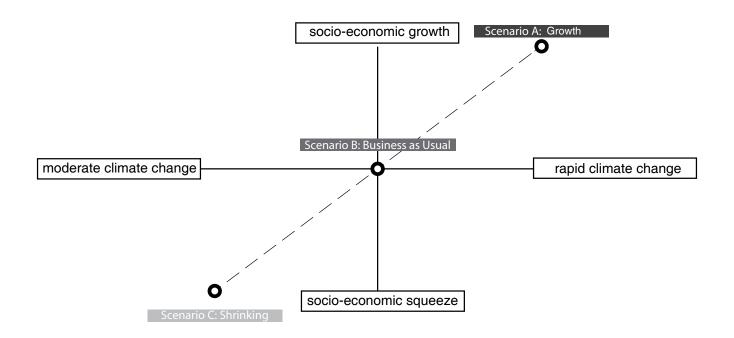


Fig 147 Scenario building

### 5.3 Pilot Area and Process Design

In order to apply specific design strategy and testify whether the method raised above could guide the design and development process in practice, a pilot area is chosen to further explore the spatial implications of the vision and the assisting strategy to lead the design and implementation process. The pilot area is chosen based on two major arguments. First of all, the pilot area is the entrance of Guangming located at the higher elevation compared to other parts. From the vison, this pilot area offers a complex landscape, which has the potential to offer multiple ecosystem services. Therefore, this pilot area is worth investigating in terms of gathering more experiments of delivering the vision components. Secondly, this pilot area is also the development priority of the local government within the next 10 years due to its accessibility thanks to the high-speed railway station, which allows citizens from Guangzhou, Shenzhen and Hongkong can access Guangming easily. Besides, with more investment from various industrial parks in this pilot area, it has the potential to be developed

as an example projects for the rest of the city, or even other eco-city projects. Therefore, this pilot area with 1489 hectares is chosen to explore the strategy and design interventions which can lead the urban development of Guangming eco-city towards the vision.



Fig 148 Pilot area in the vision

# A collaborative design process

In order to answer the questions that how can the desirable vision be implemented, a process of facilitating spatial interventions and strategy has been proposed in this part. China has its own urban planning system and process which focus on land use planning and infrastructure oriented urban development. In this part the coherent process of delivering spatial interventions and design is emphasized in order to cope with the shortage of Chinese current planning system.

This method took reference from 'Rebuild by Design', a new kind of design competition, which is initiated in the U.S after Hurricane Sandy in 2013. It represents a new process for collaboratively researching, developing, and implementing ideas for sustainable development, and it also constitutes a new model for how government can partner with academia, the non-profit and private sectors, the designers and the local communities. The strategy of delivering the vision for Guangming eco-city is about designing the process that enables collaboration between governments, designers, researchers and local residents to ensure that the inputs to the urban development are based on the best knowledge and talent, and that the final spatial interventions would be creative, collaborative and focus on ecosystem services restoration. In this way, a collaborative

and innovative approach is a side step away from the institutional world. A detour around negotiations, the process aimed to build understanding and trust, and ultimately delivers innovations and raise awareness for environmental protection.

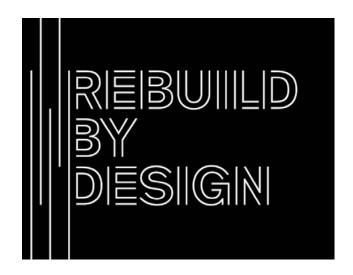


Fig 149 Rebuild by Desgin http://www.rebuildbydesign.org/

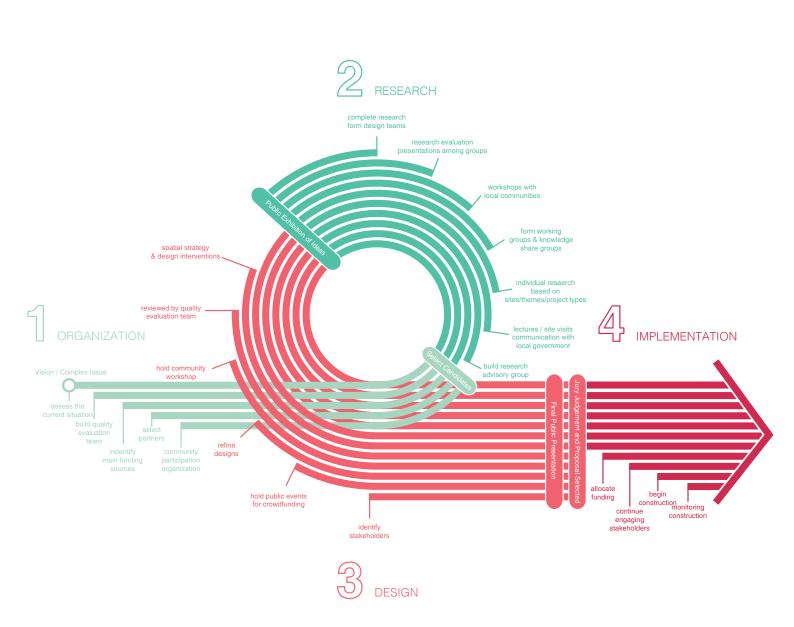
It is never an easy process to achieve the vision. Traditionally (also in modern China), planners and designers always provide the cities one blueprint vision, afterwards it is just implementation of the vision. However, with the increasing complexity and challenges our cities are facing, complex problems cannot be solved through a singular choice of organization or innovative ideas. Issues of how to stage the scene and how to facilitate the innovative process and the involvement of diverse actors have increasingly come to focus.

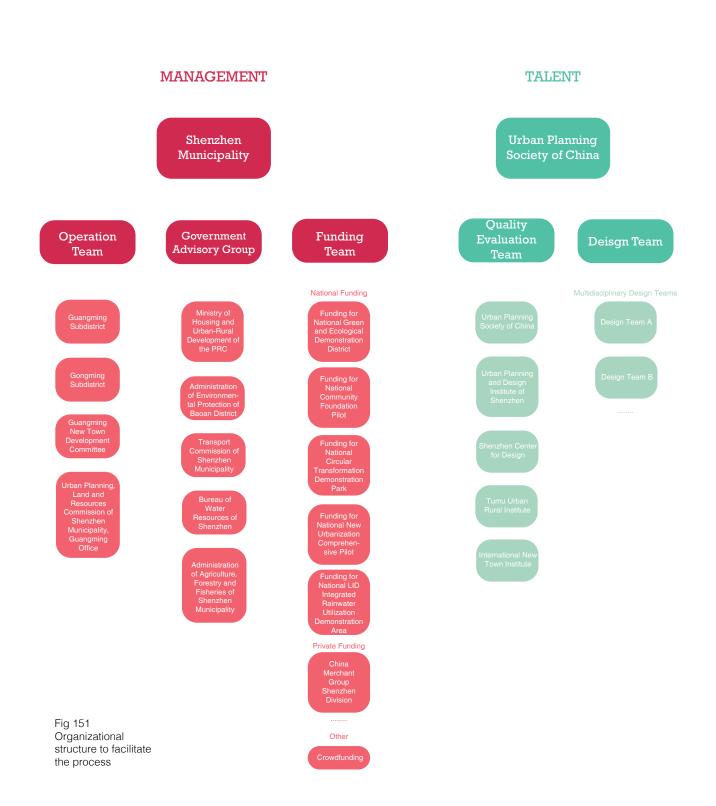
As the major product of this research, a coherent design process, which includes various stakeholders, management organizations, funding sources and community engagement has been provided. A spatial framework consists of a series of projects (spatial interventions) is raised to facilitate the design process to meet the goal of the proposed vision. The coherent strategy is the combination of different stages of process, from organization, research, design and implementation.

In the end, based on three scenarios, three possible proposed spatial interventions are provided to illustrate a possible outcome of this collaborative process.

The spatial interventions outcome of this thesis would be based on hypothetical conditions and available resources. The more thorough design outcome and interventions would require tremendous input from designers, researchers, public opinions and government's effort. Hence, the main contribution of this thesis, in the spatial strategy part, would be this process that can facilitate the future inputs from various actors. It also opens the questions and opportunities for future researches.

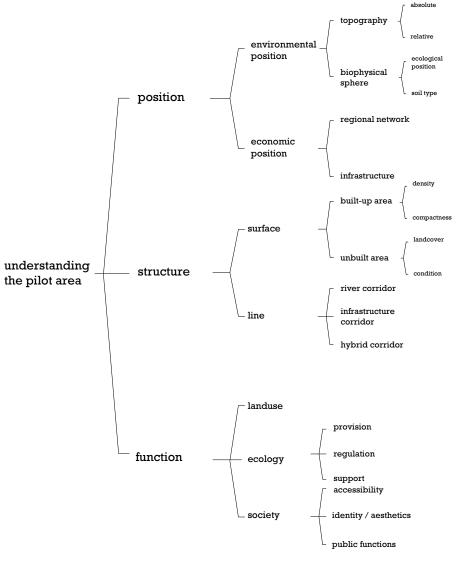
Fig 150 Process design for the strategy





# 5.4 Spatial Narrative

In order to better understand the pilot area, its values and constraints, this part investigate the site through a spatial narrative. Aiming at putting the pilot area in larger context, it investigates the position, typologies and functions of the area in terms of both built up and unbuilt areas. By understanding of this area, the strategies can be translated into spatial interventions.

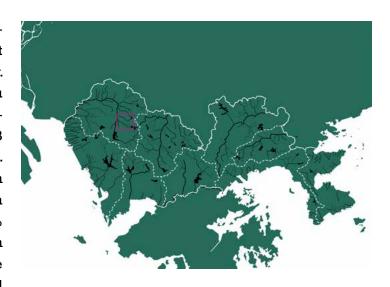


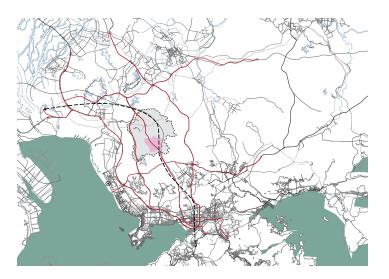
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### Position

Guangming Eco-city locates in the Maozhou Rivere Basin (MZRB), the largest river basin within Shenzhen municipality. With catchment area 388 km2, Maozhou river became the most important corridor runs through Guangming. MZRB located in the lower hilly-plateau area. Shenzhen located in southern Asian tropical monsoon climate zone. Monsoon season is from April to September, 86% annual rainfall is centered in monsoon season. Pilot area locates in the middle stream of MZRB. Due to deforestation and increasing urban density, downstream area is facing increasing flooding threats. Moreover, because of industrialization, Maozhou river is facing severe pollution issues. Therefore, the ecological condition of middle stream is extreme crucial (because upstream is protected forestry and reservoir area).

From economic perspective, pilot area locates at the 'front door' of Guangming Eco-city. Important node like newly built high-speed railway station also locates in the pilot area. Hence it also functions as the economic engine for Guangming Eco-city.





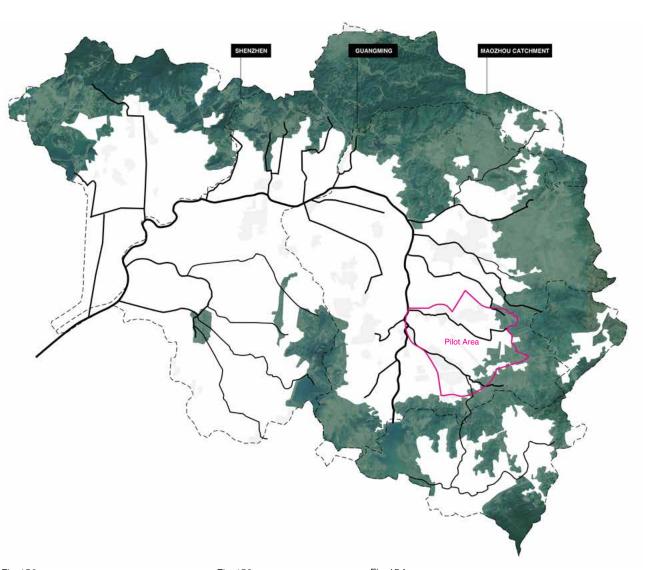
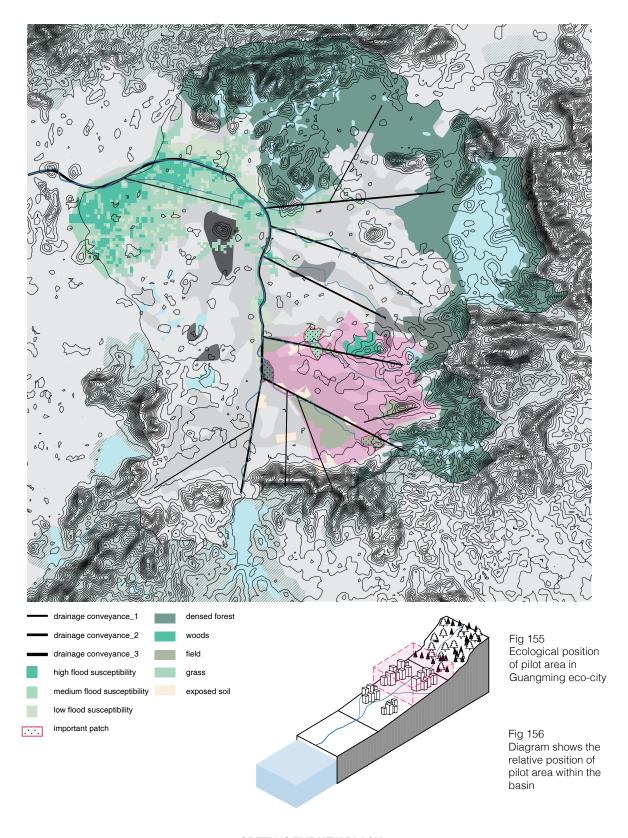


Fig 152 Hydrological network of Shenzhen, and Pilot Area's locan in Maozhou river basin

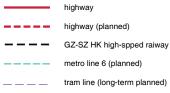
Fig 153
Regional Infrastructure
network of Shenzhen and
nearby metropolis; And
Pilot area's locaion in this
context

Fig 154 Pilot area's location in the Maozhou river basin



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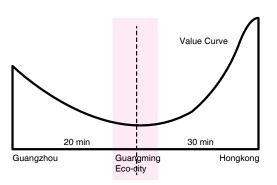


Fig 157 Infrastructure network of Guangming, including proposed ones; and pilot area's location

Fig 158
Economic value of
Guangming eco-city in
the regional context (highspeed railway connecting
Guangzhou and Hongkong)

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#### Structure

Structure is determined by the configuration of urban and natural structures in an area. It indicates the composition of ecosystem services within one urban area. It also indicates the opportunity of restoring ecosystem services in different built-up areas. In order to identify the opportunities of inserting new ecological functions and restoring the important functions, two major categories of typology are identified. First one is surface, including built-up surfaces and unbuilt surfaces. Built up surfaces indicate the density and compactness of the surface based on its FSI and GSI. Unbuilt surfaces indicate the capacity of infiltration, the value of the ecological functions, and the opportunity of providing food/ fresh water. Second major category is line, the linear structure within the area. Including river corridor, major infrastructure and hybrid corridor. Within the pilot area, three major rivers are identified: Maozhou river, Ejing river, and Dongkeng river. Maozhou river is the major river running through Guangming Eco-city, and locates on the edge of the pilot area. Ejing river runs through the

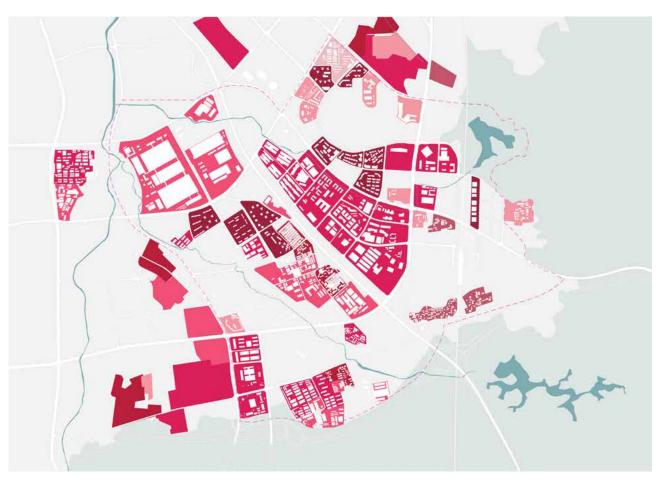
productive land of the area. Dongkeng river is partially canalized, and is the most heavily polluted one out of these three. Major infrastructure is categorized as main roads, secondary roads, neighbourhood roads and roads in urban villages. The opportunity of retrofitting theses infrastructure decreased with the lowering level. Two major hybrid corridors are identified, Longda Highway with the green area alongside it and GSH high-speed railway.

The structures of different elements composed by the built-up surfaces, natural surfaces, corridors provide the basic understanding of the distribution of services and consumers. Combining with the analysis of positions, this leads to the evaluation of the functions of the landscapes, and opportunities for the applications of design principles.



Fig 159 Landcover's permeability in the pilot area: green- permeable; white- buildings and infrastructure; grey- exposed soil

# Structure\_Surface



high-rised neighborhood

high-density urban village

low-density urban village

industria park

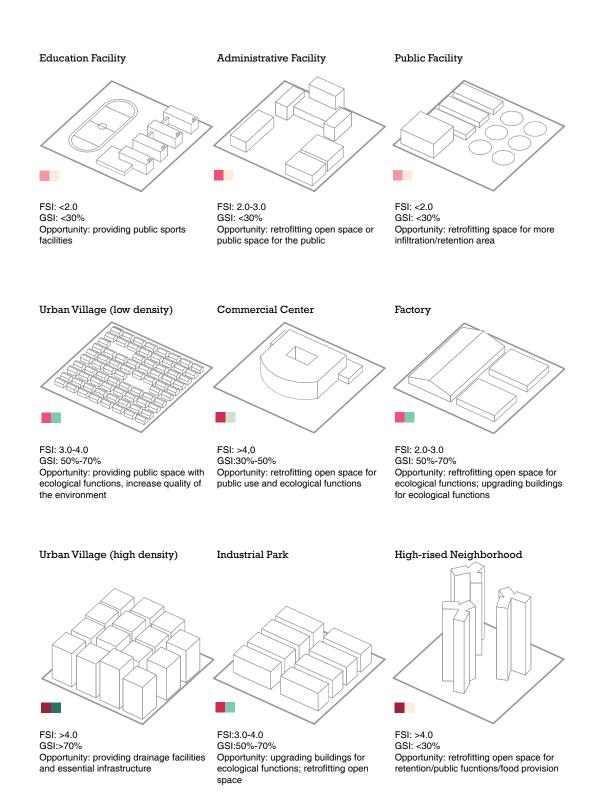
factory

public facilities

danwei residential neighborhood (building height belows 30m)

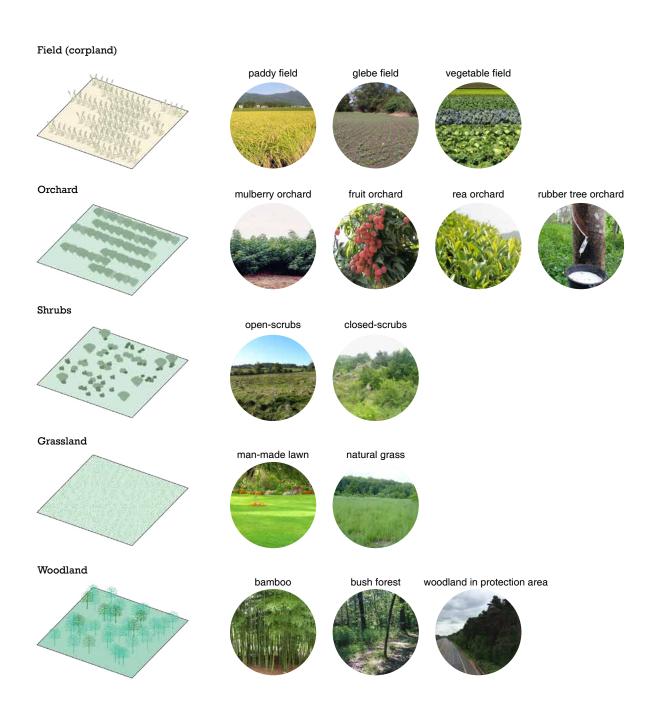
Fig 160 Structure of built area

Fig 161 Typologies of different built up area and their density/compactness, as well as opportunities for retrofitting



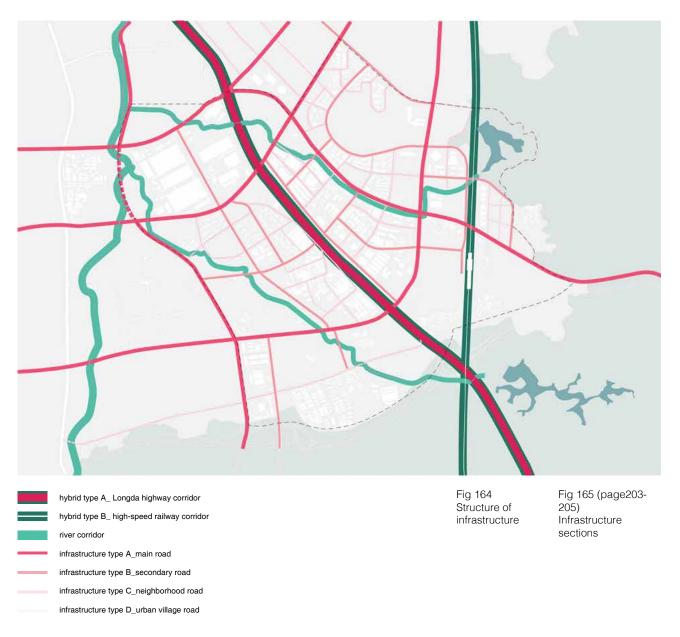
# Structure\_Surface

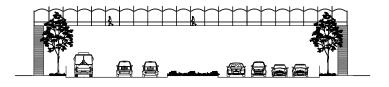




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# Structure\_Line





Infrastructure\_type A



Infrastructure\_type B1



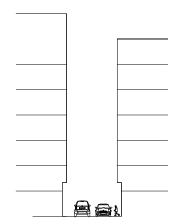
Infrastructure\_type B2



Infrastructure\_type C1

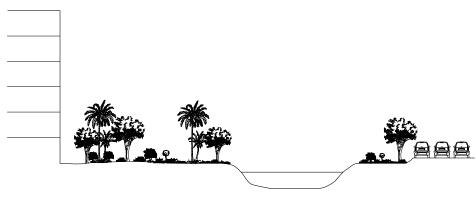


Infrastructure\_type C2

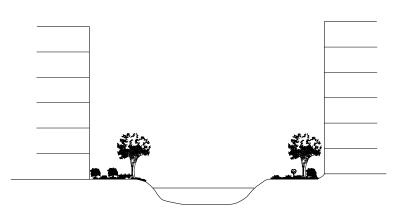


Infrastructure\_type D

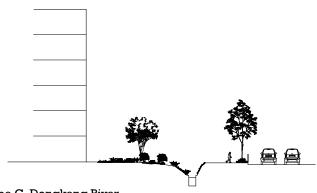
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Corridor\_type A\_Maozhou River

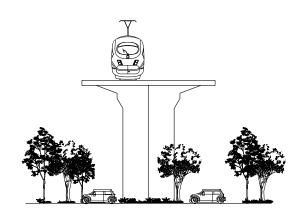


Corridor\_type B\_Maozhou River / Ejing River



Corridor\_type C\_Dongkeng River

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 $Hybrid\_type\ A\_High\text{-speed Railway}$ 

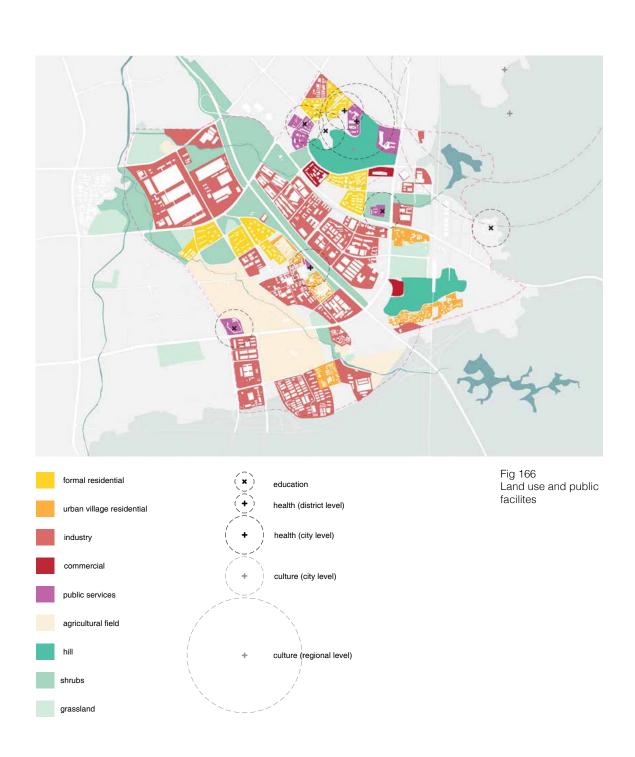


Corridor\_type B\_Longda Highway

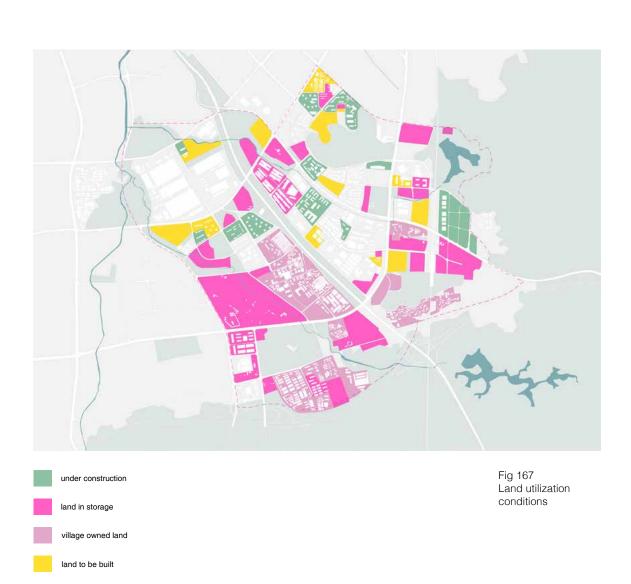
### **Function**

In this part, functions are investigated based on two major categories: urban functions and natural functions (ecosystem services). The functions of urban facilities indicate the accessibility of the public, indirectly indicate the area with higher social index. Based on the analysis, we can conclude that the area located in the north-eastern area have higher accessibility to public functions and natural resources such as parks, natural reserved area. Meanwhile, by looking into the ecosystem services/ functions of natural area, this project finds out the area located in the south-western has less functional natural lands, and it located in the lower part compared to north-eastern area, hence it has higher susceptibility of flooding or other natural disasters. Finally, this project also identifies different status of the land within the area. It finds out in the area with lower social index, lower natural functions, there is also higher ratio of land available for development or retrofitting.

In conclusion, by identifying different functions of urban facilities and natural area, the pressure and opportunities of this area is identified. In order to achieve a better balanced area in terms of ecological functions and social inclusion, there will be more concentration on the area with more vacant land available, and lower social index.



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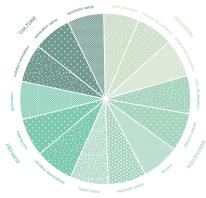


Fig 168 Ecological functions and social vulnerability

# 5.5 Projects and Design Guidelines

Combining the analysis the opportunities have been identified. By understanding the position of the pilot area, urban runoff mechanism is understood and further it can guide the projects to retrofit certain crucial area to provide regulating services. By understanding the typologies of patches and corridors, different suitable strategies can be guided to apply to different types of land or projects. At last, the functions of urban facilities and natural land indicate the potential and performance of ecosystem services within the area.

Combining all the analysis and refer to the vision which provides a structural spatial intervention, a series of project is connected to form a coherent strategy to move forward to the vision.

As mentioned before, these spatial intervention projects are part of the whole process of designing. In this thesis, a preliminary spatial intervention structure is provided based on the analysis. These projects have different aims, levels, stakeholders and urgency. The overview of all projects (Fig.169) will be the guidelines for further design process.

Taking three different scenarios into considerations, different projects will have different levels of priorities. Therefore, under three different scenarios, various sets of projects are put together to deal with the most urgent needs of different situations. However, no matter in which scenario, the process of design remains the same: from team organization to research to design and then implementation.

These projects will simplify an extreme complex condition and offer the strategy capability of dealing with uncertainties. It provides possibilities and platform for different stakeholders, governmental institutions, designers a common ground for negotiating and trade-off of different ecosystem services and economic priorities. This is a flexible, process oriented spatial strategy.



Fig 169 Spatial interventions structure

- 1.Maozhou River/Riverfront Urban Design
   2.Huangxing Park Design
   3.Ejing River/Riverfront Restoration
   4.Guangming Green Gate Park Design
   5.Guangqiao Road Retrofitting
   6.Urban Farmland Re-development
- 7.Tangjia Urban Village Street Re-design 8.Guangming New Town Park + Biyan Reservoir Park Design
- Dongkeng River Water Quality Improvement
   Guangming Railway Station District Urban Design
- 11.Longda Highway Stormwater Bulevard Urban Design 12.Changzhen Village Retention Pond 13.Guangming Cultural Center + Park Road Retrofitting Design

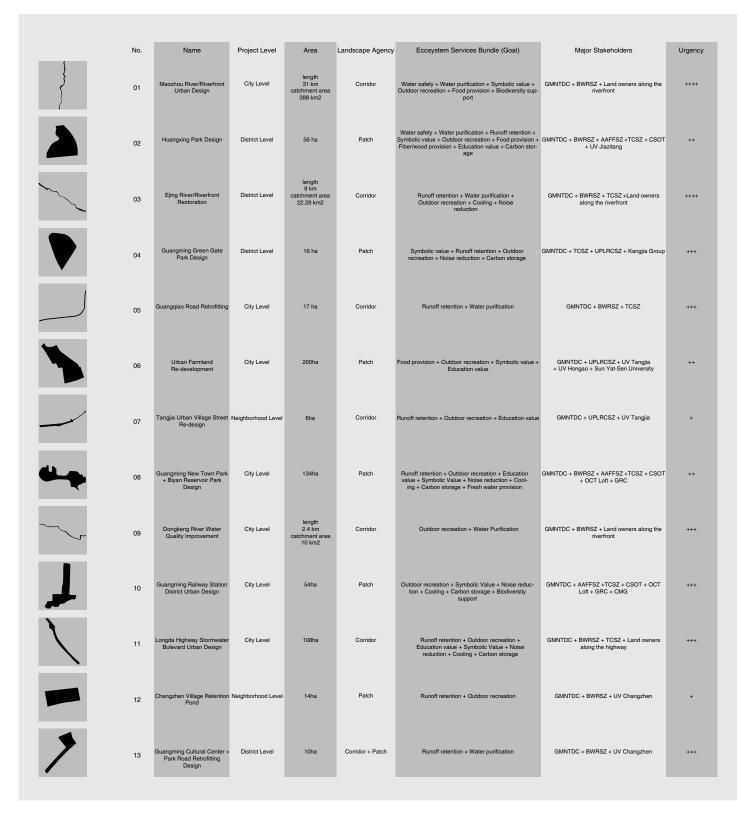


Fig 170 Overview of intervention projects

# Scenario A: Growth

Socio-economic growth (indicates highly densed urban environment) and rapid climate change

# Strategy

Mitigation

# **Spatial Interventions**

Retrofitting Streets











### Scenario B:Business as Usual

Socio-economic and climate status stay nearly unchanged in the future. City is seeking new approach of development

### Strategy

Steering for Change

# **Spatial Interventions**

Re-Identify Public Space





# Scenario C: Shrinking

Socio-economic squeeze and moderate climate change. City is challenged by new defination of 'growth' and seeking new development approaches to increase the quality of life

# Strategy

Reclaimation

# **Spatial Interventions**

Urban + Agriculture





In different scenarios, different projects are given various priority to better achieve the goal of the strategy. It also aims at restoring different ecosystem services, and followed by different spatial interventions. However, all projects will have a design guideline to specifically restrain its functions, types and what kind of ecosystem services are preferably to be restored.

# Examples of project design guidelines



Project 1 - Maozhou River / Riverfront Restoration

Project type: Riverfront Design + Water Treatment

Drainage basin area: 388 km<sup>2</sup>

Level: City Level

Landscape Agency: Corridor

Funding Source:Funding for National Green and Ecological

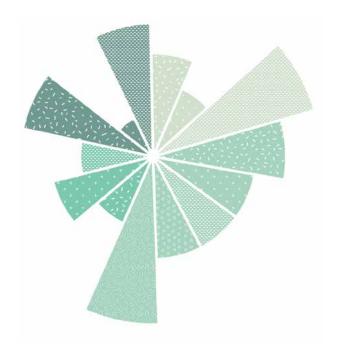
**Demonstration District** 

#### Introduction

Maozhou river basin lies in the west fringe of Shenzhen. It is known as the largest watershed in Shenzhen with the drainage basin area of 388 km2. Due to the fast urbanization and industrialization, Maozhou river is heavily polluted. Moreover, because of the new town construction of Guangming Eco-city, Maozhou river is planned to be canalized. This projects focus on restore the natural riverbanks for the upstream of Maozhou river. This project lies in the west fringe of the pilot area, and it will function as one of the core projects of the vision for Guangming Eco-city.

#### Goal

Maozhou river/riverfront restoration will focus on water treatment, water safety and recreating identity for Guangming Eco-city. Pilot part of the project is located in the upstream area, the main focus of the project will be riverbank restoration, plantation for water cleaning capacity, test ground for water resilience agriculture and increase public accessibility.



#### **Process**

Bureau of Water Resources of Shenzhen will lead the process. Starting of gather stakeholders along the riparian area and the industries alongside the river. Making goal for river water quality, and spatial quality. Workshop with stakeholders and local community, with design input together come up with strategy and spatial design guidelines, to both achieve high quality of water and public space.



Project 11 - Longda Highway Stormwater Boulevard

Project type: Open Space Design + Stormwater Management

Area:108 ha Level: City Level

Landscape Agency: Corridor

Funding Source: Funding for National LID Integrated Rain-

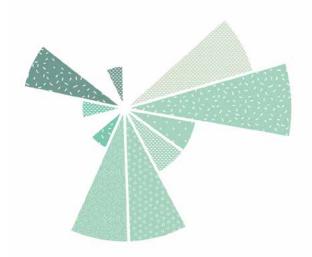
water Utilization Demonstration Area

#### Introduction

Longda Highway functions as a regional connection between Shenzhen and Zhuhai, Dongguan (two other important cities within PRD). This highway cross Guangming Eco-city from the south to the north, and it forms a barrier in the urban environment. Besides, it also breaks down the ecological connections form the east-side's preserved forests to the urban center. There are approximately 150-200 meters next to Longda Highway remaining under used shrubs. With a critical location in the pilot area, and the opportunity due to its vacancy, Longda Highway can be transformed from a divider to a binding area for the city.

#### Goal

Longda Highway stormwater boulevard focus on stormwater management and public space creating. It aims at revitalizing undersed urban space near large infrastructure. In the future the Longda boulevard needs to function as stormwater storage in heavy rainfall condition, and public space in day-to-day rainfall condition.



#### **Process**

Guangming New Town Development Committee and Transport Commission of Shenzhen Municipality will lead the process, inviting industrial parks and Tangjia urban village residents to participate the process. With expert input from infrastructure, and landscape architecture, a coherent strategy should be raised to regulate urban runoff, and storage rain water in extreme rainfall.

#### 5.6 Scenario A: Growth

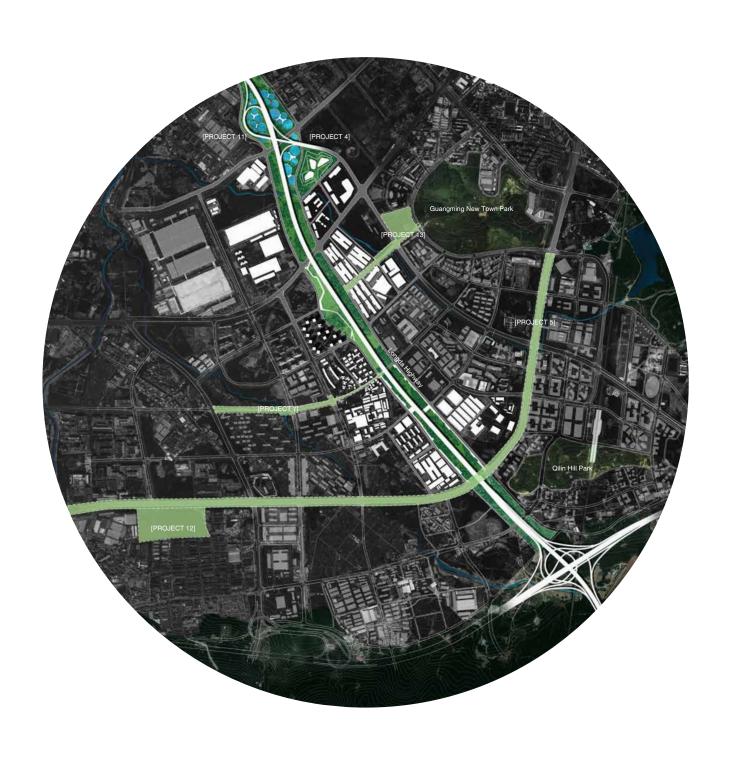
In this scenario, the global network is taking over the local network. More industries will be upgraded to the global level. Shenzhen has been known for the factory of the world, supplying manufacturing products for multiple global business. In this scenario, the identity of Guangming will continue to inherit the industries which are phased out from the city center of Shenzhen. More foreign direct investment in Guangming will mean more intensive urbanization, and formalization of infrastructure, which will leave less room for green/blue retrofitting. Besides, in this scenario the rapid climate change is also a big factor threatening the urban development of Guangming Eco-city. Therefore, in this context, the regulation services of ecosystem will be prioritized. The main challenge is to utilized the limited urban public space to maximize the efficiency of storm water management to minimize the flooding risk of the downstream and increase the water quality.

In addition, the large amount of industrial park and factories in the area also pose the challenge of incorporated diverse actors to be part of the water management process. To exemplify how the scheme of water regulation from the vision could be translated to spatial interventions, project 4, 5, 7, 11, 12, 13 are combined to deliver a coherent spatial strategy to mitigate the impact of high density urbanization on the local ecosystem.

Fig 171 Strategy: Mitigation for scenario growth

### Implications of Scenario Growth

- population rises to 1.5 million in 2020 and 2 million in 2050  $\,$
- ongoing economic growth by 10%
- ongoing urbanization
- natural reserved area drops
- 4 degrees celsius global warming (sea level rises 0.5m to 1m)
- infrastructure development up to original plan
- urban villages are demolished and upgraded to formal land development
- all land is reclaimed for urban development

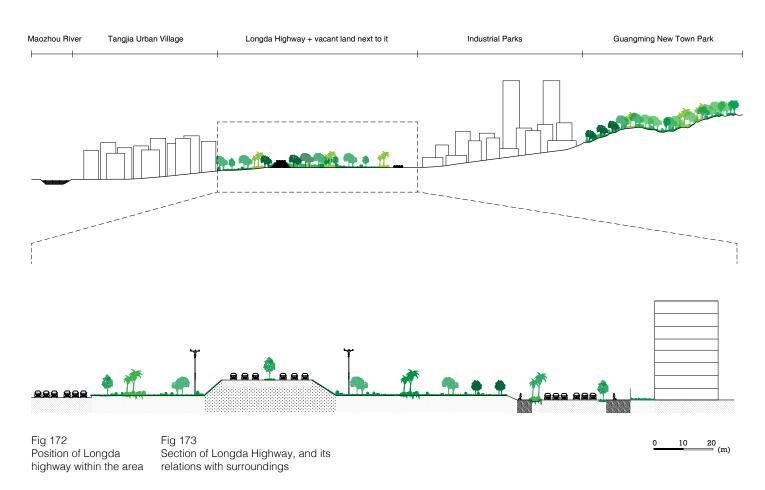


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Proposed design strategy is to create storm water lane on the northern side of Longda highway, to retain the rainwater runoff from the north part of Guangming, and leads to storage for agricultural use on the south side of the highway. Also the edge of the highway will be turned into a public active edge, based on the sur-

rounding functions. On the north end of the highway, retention ponds are created under the infrastructure to store stormwater in extreme rainfall condition. This additional water lane is also connected to the surface water, and enventually flows to Maozhou river.

#### **Current Situation**



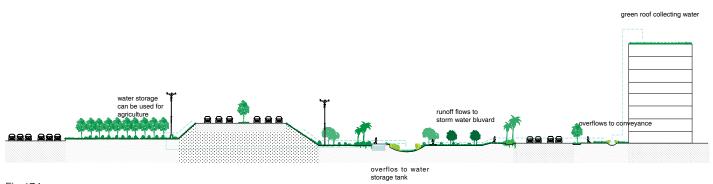
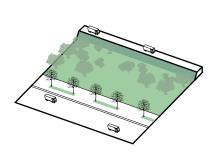
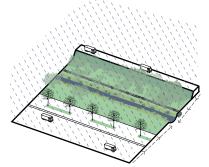


Fig 174 Design scheme for storm water regulation

#### Design Instrument\_1

Creating the water lane next to the highway for water storage and purification when there is a heavy rainfall. When there is exceedance of surface water, the extra water storage space under the pathway will function as extra water storage.

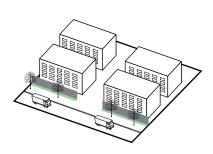


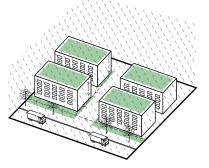


#### Design Instrument\_2

Utilizing green edge alongside the industrial park to infiltrate rainwater. Using green roof and guidlines for rainwater in industrial park connecting to its green edge. It also functions as fencing element for public and private realm.

Fig 175 Design instrutments







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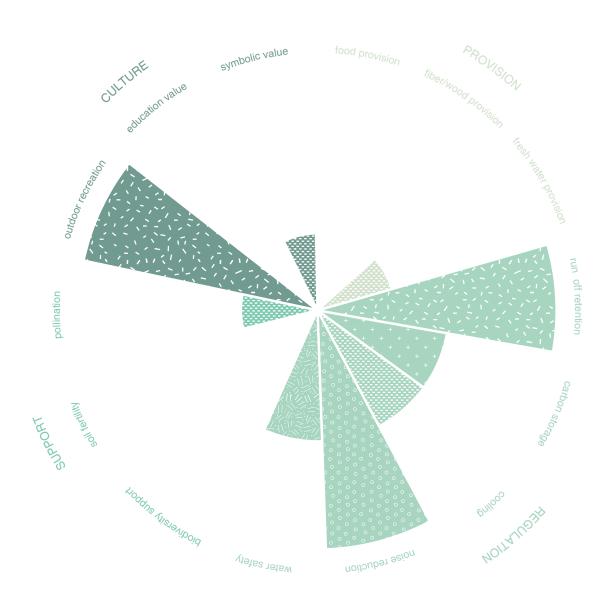


Fig 177 Priorities of ecosystem services restoration in strategy mitigation

#### 5.6 Scenario B: Business as Usual

In this scenario, the global network and the local network co-exists as it is now in Guangming. With a more stable climate and socio-economic status, the important task to achieve eco-city's goal is to raise the public awareness and providing active public engaged projects to steer for a change. Hence, the projects that mobile the major stakeholders to invest in ecosystem services; the projects that make the public to realize the importance of maintain ecosystem services, and the projects that smartly utilizing ecosystem services to create more added value are prioritized in this scenario. For project 8, the opportunity of building Guangming sports center is used to strengthen the connections between existing Guangming New Town Park (GNTP) and Biyan Reservoir, which has great potential to become a symbolic park for recreation and education. An Ecoduct is proposed to connect the hills of GNTP and the forest in the east which will strengthen the ecological connections and also provide space for 'natural finger' to extend to the highly urbanized area. For project 10, the concept is revitalizing the space under the high-speed railway to provide public space which allows the industrial park development on both sides to interact with each other. The green corridor also connects important nodes like the Qilin Hill Park, OCT industrial park, High-speed Railway Station, Biyan Reservoir Park, allowing a large green public network to weave the urban fabric through open public space. Project 9 is about water treatment for Dongkeng cannel, a vital water connection in the highly urbanized area. It is important to showcase a clean and healthy environment will highly improve the quality of urban space. A bike lane is designed to physically connecting these projects to create high accessibility and promote low-carbon mobility. The bike lane ring also connects to regional green pathway, making it part of larger network.

By linking all these projects, various stakeholders are involved in the process to collectively contribute to steering for change.

Implications of Scenario Business as Usual

- population remains in 2020 and rises to 1.5 million in 2050
- urbanization process stagnates
- natural reserved area remains
- around 2 degrees celsius global warming (sea level rises 0.35m)
- all land development remains as planned, some projects stagnates

Fig 178

Strategy: Steer for change for scenario business as usual



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Fig 179 Section of publicspace under the high-speed railway and vegetations



Fig 180 Section of ecoduct connecting Guangming New Town Park and Biyan Reservoir Park

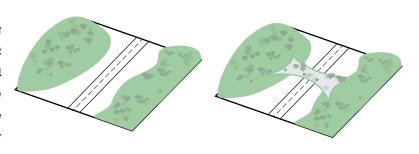
In this strategy, projects with more public functions are prioritized with the goal of raising awareness and creating more cultural value in urban nature network. In this way, the strategy 'steering for change' is translated to spatial interventions of creating an active public networks with ecological functions and educational functions. It is crucial to include

various stakeholders and the public in the process of developing projects in this scenario. In the end, mobility mode like biking is encouraged in this scenario to promote a healthy and sustainable lifestyle.

Fig 181
Design instruments for scenario business as usual

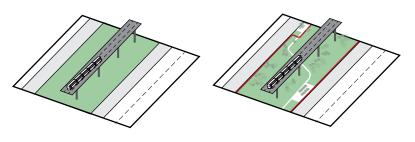
#### Design Instrument\_1

Proposing an ecoduct to connect Guangming New Town Park and Biyan Reservoir Park, it connects the public space physically, and constitutes a larger green patch within the urban area. Hence, this ecoduct increases the accessbility for citizens, and creates a larger area for the habitat of certain species.



#### Design Instrument\_2

Utilizing vacant space under the high-speed railway. By adding bike lanes, public space, this corribor can be activated as public spaces with vitality. In addition, alongside the railway, there will be important industrial parks in the future. Instead of having them all faced backwards to the railway, an active public space will weave the urban development on both sides together.



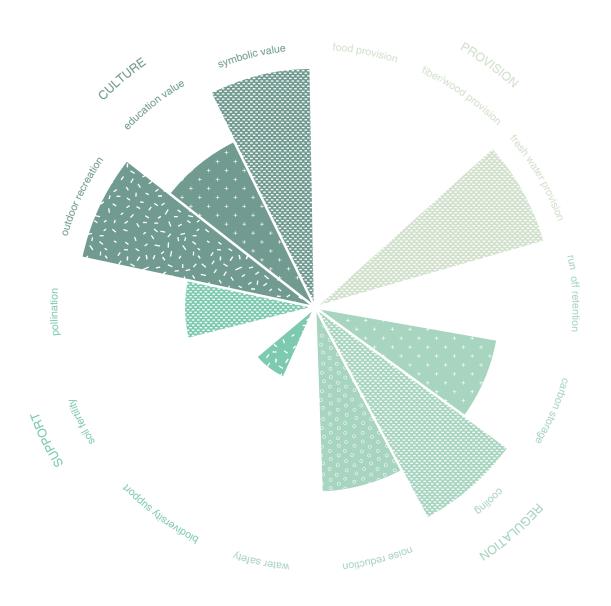


Fig 182 Priorities of ecosystem services restoration in strategy steer for change

#### 5.7 Scenario C: Shrinking

In this scenario, the global network is shrinking and the local network is gradually taking over again. Socio-economic status is squeezed. Foreign direct investment is decreasing, and more migrant workers move to Guangming for cheaper housing price in the periphery area. With fewer economic opportunities and increasing vacancy in the urbanized area, farming as the original function of this area could be reconsidered again. A new opportunity of recreating urban and rural hybrid development becomes feasible. With Sun Yat-Sen University has rooted in Guangming Eco-city, it offers more opportunities of experimenting new farming technology and typologies (Sun Yat-Sen University is famous for its medical, agriculture and food security research)

With vacant land available and originally are partially used as agriculture land in project 6, a new type of development is proposed as three major functions: agriculture research, local residents' allotment gardens and public space are mixed in this project. Food provision will be the main goal of this project, and at the same time offering education, outdoor recreation functions.

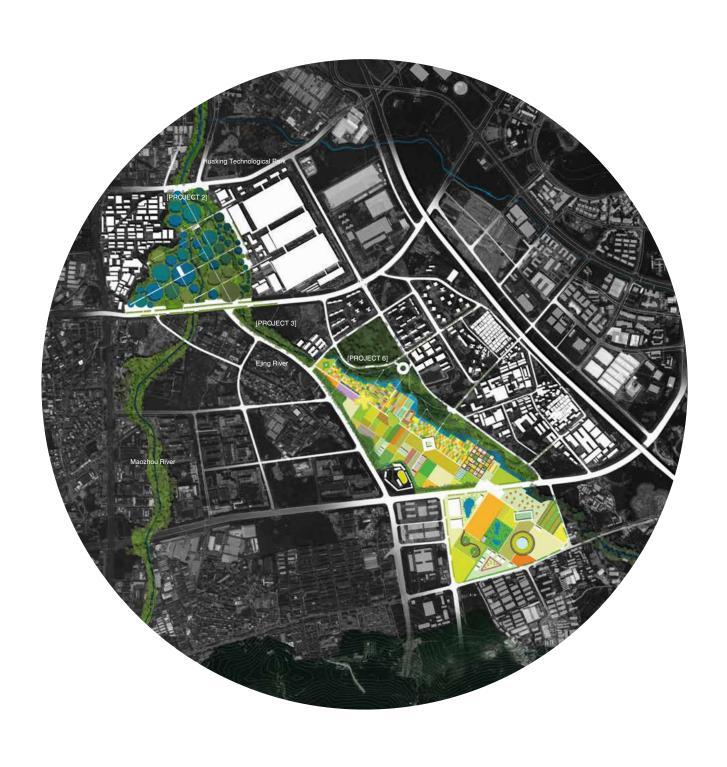
Project2 focuses on the collaboration of private stakeholders and urban village owners. By re-introducing dike-pond system to the urban area, new relations of farming, urban public space, floodplain are created. Project 3 focuses on the water treatment and connections among these projects.

With more vacancy and the need for alternative economic drive, project 2,3,6 are combined to deliver a strategy that provides productive landscape in the urban sphere.

#### Implications of Scenario Shrinking

- population remains in 2020 and slightly declines in 2050  $\,$
- economic growth stagnates
- urbanization stagnates, some industrial parks are closed down
- natural area slightly increases
- below 2 degrees celsius global warming (sea level rises below 0.35m)
- awareness of sustainable development increases
- new forms of urbanization is considered

Fig 183 Strategy: Reclaimation for scenario shrinking



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The key element of this strategy is to activate vacancy through program and collaboration between stakeholders, designers and local residents. In the scenario of shrinking, more land is open for new attempt and it is the opportunities to explore new ways of urban development and shift the traditional eco-city development towards a local-oriented, environmental and social sustainable development.

In this scenario, process is extra essential, in order to create more value and enable collaborations between various actors. Collaboration between funding sources, design teams, local partners and evaluation team needs to be carried out through the whole process of re-

search and design. The research and design outcome will be exhibited in local communities in order to gain feedback from local residents. Various stakeholders will be part of the whole process, and it is essential for the design to be carried out by a collective effort.

Fig 185-186 Public participation



Fig 187 Impression of the proposed dike-pond park



Fig 188 Priorities of ecosystem services restoration in strategy reclaimation

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# CHAPTER IV

# Beyond Green Dreams

Reflection, Discussion and Further Research

GREEN IS THE NEW BLACK THESIS REPORT

#### 6. REFLECTION & DISCUSSION

This thesis project looks into the urban phenomenon of 'eco-city' in China. From this perspective it aims at understanding the challenges and opportunities of Chinese sustainable development and envisioning a possible alternative future. In this chapter, four major aspects will be reflected based on the research process and conclusions:

- 1)The relationship between research and design
- 2)The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)
- 3)The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework
- 4): The relationship between the project and the wider social context

By reflecting these main topics, it proves the relevance of this thesis research in terms of a branch of larger research topic as well as its contribution for academia and society.

Furthermore, in this chapter, experience and research process will be raised to invite a larger discussion on this issue from different perspectives, disciplines and worldviews. It also discusses the transferability of the method, the strategy and design tools, which may further extend to the debate of eco-city as an universal model. In addition, a summary of findings and conclusions will be provided to answer the research questions to some extent. It also provides ideas and necessity for further research to work on this highly relevant topic.

#### 6.1 Reflection

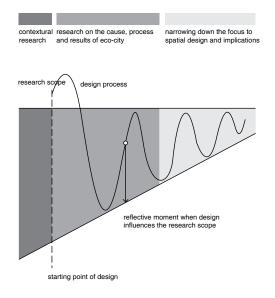
 Aspect1: The relationship between research and design

In this thesis project, the research started off with a large and extensive scope, which investigates different aspects of eco-city development. From the understanding of this phenomenon and its the impact; the theory behind eco-city planning and design; and the historical and contextual reasons why Chinese eco-cities development became what it is at this moment. From the extensive research, the focus of the project gradually narrows down to spatial implications and spatial design elements.

For design process, the design process or 'designer thinking process' started between Pl and P2. The first attempt of designing is not so successful, because the intention of the designing with flows (the designing concept for P2) is disconnected from the general research on eco-city planning, and it enters a brand new field of research. However, the research on the cause, process and results of eco-city development contributes to my focus of spatial design scope and gradually leads my design and research in align with each other.

In conclusion, from my personal under-

standing, this thesis project adopts the method of 'design research', meaning the research supports and determines the major design methods. (Unlike 'research by design' when design process contributes and leads the research). For example, the design outcomes showcase a possible future in different composition of strategies, but they all function as restoring ecosystem services, which is the main goal of the vision. Hence, the design instruments are determined by the general goal of the vision, which is the first phase's research conclusion. As shown in the diagram, the design process are narrowed down with more conclusions made from the research.



•Aspect2: The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)

Graduation studio 'happy cities' investigates the concept of happiness from different angles and formulate a critical position on the subject. This thesis project focuses on two major topics from the umbrella concept of 'Happiness' – livability and well-being.

The major purpose of incorporating happiness research in built environment discipline is to distinguish what happiness consists of, how it can be measured and quantified, and how we can make plans and designs to improve happiness.

For the specific case Chinese eco-city development, it is substantial to explore the relevance of well-being in terms of questioning what kind of 'green future' we are looking for and how ecocity can or cannot contribute to that. Also it is worthy questioning, does ecocity development in China put people's well-being into consideration during the planning process? Whose well-being are considering? After the eco-cities with high-rise buildings, green community and renewable energy system are con-

structed, who are going to benefit from it and whose rights have been deprived to achieve so? Is there an alternative way of delivering an eco-city with consideration of resident's well-being as well as the consideration of the environment.

Secondly, this project also explores the relations between ecosystem services and well-being. By using ecosystem services as a research and design tool, the relations between natural environment and well-being are discussed. To some extent, there is correlations between the quality of nature and the well-being. Key constituents of well-being like the basic material needs for a good life, freedom and choice, health, good social relations, and personal security, are all directly or indirectly connected to ecosystem services. Research from UNEP has proved that ecosystem change has impact on human well-being. Hence this project will also explore how a new approach of constructing eco-city with ecosystem services will affect well-being.

Last but not the least, the livability is considered as a interconnected measurement of connecting natural environment and human well-being. By focusing on restoring ecosystem services, the livability of cities will also be improved,

therefore it will affect human well-being as well. In conclusion, from the contextual, theories and R&D tool, this project follows the guidelines of investigating the relevance of livability and well-being in understanding and planning eco-cities in China.

•Aspect 3: The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework

One of the major criteria within the methodical line in happy cities studio is to identify what constitute 'happiness', and how are the components related to spatial palnning and urban design. It also requires students to make it explicit what exactly are being investigated when we are exploring the relevance of well-being/livability/quality of life in built environment. This thesis project focuses on this criteria by relating the ecosystem services and constituents of well-being. By investigating what services we took from nature free of charge are tightly connected to human well-being, the importance of restoring ecosystem services will appear. Therefore, by following

this methodical line of approach, it also helps on concentrating on the elements which are significant, in terms of contributing to well-being, in developing eco-cities.

•Aspect 4: The relationship between the project and the wider social context

The scale of urbanization in China is without precedent in human history. The transformation is happening at an unbelievable speed and a vast scale, which results in huge growth as well as ultra complex problems. China's cities, already home to more than half the country's people, are growing by roughly the population of Pennsylvania every year. By 2030 they will contain around a billion people—about 70% of China's population, and perhaps an eighth of humanity. China's fate, and that of the Communist Party, will be determined by the stability of its cities.

Due to the drastic urban transformation, the environmental degradation becomes more and more severe. A study out just now from Berkeley Earth in California, written by Robert Rohde and Richard Muller, deserves attention. It concludes that air pollution in China, familiar to everyone, in fact does more damage than is generally recognized. The study finds that as a result of this pollution, some 1.6 million Chinese people per year, or more dramatically well over 4,000 per day, are dying prematurely.

With a huge scale and population, the policies Chinese government adopted will not only affect 70% population of China, it will also severely affect the surrounding countries, moreover the whole world. In that sense, the sustainability discourse in China is highly relevant not only to Chinese urban development, it is also an inevitable challenge for human-kind.

Eco-city is the mostly hightly publicized and promoted urban development policy recently in China. Because of its massive scale, investment and ambitions, it draws attentions from researchers in various fields investigating on this matter. This project is a small attempt to question the vision of eco-cities in China from the perspective of well-being. Because Chinese urban policies are trying to adopt this model as the future new town development prototype, eco-cities will have larger impact on people's life and

the future of our cities. Therefore, this will be a massive research topic for a lot of fields of study, and it also will require input form various worldviews, disciplines and professionals.

The case of this project is located in Shenzhen, one of the most fast growing metropolis situated in a very ecologically sensitive delta. Besides, Shenzhen is known as a 'migrant city', 'instant city', where floating population (people without urban household registration) and urban villages compose a very diverse and distinct image. Therefore, it's challenging as well as intriguing to investigate eco-city in such a social context. Shenzhen has set up a model for various Chinese cities by establishing 'special economic zones' to attract FDI. Will Shenzhen set another examples for other Chinese cities with ecological dreams? In this sense, this project is highly relevant in terms of questioning the ongoing ecocity development wave, and reflect on what is important for future sustainable development in China.

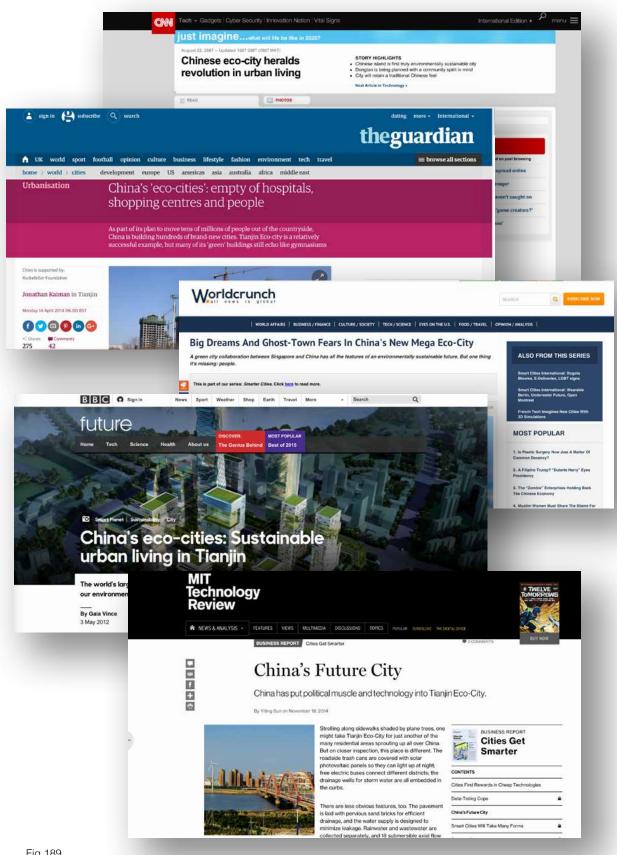


Fig 189 News about eco-city projects in China

#### 6.2 Discussion

This work investigates the urban phenomenon of eco-city in China, looks into the ideologies behind the sustainable effort, explores the future alternative possibilities carried out with different tools like ecosystem services, and proposes a design process which facilitates different strategies to achieve the goal of restoring ecosystem services and increasing ecological values of Guangming, Shenzhen. By questioning the current index of eco-city evaluation in China, this research explores the definition of 'green', and why we want 'green'.

The title of this research 'green is the new black' uses three layers of metaphor 'black'. First one, black can mean evil, immoral and the secrets behind the scene. This metaphor questions the intentions, motives and unrevealed facts of eco-city development in China. Second one, black can mean trendy, popular. Indeed, green discourse has become popular, and it is labelled everywhere, because green also sells. This metaphor leads me to question the intention of incorporating 'green' in our life and urbanization. Where did this come from

and why does it mean so much to humankind. This also assists me to explore the ideologies of green movement and sustainable discourse, which leads to the findings of two opposite streams of ideas in green discourse. The last but not the least, black here is also the metaphor of urbanization. Our world now is constituted of green (nature) and black (urbanization). We rely so much on the planet and its resources, however our urbanization is destroying the planet like a dark force. However, is our urbanization necessarily being the opposite of nature? Is our urbanization destined to be extractive? Is there a future where human needs and capacity of nature is balanced? I wish there is, and this title contains my foremost wishes for the future urbanization.

Maybe the first steps could be recognizing the value of ecosystem, and the services we gained from it. How to develop our cities with sufficient capacity to provide ecosystem services for the local residents within the constraints of the surrounding environment? This should be the core discussion in eco-city devel

opment, and it will reach the policy making, scientific studies, planning, design disciplines.

The method I adopted here in this research may not being able to offer a 'new model' for eco-city development in the future. However, it opens the questions like what kind of eco-cities we would want to live? What elements we need to prioritize in the development of eco-cities? How can we deal with uncertainties in urban development? I hope this research will start a rather immature but intriguing question, and attracts more people to work on this topic.



Fig 190 Green future

# GREEN FUTURE

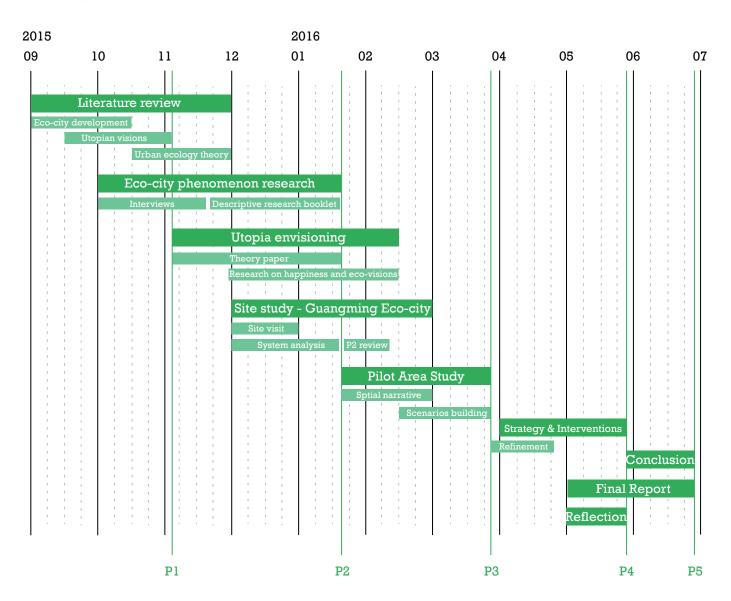
#### 6.3 Future work

This projects provides a new vision for Guangming Eco-city and a strategic process to deliver the desirable future. However, in order to specify the amount of ecosystem services to be restored and translate to spatial distributions will require further research with the input of data, and preferably in GIS platform to simulate spatial outcomes. Moreover, the specific implications for different scenarios will also require further research to make policy guidelines. The designed process aims to invite talents from different fields to participate in the process of developing Guangming ecocity. And local community engagement is also crucial, which will open another field of research on social cohesion and public participation. In conclusion, this project raised a crucial question, and provides ideas of possible pathways to deliver a more sustainable development approach. It will require inputs from scientific fields like ecology, landscape architecture, urban policy and social science to collectively deliver a more detailed and practical strategy.

# **APPENDIX**

# Appendix 1

# Working Schedule



# Appendix 2

# Summary of average global value of annual ecosystem services

								EGOS)	stem sen	ices (1994 t	IS\$ har 'yr	3								
Diome	Area (ha × 10 <sup>6</sup> )	1 Gas regulation	2 Climate regulation	3 Disturbance regulation	4 Water regulation	6 Water supply	6 Emsion control	7 Soil formation	8 Nutrient cyaing	9 Waste treatment	10 Pallination	11 Biological control	12 Habitat/ refugia	13 Food production	14 Raw materials	lib Genetic resources	16 Recreation	17 Cultural	per ha (\$ha <sup>-1</sup> yr <sup>-1</sup> )	flow value (Syr T × 10 <sup>0</sup>
Marine	36,302	Carrenanda		, cevi una menor				MANUTABADA		2577 Deleteration		Van Cysellau VIII.				/ ) DI NAMADA UKI			577	20,949
Open ocean	33,200	38							118			.5		15	۵		~~	76	252	8,381
Coastal	3,102			88					3,677			38	8	93	4		82	62	4,052	12,588
Estuaries Seagrass/ algae beds	180 200			567					21,100 19,002			78	131	621	2b 2		381	28	22,832 19,004	4,110 3,801
Coral reefs	62			2,750						58		.5	7	220	27		3,008	3.	6,075	375
Shelf	2,660								L431			39		68	2	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		70	Ļ610	1,283
Terrestrial	15,323																		804	12,319
Forest	4,855		141	2	2	3	96	10	361	B7		2		43	138	16	66	2	000	4,706
Tropical	1,900		223	5	8	8	245	10	922	87				32	315	41	112	2	2,007	3,813
Temperate/boreal	2,966		88		0			10		87		4		50	25		36	2	302	894
Grass/rangelands	3,898	7	0		3		20	.1		87	25	23		67		0	2		232	906
Wetlands.	330	133		4,539	15	3,800				4,177			304	256	108		574	881	14,785	4,879
Tidal marsh/ mangroves	165			1,839						6,696			169	466	182		658		9,990	1,648
Swamps/ floodplains	165	265		7,240	30	7,600				1,659			439	47	49		491	1,761	19,580	3,231
Lakes/dvers	200				5,446	2,117				665				41			230		8,498	1,700
Desert	1,925																			***************************************
Tundra	743									OH MANAGEMENT		V. 17 (17 (18 (18 (18 (18 (18 (18 (18 (18 (18 (18								
Ice/rock	1,640	#1040040040040000		***************************************						.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	*************			***************************************						***************************************
Cropland	1,400										14	24		54					92	128
Urban	332														••••••					
Total	51,625	1,341	684	1,779	U15	1,692	576	53	12076	2,277	117	417	124	1,386	721	79	815	3,015		33,268

Numbers in the body of the table are in \$ ha "yr". Row and column totals are in \$ yr" x 10", column totals are the sum of the perducts of the perha services in the table and the area of each biome, not the sum of the perha services themselves. Shaded cells indicate services that do not occur or are known to be negligible. Open cells indicate lack of available information.

source: d'Arge, R., Limburg, K., Grasso, M., de Groot, R., Faber, S., O'Neill, R.V., Van den Belt, M., Paruelo, J., Raskin, R.G., Costanza, R. and Hannon, B., 1997. The value of the world's ecosystem services and natural capital.

# Summary of average value of annual ecosystem services in China and Shenzhen

	Forest	Grassland	Cropland	Wetland	Water body	Barren land
Gas regulation	3.5	0.80	0.50	1.80	0	0
Climate regulation	2.70	0.90	0.89	17.10	0.46	0
Water supply	3.20	0.80	0.60	15.50	20.40	0.03
Soil formation and retention	3.90	1.95	1.46	1.71	0.01	0.02
Waste treatment	1.31	1.31	1.64	18.18	18.20	0.01
Biodiversity protection	3.26	1.09	0.71	2.50	2.49	0.34
Food	0.10	0.30	1.0	0.30	0.10	0.01
Raw material	2.60	0.05	0.10	0.07	0.01	0
Recreation and culture	1.28	0.04	0.01	5.55	4.34	0.01
Total	21.85	7.24	6.91	62.71	46.01	0.42

	Woodland	Grassland	Orchard	Cropland	Wetland	Water body	Unused land	Build up
Gas regulation	3388.3	774.5	2081.4	484.0	1742.6	0.0	0.0	0.0
Climate regulation	2613.9	871.3	1742.6	861.6	16,554.4	445.3	0.0	0.0
Water supply	3097.9	774.5	1936.2	580.9	15,005.4	19,749.1	29.0	0.0
Soil formation and retention	3775.6	1887.8	2831.7	1413.4	1655.4	9.7	19.4	0.0
Waste treatment	1268.2	1268.2	1268.2	1587.7	17,599.9	17,619.3	9.7	0.0
Biodiversity protection	3156.0	1055.2	2105.6	687.3	2420.2	2410.6	329.2	0.0
Food	96.8	290.4	193.6	968.1	290.4	96.8	9.7	0.0
Raw material	2517.0	48.4	1282.7	96.8	67.8	9.7	0.0	0.0
Recreation and culture	1239.2	38.7	638.9	9.7	5372.9	4201.5	9.7	0.0
Total	21,152.8	7009.0	14,080.9	6689.5	60,709.1	44,542.0	406.6	0.0

source: Tianhong, L., Wenkai, L. and Zhenghan, Q., 2010. Variations in ecosystem service value in response to land use changes in Shenzhen. Ecological economics, 69(7), pp.1427-1435.

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Fig.117: Illustrated by author inspired by Dogma: Easier Taken Slow. Masterplan for the corridor Durrës-Tirana, 2014.

Fig.118: Illustrated by author based on information from 'Ecological restoration planning based on connectivity in an urban area' byYu, D., Xun, B., Shi, P., Shao, H. and Liu, Y.

Fig.119: Illustrated by author based on information from 'A study on the biodiversity and protection in Futian National Nature Reserve of mangroves and birds' by Chen, G. Wang, Y. and Huang, Q.

Fig.120: Illustrated by author based on illustration of 'Hypar nature' by HNTB+MVVA

Fig.121-122: Illustrated by author based on information from Masterplan of Guangming (2007-2020) and Google Earth

Fig.123: Illustrated by author based on Google Earth

Fig.124: Image from blogger Lutu-2008 (http://lutu-2008.blog.163.com/blog/static/538593020111811833967/). Original source unknown.

Fig.125: Illustrated by author inspired by image (https://nl.pinterest.com/pin/457608012114772193/). Originally source unknown.

Fig.126: Illustrated by author based on information from the Diploma 2 work by Li Zhang, AA

Fig.127: Illustrated by author based on temple pictures from Google Search

Fig.128: Illustrated by author based on Google Earth

Fig.129: Illustrated by author based on method developed by Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M., in 'Ecosystem service

bundles for analyzing tradeoffs in diverse landscapes', 2010.

Fig.130: Master plan of Shenzhen (2010-2020) by Urban Planning Land and Resources Commission of Shenzhen Municipality

Fig.131: Illustrated by author based on rendering from 'Guangming Phoenix Town Development Guide Plan' by Urban Planning and Design Institute of Shenzhen

Fig.132-136: Illustrated by author, with reference to project Lifelines, Berat, Albania by Openfabric. (http://www.openfabric.eu/lifelines-berat-albania/)

Fig.137-141: Illustrated by author

Fig.142-146: Illustrated by author

Fig.147: Illustrated by author based on literature 'Framing climate uncertainty: socio-economic and climate scenarios in vulnerability and adaptation assessments'. Regional environmental change, 2014

Fig.148: Illustrated by author based on the information from 'Guangming Phoenix Town Development Guide Plan' by Urban Planning and Design Institute of Shenzhen

Fig.149: Logo of 'Rebuild by Design: Promoting Resilience Post-Sandy Through Innovative Planning and Design' 2013. (http://www.rebuildbydesign.org/)

Fig.150: Illustrated by author based on the process design of Research by Design, Promoting Resilience Post-Sandy Through Innovative Planning and Design. 2013 (http://www.pentagram.com/#/blog/125230)

Fig.151: Illustrated by author

Fig.152: Illustrated by author based on Google Earth and 'Impacts of rapid urbanization on river network and flood hazard in Shenzhen region, China.' by Zhou, H., et al.

Fig.153: Illustrated by author based on Google Earth and Masterplan of Guangming (2007-2020)

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Fig.155: Illustrated by author based on Google Earth; information from 'Guangming Phoenix Town Development Guide Plan' by Urban Planning and Design Institute of Shenzhen and Masterplan of Guangming (2007-2020) by Urban Planning Land and Resources Commission of Shenzhen Municipality

Fig.156: Illustrated by author based on the scheme developed by Kuzniecow Bacchin, T. in 'Performative nature; urban landscape infrastructure design in water sensitive cities' (Doctoral dissertation, Delft University of Technology, UNESCO-IHE) 2015.

Fig.157: Illustrated by author based on information from Masterplan of Guangming (2007-2020) by Urban Planning Land and Resources

Commission of Shenzhen Municipality

Fig.158: Illustrated by author based on the presentation of Ronald Wall 'Shenzhen II: Global green economic zone' (http://www.newtowninstitute.org/spip.php?article1065)

Fig.159: Illustrated by author based on Google Earth

Fig.160: Illustrated by author based on Google Earth

Fig.161: Illustrated by author

Fig.162: Illustrated by author based on Google Earth

Fig.163: Illustrated by author based on information from 'Ecological Planning on water system renovation of landscape in Maozhou river of Shenzhen' by J. Yin and M. Huang

Fig.164: Illustrated by author based on Google Earth

Fig.165: Illustrated by author

Fig.166: Illustrated by author based on Google Earth and information from 'Guangming Phoenix Town Development Guide Plan' by Urban Planning and Design Institute of Shenzhen

Fig.167: Illustrated by author based on Google Earth and information from 'Guangming Phoenix Town Development Guide Plan' by Urban Planning and Design Institute of Shenzhen

Fig.168: Illustrated by author based on Google Earth

Fig.169: Illustrated by author based on Google Earth

Fig.170: Illustrated by author

Fig.171: Illustrated by author based on Google Earth

Fig.172: Illustrated by author based on height information from Google Earth

Fig.173: Illustrated by author

Fig.174: Illustrated by author

Fig.175: Illustrated by author with reference to 'Performative nature; urban landscape infrastructure design in water sensitive cities' (Doctoral dissertation, Delft University of Technology, UNESCO-IHE) 2015. by Kuzniecow Bacchin, T.

Fig.176: Illustrated by author based on Google Earth

Fig.177: Illustrated by author based on method developed by Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M., in 'Ecosystem service bundles for analyzing tradeoffs in diverse landscapes', 2010.

Fig.178: Illustrated by author based on Google Earth

Fig.179: Illustrated by author with reference to 'The underline' by James Corner Field Operations (https://www.theunderline.org/)

Fig.180: Illustrated by author

Fig.181: Illustrated by author

Fig.182: Illustrated by author based on method developed by Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M., in 'Ecosystem service bundles for analyzing tradeoffs in diverse landscapes', 2010.

Fig.183: Illustrated by author based on Google Earth, with reference to 'Almere Oosterwold: Do-It-Yourself Urbanism to revolutionise Dutch planning' by MVRDV (https://www.mvrdv.nl/projects/oosterwold/)

Fig.184: Illustrated by author with reference pictures (1)http://extension.udel.edu/ag/irrigation-2/warrington-irrigation-research-farm/ (2)http://vermontvalley.com/the-csa-philosophy/ (3)https://www.ottawatourism.ca/

Fig.185-186: Illustrated by author based on unknown sources

Fig.187: Illustrated by author

Fig.188: Illustrated by author based on method developed by Raudsepp-Hearne, C., Peterson, G.D. and Bennett, E.M., in 'Ecosystem service bundles for analyzing tradeoffs in diverse landscapes', 2010.

Fig.189: Picture sources (1)http://edition.cnn.com/2007/TECH/08/14/dongtan. ecocity/ (2)http://www.theguardian.com/cities/2014/apr/14/china-tianjin-ecocity-empty-hospitals-people (3)http://www.bbc.com/future/story/20120503-sustainable-cities-on-the-rise (4)http://www.worldcrunch.com/smarter-cities/big-dreams-and-ghost-town-fears-in-china-039-s-new-mega-eco-city/tianjin-eco-city-environment-pollution-sustainable/c15s13841/ (5)http://www.bbc.com/future/story/20120503-sustainable-cities-on-the-rise

Fig.190: Illustrated by author based unknown sources



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### Education

B.E in Urban Planning, 2014 Faculty of Architecture and Urban Planning, Chongqing University

MSc in Architecture (Track Urbanism), July 2016 Faculty of Architecture and the Built Environment, Delft University of Technology

#### Awards

### First Prize in 'Light of the West' Student Design Competition

Awarded by UPSC (Urban Planning Society of China) and CUPEN (China Urban Planning Education Network) Oct. 2013 Qingdao China

## Third Prize in National Urban Planning Student Social Investigation Competition

Awarded by UPSC (Urban Planning Society of China) Sep. 2013 Harbin China

# Special Mention for International Design Collaboration for Kenya Competition

Awarded by UN Habitat Jun. 2016 Nairobi Kenya

# Professional Experience

# Internship at Vanke Real Estate Co. Ltd

Assisted team leader in design management of 'Golden City' Residential Project in urban design phase. Correspondent of the project in design negotiation with foreign design teams like Martha Schwartz Partners and SPARK.

Jul. 2012 - Sep. 2012 Chongqing China

#### Internship at AECOM

Assisted team leader in concept development, masterplan design, modeling and perspective rendering for Longfor Lijia Park design competition, in charge of diagram drawings and the production of final documents.

Jul. 2013 - Sep. 2013 Chongqing China

#### Villa design for Katara Hills Invited international design competition in Doha

Researched the local residential area in Doha, and carried out a community conceptual design and an individual villa design for Katara Hills, an important luxury community developed by Qatar government.

May. 2013 - Jul. 2013 Doha Qatar / Team Work

# Other Experience

#### International Volunteer of ISCO Foundation

Jan. 2010 - Feb. 2010 Jarkarta Indonesia

# Student Representative for iCities Conference in NCKU Taiwan

May. 2015 Taiwan China

### Student Assistant of Summer School 'Planning and Design with Water'

July. 2015 Delft The Netherlands

#### Student assistant of Delta Interventions

Assisted the graduation studio Delta Interventions with semester booklet, website management and studio organizations. Within the period, also assisted the publication of the book 'Delta Interventions: Design and Engineering in Urban Water Landscape'.

Sep. 2015 - Jun. 2016 Faculty of Architecture and the Built Environment TUDelft

