

## **The Way toward Green City - the Case of Shenzhen**

### **Introduction**

While Shanghai and Beijing become well known in the world because of Chinese involvement into the globalization process, it is Shenzhen rather than the two mega cities being viewed as a classic case in creating a green, modern, efficient, effective and creative city. In its 30 years rapid developing history, urban planning has helped to shape an urban development miracle no one had ever imaged: Shenzhen has transferred from a small border city<sup>j</sup> with 250 thousand citizens to a mega city with 12 millions people within its 1957 square kilometers area, the fourth largest city in China. The per capita Land GDP in Shenzhen has been Top 1 in China since 1990s, which has achieved to 10000 US Dollars in 2007, though the per capital land GDP is much lower than European standard. More than 0.45 billion square meters housing floor area has been constructed. While urban growth keeps in such a super-high speed, all kinds of urban activities are still organized orderly, and turns to cleaner and cleaner.

Hundreds of scholars have studied Shenzhen Miracle from various perspectives, and several significant factors having significant relationship with the Miracle are summarized: (1) the booming of market-led economy in China from economic perspective; (2) the preferential policies Shenzhen enjoyed as an Economy Zone from politic-economic perspective, (3) the geographical location nearby Hong Kong from Eco-geographic perspective and (4) effective and efficient urban planning system Shenzhen applied. The paper focus on the urban planning system, and most of the materials of the paper are collected from published papers and hundreds of urban planning reports and projects Shenzhen Urban Planning and Research Institute owns. At some degree, the paper is more an introductive and collective work than an original work.

The paper tries to interpret Shenzhen's experience in shaping a green city, by emphasizing on the concept of linear + clusters urban modal. At the beginning of the paper, a neglected dilemma of urban development is pointed out to drawing out why the linear + clusters urban modal Shenzhen applied is a creative concept and could be learned by the world as a classic case. Secondly, three core elements of urban planning in Shenzhen--urban structure evolution, land Use and intensity control system-- are discussed. Urban structure evolution is mainly interpreted in the master plan level, while land use and intensity control system are mainly explained in the statutory plan level.

### **Part I: A neglected but essential dilemma of urban development:**

A dilemma in urban development evolution process has not been paid enough attention. Compared to its importance, the neglect is almost unbearable: the long-term relationship between the rural land and the built up area in a rapid developing city. On the one hand, while a rapid developing city is in its pre growing up period, desire of development land. New constructions could be happened in almost unlimited undeveloped area and urban development could be organized in an economic and efficient way. However, because of the limitation of its population and economic power, this evident advantage is seldom emphasized by the city government. On the one hand, once the small city grew into take off period, it would suddenly find that the former unlimited rural area now are filled up with thousands of buildings which stand up in a chaos and inefficient way. And only few undeveloped area are available for new developments. As a result, the city government has to devote most of its energy in dealing with urban regeneration in order to release available space. Communities built up in 10 or 20 years ago have been broken down, difficult and time wasting negotiations have to process, billions of government finance has to compensate those building owners, no matter the buildings are constructed by illegal or legal. Because there is no available space for new urban functions which would greatly promote the competition capability of the city, new urban functions have to locate in suburban or even other cities, citizens and new technological immigrants have to spend hours in traveling..... Such urban problems are continued in a cycling way, and the urban environment of the former young and creative becomes worse and worse. At last, only several years later, the city joins into the team of boring and demolished cities.

Shenzhen, at the beginning of its urban development, no matter by the planners' rational wisdom or the God's Guideline, avoided the dilemma by the application of the linear + cluster urban model, the transferring CBD and the acceptable cost for urban regeneration. The linear + cluster urban model, granted the super high speed of development for more than 30 years be available. The transferring CBD guaranteed the new advanced urban function could have enough land the land price of Shenzhen is balanced. The acceptable cost for urban regeneration ensured the development could still continue in the next 10-20 years and enter into its nature period while keeping Shenzhen as a green and sustainable city. The FAR division and land use control system led these ideal and sustainable concepts into practice.

### **Part II: The Linear + Cluster City: a concept has been held since Shenzhen was born**

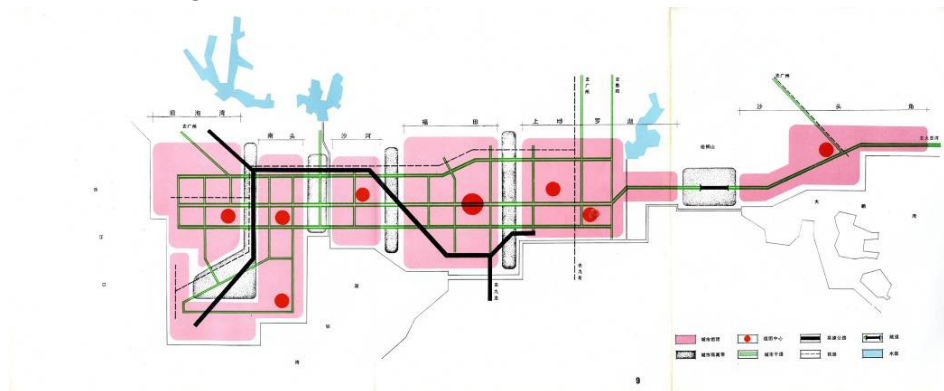
Shenzhen is a planned city and three master plans have been made since 1980, which are 1986's Master Plan, 1996's Master Plan, 2007's Master Plan. The contents and characteristics of the three master plans are interpreted to show how the linear+

cluster city modal has been executed in different developing contexts and their impacts on the urban structure of Shenzhen.

### (1)1886's Master Plan

Shenzhen is surrounded by mountains and the land nearby Shenzhen River and the Pacific Sea is the ideal space for urban development, According to the nature geography, 1986's Master Plan had selected the riverside land as the developing area and designed a linear + clusters city structure for Shenzhen---several separated living-clusters connected by three express highways. The 6 developing clusters designed from east to west are: Eastern Area, Luohu Area, Futian Area, Shahe Area, Southern Area, and Sea Reclamation Area (Figure 1). Sea Reclamation Area is created by sea reclamation. Each of the 6 area is separated by green belts and public spaces and each is self-supported with its own sub center, while Huaqiangbei Center in Luohu Area is designed as the operating CBD of Shenzhen. The development of each cluster is scheduled orderly: the two clusters just between the middle and the end of the "urban express line"---Luohu Area and Southern Area--- are planed to develop firstly, and the others would be controlled as undeveloped area until the development of the firstly-developed two clusters have almost finished and operate well.

Figure 1: The Urban Structure of 1986's Master Plan



Source : The General Planning of Shenzhen Special Economic Zone, 1986

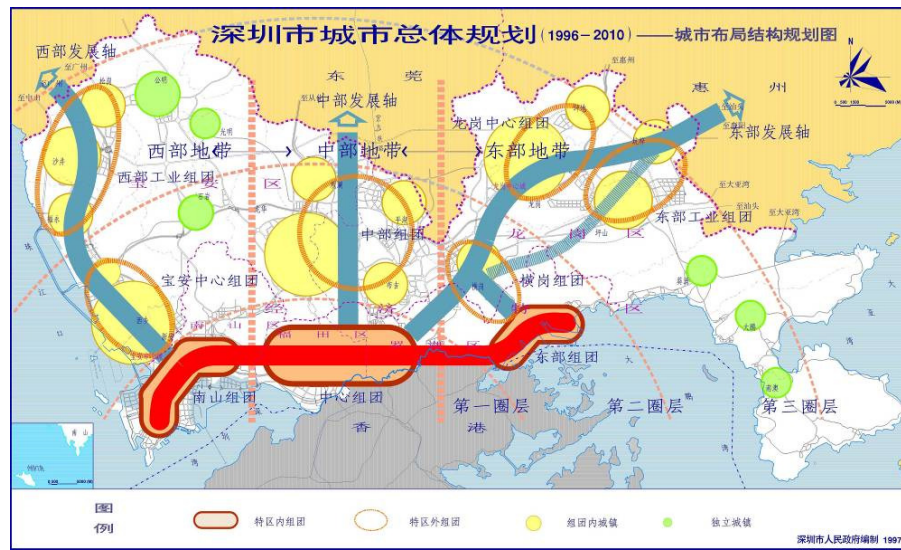
1986's Master Plan is a very bold and over-seeing plan, not only because of the linear + clusters urban modal, but also because of its bold assumptions. Several bold assumptions have been set up in 1986's Master Plan. Firstly, the population of Shenzhen at the end year of the plan would be 1.1 million people, 5 times than the population in Shenzhen in 1986. Secondly, the public facilities and infrastructure construction should be more visionary and the capacity of public facilities and infrastructure should maintain 1.5 million people's daily urban life. Moreover, the capacity of public transport is designed to accommodate 2 million populations. These bold assumptions and the linear + clusters urban modal guaranteed that Shenzhen could still operate well even if the actual development was more dramatic than the over-seeing planners' prediction. The population of Shenzhen had already achieved to 2.4 million at 1996, 10 times than the population in 1986, double time than the

planned population. The oversize population has stressed great pressure on urban daily operation. Futian Cluster and Xiasha Cluster have to start developing before the scheduled year. However, as the area of each clusters are strictly controlled, the public space and greenbelts were kept and not occupied by new constructions; as the public facilities and public transportation is designed to contain 2 million population, Shenzhen operated well and did not go into chaos during the planed years.

## **(2) 1996's Master Plan**

The developing context of 1996's Master plan is totally different from that of 1986's Master Plan. While the area of Shenzhen in 1986 is only 327 square kilometers, the area of Shenzhen in 1996 has expanded to its current 1951 square kilometers. The rest 1623 square kilometers area is not rural lands but urban sprawl area. More than half of rural lands had been occupied illegally by millions of illegal buildings because of the lack of a united plan and a strict land control system, thousands of high energy-consumed factories were built-up and urban pollutions become worse and worse, especially the rivers in the politic govern region were serious polluted. The development context in 1996 certainly was not as ideal as 1986's Master Plan. Some necessary revisions of linear + clusters urban modal were made to accommodating the new changes. Firstly, the planned area had expanded to cover the whole politic govern region of Shenzhen. In order to promote the urban environment of the new added area, the first urban-rural plan in China was made in the 1996's Master plan, where the nature reservation area and non-development area are protected by using urban growth boundary method. More than 1000 square kilometers land among the total 1951 square kilometers land are protected as the farmlands and ecological lands. No constructions were permitted in the farmlands and ecological lands and the existed constructions were planned to break down step by step within a 10 year period. Secondly, the appearance of the linear + clusters urban modal had changed while keeping the core idea of a growable and sustainable city(Figure 2). The original 6 clusters in the 1986's master plan were induced into 3 clusters and were emphasized as the core developing corridor. Three radical developing corridors expanded from the core developing corridor were designed to guild the development in the new added area. Each developing corridors has 4-5 growth hubs where would concentrate new developments in future.

Figure 2 the Urban Structure of 1996's Master Plan



Source : The Comprehensive Plan of Shenzhen(1996-2010), 1996

### (3) 2007's Master Plan

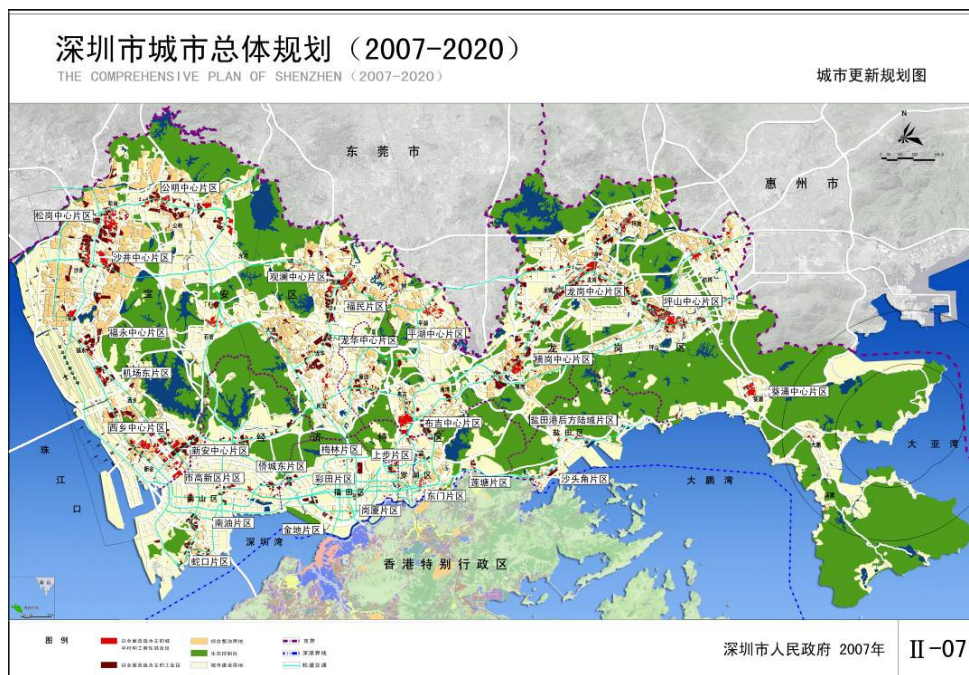
Another developing problem appeared since 2006: the strict protection of farmlands and ecological lands, together with the super high speed of development, led Shenzhen to be out of undeveloped area. 690 square kilometers area had been constructed as built-up area in 2006, the available land allowed to develop is only 100 square kilometers among the total 1950 square kilometers area. However, almost all scholars and planning officials believe that Shenzhen is still in its take off period and the rapid development of Shenzhen would continue in the next 15-20 years, thus Shenzhen had to deal with the dilemma of urban development mentioned in the part I, How to create new urban space for urban development in future became the key for the success of 2007's Master Plan. 2007's Plan tried to transfer the traditional urban development relied on land expansion to a new urban development I relied on urban regeneration.

According to the urban land shortage, what 2007's Master Plan has applied is not to reduce the area of farmlands and ecological lands and thus challenge the linear + cluster urban modal, but an urban regeneration strategy in order to protecting its sustainable urban structure.. More than 200 square kilometers area among the 690 square kilometers built up area has been signed as urban regeneration area though most of them were built within 30 years, including old industrial zones, urban villages, and residential communities built up in the 1980s. Two common characteristics have to be found in the selection of the three classic areas: (1) the owners of these urban regeneration areas are not private but semi-public stakeholders, which means the

lands in these areas are distributed to the shareholders by the government without levying any payment. (China is a communalism's country). (2) There are strong regeneration intension existed, no matter it is the residents', stakeholders', or the government's developing intension. The two selecting standards ensured there are fewer objections in its urban regeneration process.

Compared to other cities, the costs of these urban regeneration areas in Shenzhen, including the clearance of the buildings and the compensation of the stakeholders, are much more acceptable, mainly because the linear+ clusters urban structure, at some degree, has created a relatively homogenous land market price in Shenzhen.

Figure 3 the Urban Regeneration Areas in 2007's Master Plan



Source : The Comprehensive Plan of Shenzhen(2007-2020), 2007

### Part III transferring CBD: an idea never imaged before

Besides the linear + clusters urban modal, there is another creative concept been applied in Shenzhen, which is the idea of transferring CBD. The visionary planners of Shenzhen had found a truth while they were exploring the experiences of urban development in the Western countries that the urban transformation from the pre-developing period, to the take off period, to the nature period always needs a creative CBD. As the development speed of Shenzhen is so rapid that Shenzhen might finish its transformation of the all phases in a relatively shorter time, maybe 50 years, then it would be evident that those traditional and classic land use modals introduced in the textbooks would be failed to support the urban transformation process, no matter it is the co-circle modal, or the section modal, or the multi-center

modal. The unchanged CBD of the traditional models could not release enough urban space for new urban functions appeared in the new urban development period in a 10-20 years interval. Only the transferring CBD idea could ensure the new and advanced urban functions could have enough and unified land in the downtown area to support its development, therefore, Shenzhen could have a new growth hub in different developing period to drive its rapid development.

The transferring CBD idea has been applied in all the three master plan of Shenzhen. Huaqiangbei Center in Luhu area was designed to be the operating CBD of Shenzhen in the pre-developing period and the Futian Center in Futian Area was reserved to be the operating CBD in the take off period in the 1986's Master Plan. Futian Center in Futian Area started construction until the end of 20<sup>th</sup> century and now it is the financial and administrative center of Shenzhen. The 1996's Master Plan has designed the Seafront Center in the Sea Reclamation Area as the operating CBD of Shenzhen in the nature period, where some international planning competitions and research reports had held and finished. The newest 2007's master Plan confirmed Futian Center and Seafront Center as the double CBDs of Shenzhen in the take off period, and 4 new vice functional centers were designed to assist the transferring CBD idea. The distance and relationships among these transferring CBDs are carefully measured and considered. For example, the distance between the new CBD and old ones is always controlled within 20 Kilometers. The location selection of new CBD is always in the same direction of the development in future and the companies and enterprises locating in the new CBD are selected by a series of complicated and strictly requirements.

#### **Part IV: FAR and Density Regulation: an up – down Land Control System**

The concept of linear + clusters urban structure designed in the three master plan, could not be realized if the statutory plan had not been applied into the urban planning system of Shenzhen in 1997. Just after the urban area expansion, the city government of Shenzhen had found that a more detailed plan should be introduced to control FAR and land use of each parcel. What Shenzhen selected is the Statutory Plan from Hong Kong, not the popular used zoning plan in United States. The most essential elements of statutory plan related to the linear+ clusters urban modal are listed below: (1) FAR Division; (2) Land use control.

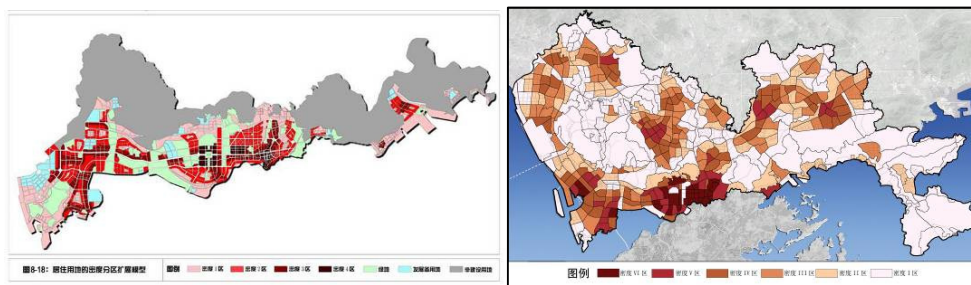
##### **(1) FAR Division**

FAR is the most directly and measurable indicator for city intensity. Shenzhen has applied a strict and logical system – FAR Division--to control the FAR of each parcel in built-up area. FAR Division is a typical up-down control system created by Shenzhen in 2001 and popularly used in mega cities in China. Different from the traditional FAR management regulation, the FAR of each parcel is theoretically different by using the FAR division, even among those parcels with the same residential zone. The methodology used to decide the FAR of each parcel could be summed as: Firstly,



according to the prediction of planned population in Shenzhen and the goal of urban development in the master plan, the total floor area for the whole city in the planning years is induced by using 90-100 square meters per person as the floor area standard. Secondly, the total floor area is distributed into each functional zone of Shenzhen by using a very quantitative and technological model with powerful GIS data. Five FAR Levels are classified to cover commercial zones, residential zones and other urban functional zone in the whole city. Thirdly, the FAR of each plot in each functional FAR zone is calculated by using a regression equation, which has considered several essential factors related to FAR: land use, the distance of Metro station, parcel land size, and the number of directly connected roads. Fourthly, according to the urban design, the planners have the freedom to adjust the FAR of each plot within the acceptable range. Lastly, the FAR of each plot is written into the land lease contract and Construction Permit as the legally attached requirements for development. Land Lease Contract and Construction Permit are the only legal documents admitted by the government normally.

Figure 4, the FAR Division of Shenzhen in 2001 and 2007



Sources : Left: the FAR Division Study, 2001

Right: The Comprehensive Plan of Shenzhen(2007-2020), 2007

## (2) Land Use Control

The land use control system could be divided into two parts: land supply control and land distribution control, on the one hand, is similar with the FAR division, an up down hierarchy control system is created to distribute the total planned built up area into annual land supply. The 3 level of the up-down hierarchy control system is that: Master Plan(15-20years)----Implement Plan(5 years)---Annual Implement Plan(1years). As the development situation is different each year and thus the desire of land in each year could be changed greatly, there usually is a big gap between the actually supplied land and the planned land in each year. However, as the annual implement plan is revised each year by the actual supplied land at last year, the gap between a 5 year's actual supplied land and the one in Implement Plan is much smaller, and the smallest between a 15-20 years' actual supplied land and the one in Master Plan.

On the other hand, Shenzhen has insisted on its mixed-use and high density development policy to keep green and sustainability. In the non-subway phase



(1978-1997), commercial and business are planned to be in the two sides of the three express highways, where mixed-use principles have to be applied in each united development. These express highway corridors is the gateway of Shenzhen, where concentrated the highest and most modern architectures, largest-size public buildings and urban plazas. A little far away from the commercial and business zones, it is residential zones and supporting facilities zones with community parks. Industrial zones and wharf zones are separated from the other zones by greenbelts and open space. In the subway phase (1998-current), TOD modal relied on the subway stations are broadly applied. As subway is more comfortable, accessible, time-saving, with larger capacity and passengers, the highest FAR zones transferred to these TOD area nearby the subway stations. A much broad urban functions could be located in these TOD zones, including commercial, business, office, large residential zones, and even light industrial zones.

### **(3) Other Management Tools**

Shenzhen City Government has announced *the management code of urban planning in Shenzhen* in 2001, which identified the leading role of urban planning in urban management. According to the principle of public priority, the management code had powered the planning department the rights to developing specific plans. In order to maximize the public interests, a series of specific plan has made, including Blue Line Plan(water resource, protection), Purple Line Plan( historical architectures protection), Red Line Plan( public infrastructure protection)、Yellow Line Plan(public facilities protection) and Orange Line Plan( dangerous zone protection), and. By pre-reserving the corridors related to public interests, these specific plans ensured there are enough spaces for wetlands, public space for public facilities, infrastructure, open space to support the sustainability of Shenzhen.

### **Summary**

One basic and essential fact should be pointed out before the end of the paper. The success of urban development in Shenzhen and urban planning has significant relationship with Chinese specific politic hierarchy. China is a market-led country within a socialistic politic hierarchy, which means the government intervention is powerful in urban public fields. The government of Shenzhen trends to apply rational urban planning tools and use strict urban land control system to guild urban development following the Utopia designed in urban planning, the practice is successful in Shenzhen that a 30 years rapid development of Shenzhen has occurred. In the super rapid development process, a multi -win result is got under such an efficient and effective planning system. Though the private interests might be sacrificed according to the long term interests of the whole city, the compensation the government paid to the private mostly are much higher than the lost. Thus the private in China trends to support urban regeneration projects and the application of a strict

and technological land use control system. It is true too that once Shenzhen enters into its nature period 20-30 years later, the compensation for the private would be much more higher than current and the arisen of citizens' rights protection, these successful policies in Shenzhen would be ended. There are other possibilities would lead the successful urban planning policies to the end, such as a sudden serious economic crisis happened in the world or China, the government intervention would be too weak compared to the development desire from the private, and then these strict land control policies and urban development modal would be given up and the development would followed under the market forces which would lead to urban sprawl and unregulated urban structure, just as many Chinese new booming cities are experiencing.

Behind the Aura of Shenzhen Miracle, there are some common urban development problems existed, including the dilemma between the traditional planning institution system and the quick development of market-led economy, the conflicts between current urban development policies and its 10 million rural immigrants in Shenzhen, and so on. All the problems are continuously disturbing the government of Shenzhen and planners in creating a green and sustainable city. While some new plans have implemented in Shenzhen to alleviate these problems, the effects are still in doubt.

In sum, urban planning and management is more a technological science rather than a political science in Shenzhen. The technological and quantitative urban planning system is effective and efficient in creating a green and sustainable city while keeping the rapid development speed, though the protection of the private right in land or building is weak compared to the Western. The urban planning strategies applied in Shenzhen is significantly related with sustainable development for a rapid developing city, including a linear + clusters urban structure, the transferring CBD, the FAR division and land use control system, etc.

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<sup>i</sup> The definition of city is different between China and the Western. A city over 1 million population in China is defined as big city.