Integrated management of urban green space

- The case in Guangzhou China

1. Introduction

1.1 Urban green space as solution of CO_2 reduction for fast developing cities

Besides reducing CO_2 emission via technological innovation in green buildings and energy sectors, capture and storage of CO_2 by natural eco-system is also of great importance for mitigation global climate changes. A recent UNEP report stated that Reducing deforestation rates by 50% by 2050 and then maintaining them at this level until 2100 would avoid the direct release of up to 50 Gt C this century, which is equivalent to 12% of the emissions reductions needed to keep atmospheric concentrations of carbon dioxide below 450 ppm (Trumper et al., 2009). It is also estimated that terrestrial ecosystems absorbed 28–37 per cent of its cumulated fossil carbon emissions during the 1980s and 1990s (Piao et al.).

In the context of contemporary city development the connotation of urban green space has extended to include the green space of the complex urban ecosystem consisting of various forms of non-constructional land including gardens, parks, vertical plants, forestry, farm lands, wetland and waterways(LI & WANG 2004). Conservation of the urban green spaces can build up a backbone of natural ecological network to support the sustainability of the cities. Unlike the well developed cities in Europe, for the cities in fast urbanizing countries such as China, the dynamic of expanding urban form is quite vital, which is still bringing about the decrease of natural green spaces and sprawl of construction land. A sound mechanism that can effectively manage urban green spaces will contribute to the overall CO_2 reduction performance of such cities by maintaining or even increasing the ability of CO_2 absorption via natural eco-system backbone.

1.2 Integrated management – an effective mechanism of natural resources management

Theory and methods of ecology, planning, landscape and environmental impact assessment has been well developed to identifying environmental sensitive area and planning of the urban green space, especially with the aid of up to date remote sensing and GIS technique(Baschak & Brown 1995). However, maintaining and enhancing the function of urban green space should rely on effective public policy and institutional framework.

Current literature have analyzed the green space protection practices in western developed countries and summarized both successful experience and lessons. 3 categories of public policies adopted in the United States including public acquisition, regulation and incentives can be viewed as typical example of green space protection measures for the countries with private land ownership. The implementation of policies above is facing challenges of lack of effective policy assessment, administrative efficiency and co-ordination among policies and communities (Bengston, Fletcher & Nelson 2004). Despite the long history of conserving urban green space European city regions are still trying to improve green space management by strategic planning(Pauleit 2003) .

Facing different development stages and institutional system in spatial governance, green space management in the fast developing countries in the 21st century such as China may not simply follow the same path of the western experiences. The issue is more crucial for these countries due to the extremely rapid urbanization speed, fragile natural ecological system and high population density.

The idea of integrated management and been successfully used in managing public resources such as water, land and coastal zones. One of the significant implementation of this idea is the integrated coastal zone management (ICZM) in EU. The ICZM concept was borne in 1992 during the Earth Summit of Rio de Janeiro. The policy regarding ICZM is set out in the proceedings of the summit within Agenda 21, Chapter 17(United Nations. Dept. of Public Information. 1993). The European Commission defines the ICZM as follows:-"ICZM is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. 'Integrated' in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space." The European Commission also proposed eight principles of good Integrated Management for coastal zone (See Fig. 1). Despite coastal zone is indicated in the principles, the idea can be also generally used for other public resources including urban green space (Rupprecht Consult & International Ocean Institute 2006).

Comparing the process and natural of urban green space and that of coastal management it can be found that they are similar in the complexity of components, interest groups and institutional framework. If the idea can be also successfully implemented in urban green space management, it can provide a solution for the developing countries like China.

Eight Principles of Good ICZM

Principle 1:
A broad overall perspective (thematic and geographic) which will take into account the interdependence and disparity of natural systems and human activities with an impact on coastal areas.

Principle 2:
A long-term perspective which will take into account the precautionary principle and the needs of present and future generations.

Principle 3:
Adaptive management during a gradual process which will facilitate adjustment as problems and knowledge develop. This implies the need for a sound scientific basis concerning the evolution of the coastal zone.

Principle 4:
Local specificity and the great diversity of European coastal zones, which will make it possible to respond to their practical needs with specific solutions and flexible measures.

Principle 5:
Working with natural processes and respecting the carrying capacity of ecosystems, which will make human activities more environmentally friendly, socially responsible and economically sound in the long run.

Principle 6:
Involving all the parties concerned (economic and social partners, the organisations representing coastal zone residents, non-governmental organisations and the business sector) in the management process, for example by means of agreements and based on shared responsibility.

Principle 7:
Support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate.

Principle 8:
Use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management.

Figure1 Principles of good Integrated Management (Source: Rupprecht Consult & International Ocean Institute 2006)

From the above prospectives, this paper will discuss the mechanism of green space management in China through analysis of the evolution of the case in Guangzhou, the 3rd largest of the country and further argue integrated management of urban green space could provide an in-direct solution for reducing CO_2 emission.

2 Social-Economic Contexts

2.1 Institutional framework of green space management in China

Under the extended concept, urban green space area contains the following basic elements: municipal Parks, Community Gardens, River and Streams, Costal Wet Lands, Scenic Zones, Forest Parks, Arable Lands, Timber Land and Natural Conservation zones. After the investigation of legislation, regulation and institutional setup relating to the management of urban green spaces, a brief summary of the institutional hierarchy of urban green space management is listed as table 1. Different departments of a city government are in charge of the construction, maintenance and management of these elements. Over the city government, the corresponding government departments in national or provincial level issues national/provincial wide regulations for management of different urban green space elements and also implement direct manage the key area of some elements. The spatial boundary, land use intentions and construction activities are under administration of both planning control of the urban planning bureau and quantitative quota control by the land and resource bureau. The result of investigation above shows that the spatial control, construction and management of urban green space are fragmented in a complex institutional framework. The modern ecological view of urban green space requires five key principles of content, context, dynamics, heterogeneity and hierarchies to achieve its service function, which would require co-ordination among different governments during planning and implementation process(Flores et al. 1998). Whether or not such co-ordination is efficient will decide the result of urban green space management.

Table 1 The institutional hierarchy of urban green space management in China

Departments \ Element			Municipal Park	Community Garden	River & Stream	Costal Wet Land	Scenic Zone	Forest Park	Arable Land	Timber Land	Conservation zone
National	Provincial	City									
M. of Construction	P.D. of Construction	B.of Urban Planning	o	o	o	o	o	o	o	o	o
		B.of Municipal & Landscape	*	*	*		*				
M. of Land & Resources	P.D. of Land & Resources	B. of Land & Resources	o	o	o	o	o	o	o*	o	o
M. of Water Resource	P.D. of Water Resourc	B. of Water Resources			*						

	e										
S. B. of Forestry	P.B. of Forestry	B. of Forestry						*		*	
M.of Agriculture	P.D. of Agricult ure	B. of Agriculture ,Marine & Fishery							*		
State B. of Marine	P.B. of Marine					*					
State Admin. Env. Protection	P. B. of Environ mental Protecti on	B. of Environme ntal Protection									*

M.= Ministry P.D=Provincial Department B.=Bureau

*= in charge of construction and conservation °= in charge of planning

2.2 Expansion of City Boundary

The land use reform and rapid economic growth in China have resulted in the conversion of a significant proportion of agricultural area around the major central cities into areas with rapid

growth of non-agricultural activities. Such area was defined in literature as of peri-urban zone(Lin 2001) or deskota(Yichun et al. 2006) . This phenomenon has broken the original structure of urban/rural dichotomy and led to various ecological/environmental problems. During the first half decade of the 21st century, a lot of central cities in China spatial development of decentralization and managed to get approval of central government to converting surrounding counties into new urban districts directly under the control of city governments.

Guangzhou, the capital city of Guangdong province, also merged with the two county-level cities Panyu and Huadu by changing both cities into urban districts in June 2000. The urban district area increased from 1440 km2 to 3715 km2 (Figure 2). Although these areas covering most of the peri-urban zone or deskota have namely become part of the urban districts over one night, the upgrade of social economical characteristics including land ownership, industrial structure and government administration hierarchy of these districts from rural county level to a matured urban district level will take a long time. On the aspect of urban green space conservation and management the city did realized the importance of an urban green space network and included sustainable ecological environment as one of the main strategies in the city's master development strategic plan after the merge with Panyu and Huadu. However, the expansion of city boundary also brought about both challenge and opportunity to including the green space elements in the peri-urban area into a greater urban green space network. Lack of planning and the difficulty of development control on the rural lands with collective ownership are the major challenges. On the other hand it was an opportunity for the city government to have a broader prospective in ecological safety to research and manage the urbanization process of the metropolitan area after the expansion. Started with the original green space management framework, which was compatible for the original urban area, the city government began an exploration aiming at efficient construction, maintenance and management of the ecological backbone to support speedy growth of the city.

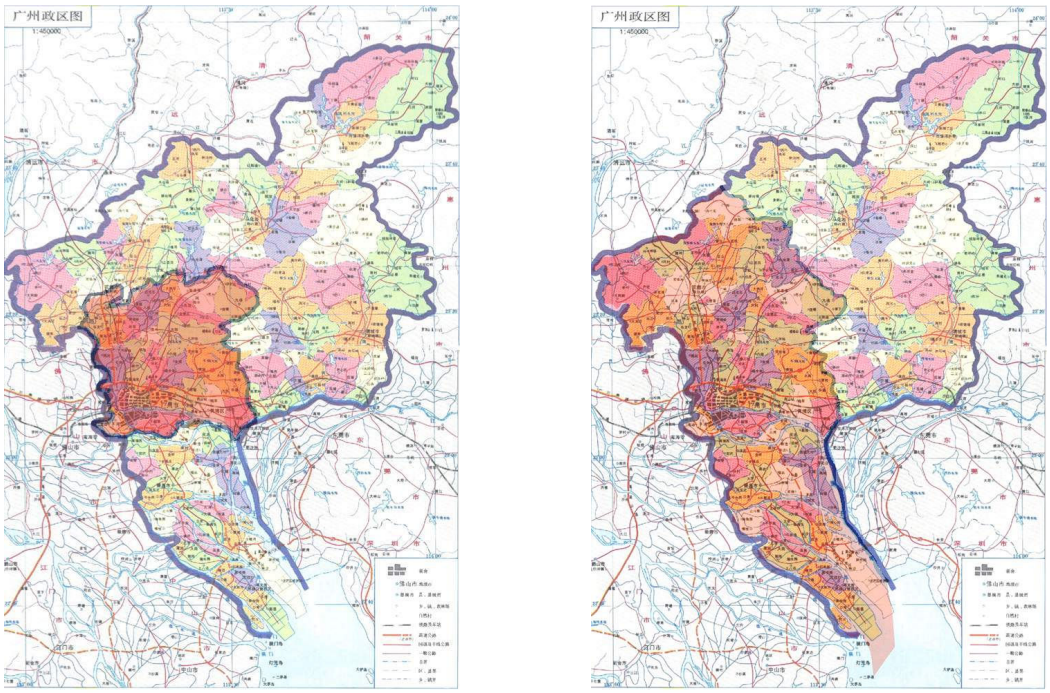

Figure2 Expansion of Urban District Boundary of Guangzhou in 2000 (Urban Planning Bureau 2001)

3 Analysis of urban green space management practice of the city government of Guangzhou

3.1 Planning the overall spatial structure of urban green space

Before the expansion of the city boundary, the development within the former 1434 km2 of urban districts of Guangzhou had been following the trend of a 2-direction linear pattern to the north and east around the mountainous area in the north east part of the city. Municipal parks, squares and the Baiyun Mountain scenic area are owned by the government and under effective maintain. Some rural arable lands such as the fruit land conservation area in the southern edge and vegetable lands between Tianhe and Huangpu district were designated by the city master plan as green belt area with relatively strict development control. Although not having been defined as a whole system, the key urban green space elements were given concern in some extent through experience and traditional planning research. After the city expansion in 2000, the new urban district area of 3700 km2 did not have an integrate master plan. Except for the original urban district area and the central town of Panyu and Huadu, other areas had never been systematically planned. Setting up the new ecological framework

and deciding which area should be reserved were imperative for urban green space management because the desire for land development and urbanization in the rural area was inspired by the urban boundary expansion. This problem aroused attention from different departments of the government and several plans relating to different urban green space management were put forward. On the aspect of the hierarchy, these plans can be divided into two categories: Plans for the overall spatial structure of urban green space, and detail plans for construction and conservation of urban green space. This section will first describe the planning process and results of plans for the overall spatial structure and the detail plans will be discussed with implementation problems in the next section.

Comprehensive Strategic Development Plan of Guangzhou

(Urban.Planning.Bureau.of.Guangzhou 2001)

After the urban boundary expansion in 2000, on behalf of the municipal government of Guangzhou, the Guangzhou Urban Planning Bureau launched the strategic development plan program to formulate the long term development strategy under the new boundary condition. The research result of The On the first stage of research, consultation was made among 5 famous universities and planning institutes around the country. Urban ecological environment was one of the tree key themes of research required by the municipal government. The second stage of the research was an integration of the consultation documents by the bureau and finalizing a governmental document as Comprehensive Strategic Development Plan. The plan put forward the strategic objective that by establishing a natural ecosystem well balanced with the urban construction system, and forming an urban and rural ecological safety pattern, a favorable circulation of urban and rural ecology will be achieved to promote the co-existence of the city and the nature, ensure, facilitate and lead the city's sustainable development, ultimately lay solid foundation to turn Guangzhou into a beautiful eco-city most suitable for business, inhabitation and living. The plan emphasized mountain, city, farmland and sea as four physical features of the city and put forward the framework of a regional Annular Eco-Corridor and the other Eco-Corridors (three in north-south direction and four in east-west direction) are developed to create a multilevel, multifunctional, three-dimensional and networked ecological structural system. After ecological sensitiveness analysis and land suitability analysis, the plan carried out the policy classification and zoning of the ecological environment by defining the Eco-Conservation Zone, Eco-Regulative Zone, and Eco-Balanced Zone covering the whole city.

Sustainable Development Plan for Eco-City of Guangzhou

(Env.Protection.Bureau.of.Guangzhou 2002)

At the same period, also on behalf on the municipal government, the environmental protection bureau launched the research on Sustainable Development Plan for Eco-City of Guangzhou. Based on the urban nature-economy-society complex eco-system theory, the plan set up the evaluating indicator system of urban ecological sustainable development level of Guangzhou is on the stage of semi-healthy. The plan also put forward a 3 step objective to improve the city's urban ecological development level to the stage of healthy. Applying GIS techniques and ecological functional zoning, the plan put forward an alternative spatial framework of urban green space: Based on the four physical features mountain, city, farmland and sea, the plan proposed three green corridors in the north and one ecological corridor from north to the south. The fruit land in the southern edge of former urban boundary is considered as the green core of the city. The plan also suggested conservation of green belts and green area along the water/stream network in the south to prevent urban sprawl.

Outline of Eco-city Plan

Comparing the overall spatial structure in the two plans mention above, the difference is obvious. Such difference comes mostly from the different aspects concerned by different departments and the knowledge background of the experts invited. The fast development trend of the city could not wait for academic debate to reach agreement. The plan and development commission (now called the development and reform commission) of the municipal government soon began the work of integration of the research and plans relating to ecological environment and sustainable development from different departments of the municipal government. The result of the integration is called the Outline of Eco-city Plan and got approval from the municipal government. This integration provided the municipality a set of explicit strategies in ecological conservation, environmental protection and sustainable development. In this plan, on one hand the spatial structure for urban green space from the Comprehensive Strategic Development Plan was adopted, on the other hand the indicator and objective of the Sustainable Development Plan for Eco-City was also adopted. The overall urban green space structure was decided after this plan.

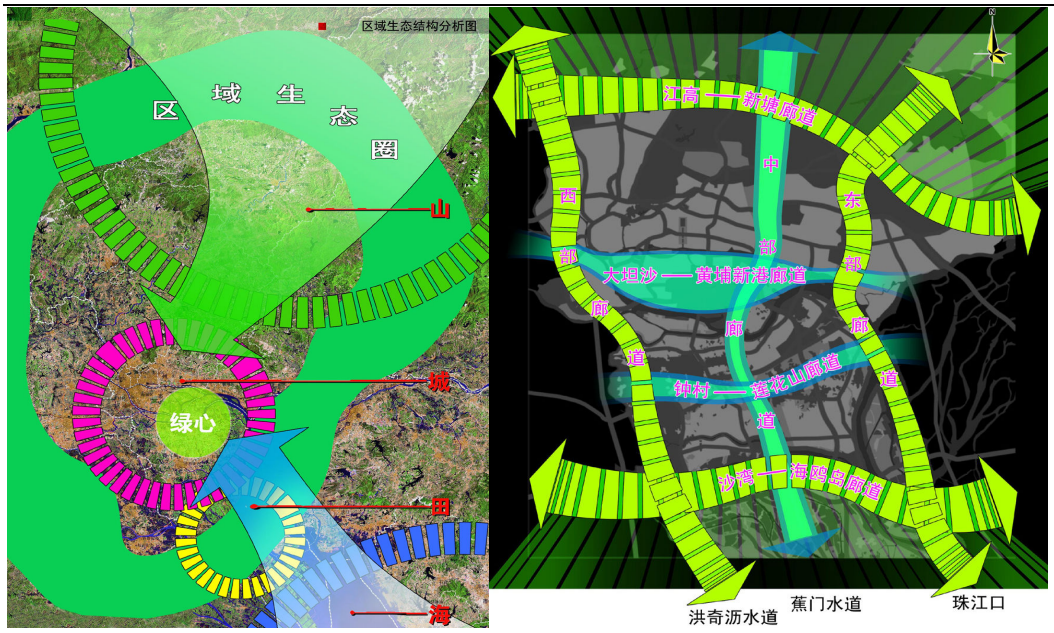

Figure3 Overall spatial structure of urban green space in Comprehensive Strategic Development Plan (Urban.Planning.Bureau.of.Guangzhou 2001)

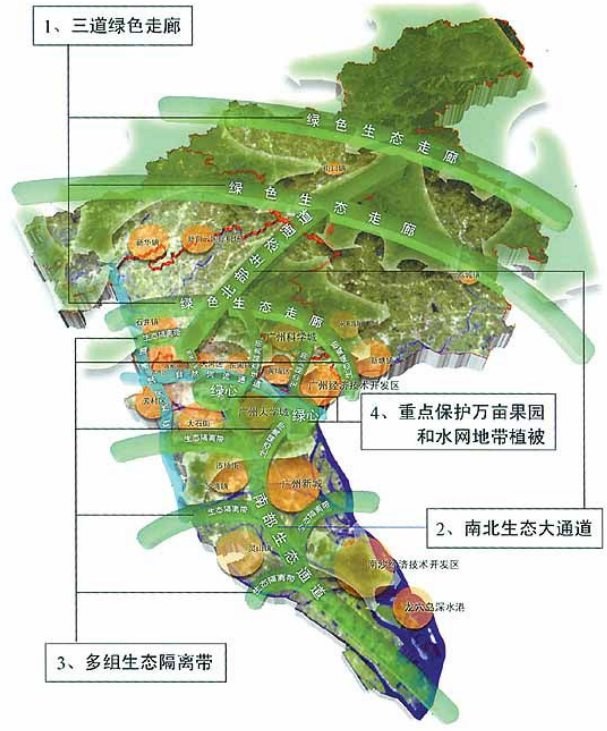

Figure 4 Overall spatial structure of urban green space in Sustainable Development Plan for Eco-City of Guangzhou (Env.Protection.Bureau.of.Guangzhou 2002)

3.2 Detail plans of urban green space maintenance and construction

As soon as the overall spatial structure was decided, detail plans for conservation and construction for specific urban green space elements were put forward. The Green Space System Plan for the Central Urban Districts and Eco-corridor Control Plan in Panyu District are two typical detail plans covering the former central urban districts and newly included urban districts respectively. This section will describe the characteristics of these two plans and the implementation results of both plans.

Green Space System Plan for the Central Urban Districts

(Municipal.and.Landscape.Bureau.of.Guangzhou 2001)

The Green Space System Plan for the Central Urban Districts was put forward by the municipal and landscape bureau in 2002. The plan covers the urban area before the expansion in 2000. Following the overall spatial structure, the plan put forward the detail spatial structure of the central urban area by enhancing green space elements such as the green belts along the Pearl River, the two city axes, the key express way rings and green cores in the Baiyun Mountain and two preserved farmland in the south and west. Guided by the urban green space standards and regulations by the Ministry of Construction and helped by an planning GIS system, the plan also proposed a list of green space lots to be conserved or constructed with specific boundaries. If this plan were to be implemented successfully, the landscape and environmental quality of the central urban district area would be greatly improved. Unfortunately the plan failed to include the complex data of land use rights and planning permits in the old urban districts, which made it impossible to assess the cost of changing land use right or planning permits. The plan was highly appreciated by experts but did not get approval from the municipal government.

Eco-corridor Control Plan in Panyu District (Urban.Planning.Bureau.of.Guangzhou 2003)

The Eco-corridor Control Plan in Panyu District was a pilot approach by the urban planning bureau to implement development control in the proposed eco-corridor area of the newly included district of Panyu. Based on remote sensing land-use survey and ecological service function analysis also including the current land-use right data, the plan put forward the detail boundary of eco-corridor control area specifying the eco-corridor structure of the

Comprehensive Strategic Development Plan. In order to achieve successful development control, the plan also graded the lots in the control area into three levels and gave development control parameters such as land use intention, open space coverage and population etc. When the plan was finalized, different opinions came from the towns and Panyu district. As a newly included district, the economic development pattern did not changed much from the former peri-urban area. The key development engine depends on the setting up of industrial or residential real estates by towns or villages. Implementation of the eco-corridor control plan would decrease the flexibility for the attracting investment. Hence, the towns and district government delayed the process of approving the plan. During the delayed period, the Ministry of Railway proposed to build a new high-speed train station in one of the protected area proposed by the plan and got approval because it is a national key project and there is no approved plan of conservation of that area.

The two examples above show that up-to-date technique can help to define the area for protection scientifically, but the implementation of detail plans of urban green space will affect the complex issues of land use right and development rights. Making a well balance of protection and development in urban green space management is far more beyond the ability of one single department of the municipality.

3.3 Three-year action plan - the integrated implementation approach

Facing the challenge during implementation of plans on urban green space, the municipal government initiated an alternative approach as formulating and implementing an action plan for improving the overall environmental quality of the municipality through administrative directive. This action plan is called projects for greener mountains and green land. The formulation process of this plan can be divided into several steps. Beginning with the collection of plans relating to urban green space management, the goal and objective of all the plans and compared and grouped by different stages. The second step was compiling the goal for this 3- year action plan based on the results of the first step the goal was both descriptive and quantitative. The third step is formulating action task inventory to support the goal of the second step. Each task is an explicit one with the responsible entity of bureau or district level and investment estimation. After the draft of the action plan was finished, it was circulated among bureaus and district governments for their comments to make sure that the task is within the capability of the responsible entity. The finalized action plan proposed to establish or upgrade 119 km2 of green space around the municipality including 33 km2 of

green space in the core urban area. The action plan was launched in October 2003 (Guangzhou.Municipality.Government 2003).

The explicit plan was smoothly implemented within the past three years. Under the integrated arrangement of the municipality government with administrative power and relatively sufficient investment, the tasks were successfully finished. By the end of October 2006, 131 km2 of green space including 36 km2 in the core urban area was established or upgraded. Through this action plan, a green space network including forest parks, public parks, green belts along highways, vertical green landscape on bridges and re-vegetating of demolished quarries. With the explicit responsibility, some creative solutions of solving interests were reached. For example, in some proposed green belt areas where land is collectively owned by the town and villages. The lands were leased to greenery companies for nursery uses. This solution brought both economic benefits and employment opportunity for the towns and villages. On the aspect of environmental quality, the nursery built on these lands can provide green open space and is much more environmental friendly than industrial estates(Aihua, Fang & Yongsheng 2006).

3.4 Evaluation of Guangzhou's urban green space management practice

The various versions of plans for urban green space put forward by different departments of the municipal government provide a broad perspective of the urban green space system. Throughout the planning process of each individual plan, experts from national wide were invited to provide top knowledge base for the plan. Different departments' view on urban green space system and some public consultation process can to some extent represent diversity of interest groups relating to the urban green space system. Researches on both strategic level and implementation level were conducted provided a balance of long term objective and short term goals.

The three year action plan integrated the different planning proposals from different departments through brief negotiation and distributed the responsibility through administrative power as explicit tasks. Non-governmental organization and public participation were not included in formulating the action plan. Given the social environment and emergent need for preserving urban green space after the boundary expansion of municipality, the effect of this action plan is still positive despite of the neglect of opinions of NGO and public participation. The action plan is also an approach to facilitate coherence between sectoral policy objectives

and coherence between planning and management. During the implementation of the tree year action plan, some flexible solutions were reached to respond to practical need of the interest group involved.

Based on the evaluation above, we can find the significant trend of complying with the principles of integrated management. Although not clearly defined as a set of integrated approach, the municipality's practices on urban green space management is already on the track and gaining some positive results. If a framework of integrated urban green space management can be more systematically defined and implemented the result could be even better.

4 Recommendations on improving integrated urban green space management

The practice of integrated urban green space management is a pilot trial but it is only partly success in the short term action plan implementation. The whole framework is still un-matured and needs improving in the following aspects.

4.1 Better public participation

In order to achieve the principle of broad perspective of integrated management, a better public participation in the planning and decision making process is needed. Current planning processes are basically based on experts and government decision. Public participation was conducted to at the final stage of planning results. The experts and government officials have good professional experience but they are usually not as familiar as the planning object with the people facing it everyday. Due to the complexity of urban green space system, a broader public participation during the planning process is essential for reaching agreement and reducing difficulty for plan implementation.

4.2 Broader involvement with related interest group to share the responsibility

In the three year action plan of Guangzhou, the responsibility to establish and upgrade green space was mainly laid on governmental bureaus and district governments. In fact the conservation of urban green space is also related to different interest groups such as green NGOs, urban or rural communities, villagers, real estate developers etc. The government can

also try to include these interest groups into the action plan for urban green space management by providing incentives and sharing the responsibilities with them.

4. 3 Legislation support

In the practice in Guangzhou, the responsibility distribution in the three year action plan was by means of administrative power. When the plan is successfully implemented, the responsibility is some how going to the end. The sustainability of urban green space management shall depend on the entities holding the long term responsibilities. The distribution of long term responsibility will rely on legislation support. As discussed in the part of social and economic context, the original institutional framework for urban green space management had already distributed the responsibility in an intertangled pattern. Experience from some other cities can be adopted. The city of Shenzhen issued the regulation of ecological control line defining both the clear boundary of urban green space and the responsibility among the government departments of the city. In Hong Kong, with the effective co-operation under the explicit regulations in the Town Planning Ordinance and Country Parks Ordinance the urban green space management is succeeded along with the rapid economic growth since the 1970s. Local legislation can be solution to improve the original framework to achieve explicit distribution of responsibilities.

5 Conclusions

Sound management of urban green space can provide an additional solution for low carbon development of cities in fast growing stages. The management of urban green space such citiesis facing the challenge of confliction between expansion of urban area and the conservation of green space. The green space management in Guangzhou, China is showing the trend of adopting the principles of integrated management, which is one of the effective approaches in managing public resources. Better defining and implementing the integrated urban green space manage framework can be an effective solution to improve the ecological environment in fast developing cities.

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Reference:

Aihua, L, Fang, Z & Yongsheng, O (2006), "Review on the projects of greener mountains and lands", People's Daily.
Baschak, LA & Brown, RD (1995), "An ecological framework for the planning, design and management of urban river greenways", Landscape and Urban Planning, vol. 33, no. 1-3, pp. 211-25.
Bengston, D, Fletcher, J & Nelson, K (2004), "Public policies for managing urban growth and protecting open space: policy instruments and lessons learned in the United States", Landscape and Urban Planning, vol. 69, pp. 271-86.
Env.Protection.Bureau.of.Guangzhou (2002), Sustainable Development Plan for Eco-City of Guangzhou.
Flores, A, Pickett, STA, Zipperer, WC, Pouyat, RV & Pirani, R (1998), "Adopting a modern ecological view of the metropolitan landscape: the case of a greenspace system for the New York City region", Landscape and Urban Planning, vol. 39, no. 4, pp. 295-308.
Guangzhou.Municipality.Government (2003), Three-year Action Plan for Improvement of Environmental Quality.
LI, F & WANG, R (2004), "Recearc advance in ecosystem service of urgan green space", Chinese Journal of Applied Ecology, vol. 15, no. 3, pp. 527-31.
Lin, GCS (2001), "Metropolitan Development in a Transitional Socialist Economy: Spatial Restructuring in the Pearl River Delta, China ", Urban Studies, vol. 38, no. 3, p. 2001.
Municipal.and.Landscape.Bureau.of.Guangzhou (2001), Green Space System Plan for the Central Urban Districts.

Pauleit, S (2003), "Perspectives on Urban Greenspace in Europe", Built Environment, vol. 29, no. 2, pp. 89-93.

Piao, Shilong et al. (2009)," The carbon balance of terrestrial ecosystems in China", NATURE, Vol 458,23 April 2009

Rupprecht Consult & Internationa lOcean Institute (2006), Evaluation of Integrated Costal Zone Management (ICZM) in Europe (Final Report).

Trumper, K., Bertzky, M., Dickson, B., van der Heijden, G.,Jenkins, M., Manning, P. (2009) "The Natural Fix? The role of ecosystems in climate mitigation. A UNEP rapid response assessment.",United Nations Environment Programme, UNEPWCMC,Cambridge, UK

United Nations. Dept. of Public Information. (1993), Agenda 21 : programme of action for sustainable development : Rio Declaration on Environment and Development : Statement of Forest Principles, United Nations Department of Public Information, New York.

Urban.Planning.Bureau.of.Guangzhou (2001), Comprehensive Strategic Development Plan of Guangzhou.

---- (2003), Eco-corridor Control Plan in Panyu District.

Yichun, X, Mei, Y, Yongfei, B & Xuerong, X (2006), "Ecological analysis of an emerging urban landscape pattern desakota: a case study in Suzhou, China", Landscape Ecology, vol. V21, no. 8, pp. 1297-309.