

Planning for Eco-Cities in China: Visions, Approaches and Challenges

Eco-Cities: Planning for Sustainability

The concept of “Eco-Cities” has recently attracted attention of the local governments, the planning profession as well as the development industry in China. Until now, there has never been a standardized definition of the term “Eco-City”. Nevertheless, in general, the concept of Eco-Cities is closely aligned with the concept of sustainable development: through the adoption of sustainability as the driving objective and the integration of ecological and resources management principles into the urban planning decision making process.

However, to strive for the planning and the building of eco-cities, one faces the challenges that innovative paradigms, methods, decision making models and planning process are needed. Particularly in the context of planning practices in China, the conventional approach and mindset may not be adequately positioned to achieve the planning goals of eco-cities.

This paper discusses the following aspects of planning for eco-cities in China:

- The Fundamental Concept of “Eco-Cities”
- New Mindsets and Planning Approaches
- Planning for Eco-Cities in China
- The Opportunities : the Policy Setting
- Challenges in the Implementation of Eco-Cities in China
- Case Study: The Proposed Changxing Eco-City in Beijing
- The Pathway Ahead

The Fundamental Concept of “Eco-Cities”

The concept of “Eco-City” originates from the fundamental objective of sustainability and the application of ecological principles to urban planning, design and management. The definition of sustainability has already been widely discussed in different publications across various related professions and this paper does not intend to repeat it here. In short, “Sustainability” in urban planning is to manage the urbanization and development process to balance the social, economic and environmental needs of our society as a whole, and ensure that the choices of our further generations will not be compromised. Eco-Cities are a concept to achieve this sustainability by taking the ecological principles as the central driving principles for the planning of our cities (Huang G Y et al 2002).

The author stresses the fundamentals of the planning concept is hence reflected in the

following three aspects:

- a. City itself is fundamentally a system of social, economic and environmental processes, with resources input and output characteristics
- b. Cities are part of the global ecological system and they are interdependent with the natural ecological processes. Changes to this relationship may or may not be reversible.
- c. One needs to incorporate the goals of reducing energy input (to avoid unnecessary use of resources), recycling the resources within the city systems, and minimizing the output of waste (to protect the environment) into urban planning decision making
- d. Because cities are part of the ecological systems, the principles of carrying capacities, ecological value, diversity, ecological chain, resource management, ecological footprints are directly relevant to the urban planning decision making processes

New Mindsets and Planning Approaches

The above fundamental concept brings up an important issue: while our conventional focus on making urban planning decisions very often focus on the spatial issues such as locations, physical forms, massing and scale of the various components of the built environment (the tangibles), one must widen the perspectives with reference made to how the planned communities would demand the use of our scarce resources in terms of energy, food, water, clean air, etc (the intangibles).

Eco-cities concept implies that the planning for sustainability is to plan the communities in order to conserve our global resources based on ecological principles. Planners need to integrate the “tangibles” with the “intangibles” in plan making, development control, urban design, and the making of planning decisions (**Figure 1**).

This new mindset and planning approach demand the decision makers to look at the planning process from a new angle. The key challenges in the planning for eco-cities are:

- How can we assess the performance of the master plan in terms of sustainability ?
- Conventional planning process seldom acknowledges city as a process of resources input / output
- “Resources supply / demand” and “carrying capacity” are not widely applied to evaluation of performance land use plans and master plans
- We need fundamental paradigm shift to integrate spatial and non-spatial dimensions of sustainability
- We need new research to develop new planning methodologies and tools

Planning for Eco-Cities in China

The concept of “Eco-Cities” has been part of the research and policy issues in China over the

last 20 years. Since late 1980s, the idea to adopt ecological principles in the planning of cities in China has gained attention. At the same time, China is also one of the earliest developing countries that announce the adoption and the implementation of sustainable development strategy (Zhang K M 2003). In 1994, China announced her "Agenda 21" and explicitly stressed the importance of building sustainable settlement based on the policy areas of environmental improvement, appropriate housing, urbanization and settlement management, sustainable building industry and energy saving building, as well as enhancement of settlement energy efficiency.

By 1996, the then State Environmental Planning Agency issued the policy document "*Guidelines for the Building of Eco-Communities (1996-2050)*". The intention was to promote the planning and construction of eco-communities across the country. From the end of the 1990s, under this directive, many cities have engaged in the setting up of pilot projects or plans for "Eco-Cities" in China. By 2003, there have been 135 cities or local municipalities commencing on planning for "ecological settlement" at different scales and localities.

Over the recent years, there has been surging trends in various Chinese Cities to call for the planning and development of "eco-cities". The objectives are to apply sustainable planning and design principles in the building of new communities. In 2005, the planning of the Dongtan Eco-City at Chongming Island in Shanghai began (Shanghai Industry Investment Corporation 2006). In 2007, the China and the Singaporean Governments announced the signing of a collaborative framework to plan and develop a 30 sq km area Eco-City in the coastal new town area of Tianjin. (Sino-Singapore Eco-City Management Committee 2008) The planning for Eco-City has thus been elevated to the level of inter-governmental direct cooperation. In 2008, the City of Tangshan has started the planning of the Caofeidian Eco-City along the coastal area of the city over a site of 250 sq. km. In this project, the Phase One covers an area of 30 sq. km.

It is therefore seen that over the last 20 years, the concept of applying ecological principles to the planning of the cities has steadily gained momentum and attracted the attention of the public and private sectors. However, the visions are in place but the specific pathways leading to the implementation of these concepts are yet to be laid down.

The Opportunities: the Policy Setting

The visions of Eco-Cities can only become reality through implementation. To take the concept to detailed planning and implementation, it is necessary to integrate the concepts and planning objectives into the current statutory planning system of China. There are two immediate initiatives that are relevant and they are outlined below.

The existing planning system does offer the overarching guidance to support the planning of sustainable communities and cities. The latest version of the planning law in China, the Urban

and Rural Planning Law was recently enacted and then put into effect from 1 January 2008.

The Urban and Rural Planning Law of the People's Republic of China has provided the legal framework to require the local governments, based on Article 4 of the Law, to prepare statutory plans that implement *"the principles of planning the urban and rural areas as a whole, reasonable layout, saving the land, intensive growth and planning before constructing so as to improve ecological environment, enhance the conservation and comprehensive utilization of resources and energy, protect farmland and other natural resources"*. The law has therefore provided the strategic opportunity to promote and implement the planning for Eco-Cities in the country.

Apart from the law, the Ministry of Housing Rural-Urban development has also issued, at the end of 2007, a policy directive to provide guidance to all local planning authorities on the use of planning key performance indicators in the city-wide land use master plan preparation and monitoring (Ministry of Housing and Urban-Rural Development 2007a). In this new guidance note, the local planning authorities were requested to adopt a system of key performance indicators for their city-wide Master Plan. This system of indicators has been revised specifically to include new requirements on resource management such as: water resources balance, water re-use, efficient use of land resources, energy efficiency, emission reduction, as well as recycling activities indicators.

Challenges in the Implementation of Eco-Cities in China

While the macro legal and policy framework have been put in place, the planning of eco-cities in China faces challenges at the implementation level. These challenges can be summarized into the following issues:

1. To implement the eco-city concept one needs to take the planning concept through implementation stages such as detailed local plan making, setting of land parcel development conditions, development control and enforcement at local levels, as well as the preparation of the appropriate detailed regulatory plans. Nevertheless, the current spatial and physical planning focus of the Chinese planning system does not provide an effective means to achieve resource management planning objectives at these local planning levels. For example, if one of the key [performance indicators for the eco-city plan is to adoption 15% renewable energy for the development, the specific means to interpret this indicator at the land parcel level and as one of the planning conditions and development requirements are not available within the current planning practices. Nevertheless, without resolving this issue of implementation mechanism, the visions on driving for sustainable use of energy resources as one of the objectives for the eco-cities may not be able to be enforced.
2. The current planning system has put great focus on setting out site specific development parameters such as density, plot ratios, setback requirements etc. at the local detailed plan level --- the statutory Regulatory Plan. It is at the Regulatory Plan level that the specific development and planning constraints are laid down on the plan as part of the legal

requirements. These planning conditions based on the Regulatory Plan are also included into land use right lease agreement between the government and the land owners/developers. However, the current mandatory planning parameters used in Regulatory Plan are limited in scope and may not be able to drive all the eco-city planning intentions at the site by site level. These mandatory site specific planning parameters include:

- Land use types;
- Building coverage ;
- Building height ;
- Plot ratio ;
- Green space coverage
- Vehicular access and egress ; and
- Parking and other facilities

This list of mandatory planning parameters do not have the adequate breadth and depth inside themselves that make them fully relevant to planning issues that are relevant to eco-cities and sustainable development such as: energy usage reduction, use of renewable energy sources, rain water re-cycling, storm water management best practices, waste management as well as water treatment and re-use. The contradiction rests on the fact that the detailed Regulatory Plans indicators represent the conventional Chinese planning focus on physical planning and (the tangibles) spatial elements of the city, but little on the resource input/output systems of the cities.(the intangibles).

3. The lack of emphasis in the planning process to highlight the trade-off between different planning objectives has posed challenges to the implementation of eco-cities in China. The sustainability agenda calls for the balance amongst economic, social and environmental needs of our society. The planning process should have a transparent means to express the trade-off between different objectives and the way a balance is achieved. In other words, the use of sustainable development indicators is important as a decision making model that helps the decision makers to understand the trade-off. The achievement of a higher degree of renewable energy would means less CO2 emission but may also means higher capital investment cost. The planning for eco-cities call for the setting up of the key sustainability indicators to drive the plan making and evaluation processes. The transparency in the decision making process has its basic framework laid down in the sustainable development indicators system. Currently, such a decision making model is not yet been fully defined in the planning practices in China.

Case Study: The Proposed Changxing Eco-City in Beijing

The proposed Changxing Eco-City project in Changxin Dian of the Fengtai District, Beijing City represents a response to the call for the planning of a sustainable city in the Beijing Municipality Master Plan as prepared in 2005 by the Beijing Municipal Planning Commission. The project is located on a 600 ha site with a target population of approximately 60,000 (**Figure 2, Figure 3**).

The project has adopted the objectives to plan and implement a sustainable ecological city based on an integrated urbanism development concept; and balance the environmental, social and economic needs of the city to achieve *“energy efficiency, environmental friendliness, economic growth, and social harmony”*. The plan making process departs from the conventional approach. The project uses a set of sustainability key performance indicators (KPI) covering social, economic, environmental and resources aspects of the proposals. These sets of indicators included quantifiable targets to be achieved and are used to drive the development of the master plan options and evaluation. The overall KPI framework that is used throughout the following steps:

- Develop Project Vision & Objectives with client and stakeholders
- Establish Key Performance Indicators (KPIs)
- Identify targets and any legislative requirements
- Apply targets and KPIs to planning options and model/quantify performance
- Incorporate in design strategies

- Project Management to ensure holistic multi-disciplinary approach

The overall proposed master plan concept has achieved a level of sustainability represented by the following KPI performance.

- 1 **Density:** 600 person/ha residential gross density
- 2 **Accessibility to open space:** 100% residents within 400 m of public open space
- 3 **Barrier free design:** 20% residential unit and 100% all public facilities barrier access
- 4 **Open space provision:** Open Space > 40%; 20 s-m per person; Residential area open space >35%
- 5 **Local habitat** : 80% landscape material local species
- 6 **Accessibility to public transport:** 50% within 600m of Mass Transit; 100% within < 400 m from bus stops
- 7 **Energy:** Reduce further 20% energy consumption from current standards
- 8 **Renewable energy:** . At least 15% renewable energy
- 9 **CO2 emission:** Reduction of 50% CO2
- 10 **Water usage:** Less than 150 l/p/d for portable water usage
- 11 **Non-conventional water resources** : Non-conventional water re-uses 80%
- 12 **Rain water:** 100% rain water collection and re-use; bio-infiltration and low drainage impact development

- 13 **Waste:** 100% waste classification
- 14 **Waste recycling:** Re-cycle, re-use, re-process 70% household waste
- 15 **Construction material :** Re-cycled material 10%; re-useable material 5%, 70% material sourced from within 500 km
- 16 **Social housing:** Affordable housing 15%
- 17 **Village renewal:** Village relocated in-situ or within planning area
- 18 **Neighborhood centre:** 100% residents within 500m from local neighborhood services
- 19 **Small / medium enterprises:** 20% commercial GFA for SMEs and 3% Residential GFA for SOHO

One key point that is worth highlighting: in order to maintain the integrity of the above KPI performance at detailed planning implementation level, the project has undertaken to translate of the master planning concepts and the KPIs into detailed Regulatory Plans down to individual site parcel level. This task has employed the applications of various quantifiable modeling techniques including micro-climate assessment, water resource balance, storm-water management assessment, open space oxygen emission capability assessment, as well as the sun and solar accessibility studies. The intention is to technically translate the KPI into site specific performance requirements and urban design guidelines.

As a result, the overall vision of the Changxin Eco-city master plan concept has further been translated into a set of specific urban design guidelines that accompany the detailed Regulatory Plans. During implementation and development control process, the site specific resource and energy performance, social and economic objectives as well as the various ecological planning goals are achieved, based on clear and detailed technical specifications and control guidelines.

Concluding Remarks

The planning of Eco-Cities in China is gaining momentum and has aroused the interest of both the public and the private sectors in the country. The visions and the master plan concepts are put in place but the specific challenges rest upon the ability of the current statutory planning system in China to implement them at the detailed planning level. The current Regulatory Plans system and contents for mandatory control may have problem to incorporate all the planning principle of resource management in eco-cities. This paper has discussed the challenges and the ways ahead. Finally, the proposed Beijing Fengtai Changxin Eco-city is quoted as an example of how the planning decision making process would vary from the conventional planning practices in China.

Stanley C T YIP
Director of Planning & Development, ARUP China
Past President, Hong Kong Institute of Planners
Hong Kong, China

References:

- 1 . Lin, X D (2007) *Green Architecture (in Chinese)* (Beijing, China Construction Industry Press)
- 2 . Yao, R M et al (2006) *Sustainable Cities and Building Design (in Chinese)*(Beijing, China Construction Industry Press)
- 3 . Huang, G Y et al (2002) *Eco-City: Theory, Planning and Design Methods (in Chinese)* (Beijing, Science Press)
- 4 . Zhang, K M et al (2003) *Eco-City Evaluation and Indicators Systems (in Chinese)* (Beijing, Chemistry Industry Publication)
- 5 . Shanghai Industry Investment Corporation (2006) *Dongtan (in Chinese)* (Shanghai, United Press)
- 6 . Ministry of Housing and Urban-Rural Development (2007a) *Improving Planning Indicators System (in Chinese)* (Beijing, China Construction Industry Press)
- 7 . Chen, Q J et al (2008) “Ecological City Planning Indicators Study” *(in Chinese) City Planning Review, Vol 32, 2008*
- 8 . Ministry of Housing and Urban-Rural Development (2007b) “*Directives for Implementing Planning Indicators System for Master Plan*”(in Chinese) (MHURD Directive {2007} 65)
- 9 . Sino-Singapore Eco-City Management Committee (2008) “Sino-Singapore Tianjin Eco-City Master Plan Announcement 5 May 2008” (in Chinese) www.eco-city.gov.cn
- 10 . Zhou , Hongchun (2006), “*Circular Economy in China and Recommendations*”, *Ecological Economy*, 2006, P101 – 114
- 11 . HARASHINA, K and TAKEUCHI, K (2004), “Study on Regional Bio-resource Utilization and Recycling System in a Case of Saku City, Nagano Prefecture, Centre

Japan”, *Journal of the Japanese Institute of Landscape Architecture*, Vol.67, No. 5, P741 – 744 (in Japanese)

- 12 . State Environmental Planning Agency (1995) “*Guidelines for the Building of Eco-Communities (1996-2050)*”. (19 September 1995 SEPA Directive (95)444)

Figure 1: The Tangible and the intangible elements of Eco-cities

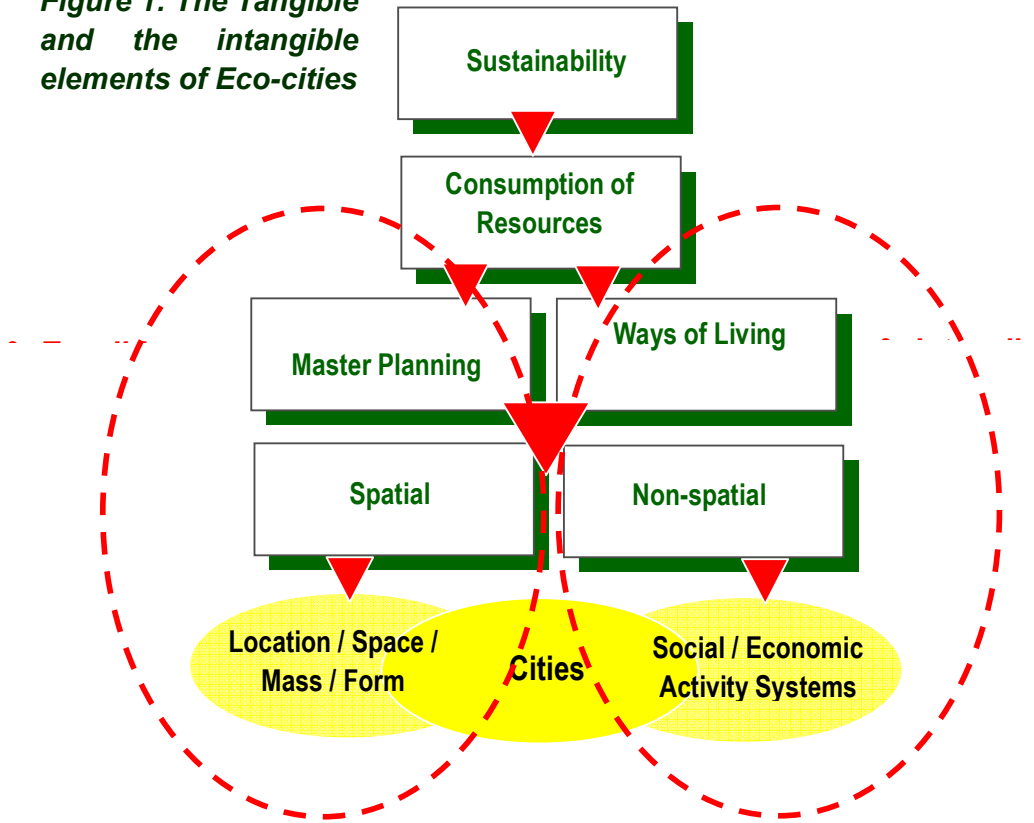


Figure 2: Project site

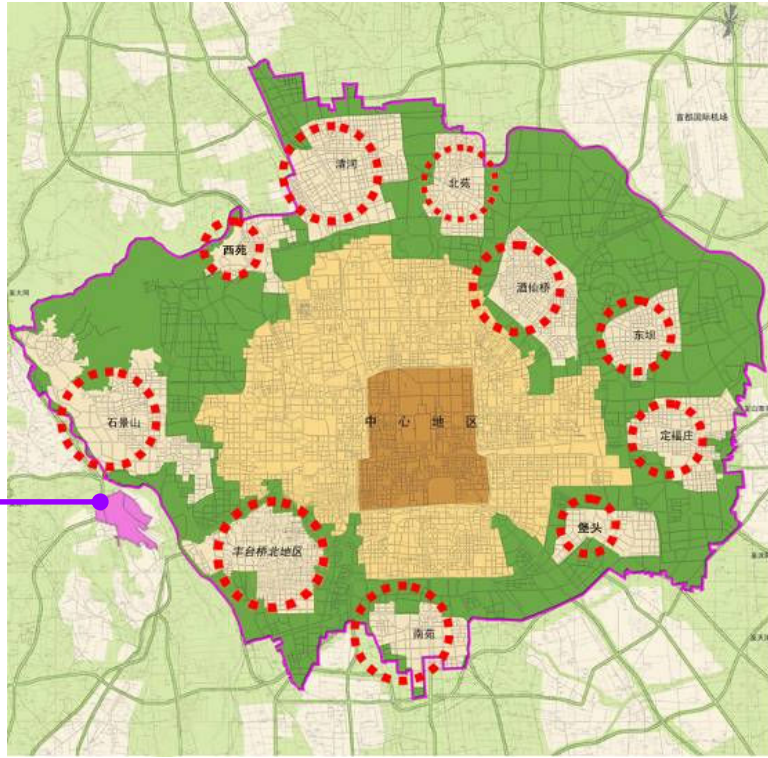


Figure 3: Beijing Changxin Eco-city Master Plan Concept

Land Use Plan

- 图例 Legend
- 商业中心
Commercial Centre
 - 医疗设施
Health Facilities
 - 旅游
Tourism
 - 邻里中心
Neighbourhood Centre
 - 公共绿地
Public Green
 - 绿色防护带
Green Buffer
 - 产业(研发中心)
Industrial (R & D)
 - 旧村改造
Village Improvement
 - 低密度住宅区
Residential Low Density
 - 中密度住宅区
Residential Medium Density
 - 高密度住宅区
Residential High Density
 - 小学
Primary School
 - 中学
Secondary School
 - 水系
Water
 - 市政公用设施
Municipal Utilities
 - 铁路
Railway

