China: From Eco-City to Eco-Civilization

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Introduction and ecocity concept

- Ecocity, Ecological City or Ecopolis.
- Originated from the Man and Biosphere program (MAB) by UNESCO in 1970s.
- Richard Register: “An Ecocity is a human settlement that enables its residents to live a good quality of life while using minimal natural resources.”
What is an ecocity?

- Commercial and living;
- Stereo greening;
- Trams, rarely cars;
- Renewable energy (solar/wind);
- Biodiversity;
- Environment & 3Rs …
- Concentrated, not sprawling. …

Cited from Richard Register
Eco-Village by Richard Register
Eco-Village by Richard Register
Ecocity World Summits 1990-2009

1. Berkeley, California 1990, … basic ideas of ecocity design/planning
3. Yoff, Senegal, 1996, … for underdeveloped countries
4. Curitiba, Brazil, 2000, … discussion on Curitiba itself …
5. Shenzhen, China, 2002, … for fast developing countries, declaration
6. Bangalore, India, 2006. a window on the world like a magnifying glass …
7. San Francisco, USA, 2008. … a declaration that laid out five requirements and ten actions for Ecocity development
8. Istanbul, Turkey, 2009. … Tianjin eco-city reported their progress but was criticized about not enough ambitious on renewable energy portion (20%). Istanbul argued about population growth…

9. To come, Ecocity 9: Montreal, Canada, August 22-26, 2011, economy issue…
An ecocity is an ecologically healthy city. Into the deep future, the cities in which we live must enable people to thrive in harmony with nature and achieve sustainable development. People oriented, ecocity development requires the comprehensive understanding of complex interactions between environmental, economic, political and socio-cultural factors based on ecological principles. Cities, towns and villages should be designed to enhance the health and quality of life of their inhabitants and maintain the ecosystems on which they depend.

Five requirements:

- **Ecological security** - clean air, and safe, reliable water supplies, food, healthy housing and workplaces, municipal services and protection against disasters for all people.
- **Ecological sanitation** - efficient, cost-effective eco-engineering for treating and recycling human excreta, gray water, and all wastes.
- **Ecological industrial metabolism** - resource conservation and environmental protection through industrial transition, emphasizing materials re-use, life-cycle production, renewable energy, efficient transportation, and meeting human needs.
- **Ecoscape (ecological-landscape) integrity** - arrange built structures, open spaces such as parks and plazas, connectors such as streets and bridges, and natural features such as waterways and ridgelines, to maximize biodiversity and maximize accessibility of the city for all citizens while conserving energy and resources and alleviating such problems as automobile accidents, air pollution, hydrological deterioration, heat island effects and global warming.
- **Ecological awareness** - help people understand their place in nature, cultural identity, responsibility for the environment, and help them change their consumption behavior and enhance their ability to contribute to maintaining high quality urban ecosystems.
Ten key actions needed:

1. Provide **safe shelter, water, sanitation, security of tenure and food security** for all citizens … priority to the poor …
2. **Build cities for people, not cars.** …
3. **Identify ecologically sensitive areas, define the carrying capacity** …
4. Design cities for **energy conservation, renewable energy uses and the reduction, re-use and recycling of materials**
5. **Build cities for safe pedestrian and non-motorized transport use with efficient, convenient and low-cost public transportation.** …
6. Provide strong economic incentives to businesses for **ecocity building and rebuilding** …
7. **Provide … education and training programs, capacity building and local skills** …
8. **Create a government agency at each level** …
9. **.. to address global heating, the coming end of fossil fuels and global crisis of species extinctions.**
10. **… international, inter-city and community-to-community cooperation to share experiences, lessons and resources ….**
To come:
Ecocity 9, Montreal Canada, Aug 22-26, 2011

Interconnecting Themes

- Climate Change and Urban Planning
- Ecomobility, Urban Planning, Public Space
- Governance and Democracy in the Ecocity
- Economics of the Ecocity
- Health and the Built Environment
- Biodiversity and Urban Agriculture
- Youth Leadership and Engagement in the Arts, Culture and Environment
- An Ecocity Project… on the Ground!
Remarks:

**Requirements**
- Safe shelter, water, food, wealth …
- Green, environment & diversity …
- No cars; public transportation …
- Renewable energy and 3Rs, low carbon …
- Governance …Education and training …

**Issues not resolved:**
- How to achieve these requirements;
- Technical feasibility;
- Economic feasibility (input/output analysis)
- Local conditions: population & growth rate, built environment…
China: from eco-city to eco-civilization
Overview

China is making a miracle, however along with rapid economic development and urbanization:

- Environmental pollution
- Resource restriction
- Social problems in urban areas
- Biodiversity in urban areas
- Climate change impacts
- .....
China is making a miracle …

It is the great enthusiasm and power of people released after a long time of depression due to war and chaos, from a nation of glorious history and magnificent culture, but of a huge population, with the “Chinese model(?)”, driving the development.
While population increased by nearly 38% and to level off, GDP had increased over 80 times.

400 million people have eradicated poverty, which is 12 years in advance on eradicating poverty for UN MDG.
But the development is at the cost of …

“The continuous roaring of sandstorms are alerting us. We are here holding the congress, feeling pressures…”

“During the 10th Five-Year Plan, all objectives of economic development were achieved more than successfully, but the targets of environmental protection. Mainly the two objectives: SO₂ emission has been raised for 27% instead of 10% reduction; COD discharge was reduced by only 2% instead of required 10%”

“…the environmental problems generated in developed countries during the hundred-year industrialization now are emerging in China collectively, damaging eco-system and environment, creating huge economic losses, threatening people’s life and health. We must be highly alerted about this situation.”

--- WEN Jiabao, Apr 17, 2006
China is still a developing country:
- Poverty (150 million)
- Uneven development:
  Gaps of rich/poor, urban/rural, east/west
- Corruption
- Environment

"Big eyes" has grown up
The environment:

Coal burning type of air pollution:

Due to the unique energy structure ...
Severe acid rain ...
Media: “Grey haze is pioneering. Cold front is coming again!”
Vehicular emissions increase quickly, causing:

- \( \text{NO}_2 \)
- Photo chemical smog, \( \text{O}_3 \)
- Acid rain
- Grey haze

Car ownership is rising rapidly

This is the 2002 situation (AR4 of IPCC)
Water pollution example: the Suzhou Creek in the 1990s
Another example:

2007 May 29~June 5...
Taihu lake “blue algae”, due to eutrophication
Drinking water crisis in Wuxi

Similar eutrophication is happening to Caohu Lake, Dianchi Lake, etc.
And solid waste ...
Eco-development programs in China

- Related programs
  - Scenery city (山水城市)
  - Green city (绿色城市)
  - Garden city (花园城市)
  - Eco – garden city (生态园林城市)
  - Environmental model city (环境模范城市)
  - Environmentally friendly city (环境友好城市)
  - Eco – demonstration city (生态示范城市)
  - Eco – civilization city (生态文明城市)
The major programs

- **Eco-Garden city program by MHURD**
  - From 1992, evaluation in every 2 years. Up to 2008, there were 10 batches of 125 cities officially nominated with state-level “Eco-Garden Cities”
  - In 2004, “resource saving” principle was included in this program. In 2006, it was further emphasized for “Three-Savings: land, water, and funding”; Four-Reductions: urban heat island, air and water pollutions, energy consumption of buildings and infrastructure, and energy consumption in urban transportation.
  - The objective is to develop green and economic societies

- **Eco – demonstration program under MoEP**
  - 1995
  - 1996~2004, SEPA approved 9 batches of cities as “Ecological Development Demonstration pilot areas”
  - Indicator system – version 1, 2003
  - Indicator system – version 2, 2008
  - To 2008, 6 cities, 3 counties, and 2 districts were officially nominated as “eco-” areas
  - 2010-2011 28 more “Ecological Development Demonstration pilot areas”

- **Eco-city building by local governments**
  - Beijing (Mengtougou), Tianjin(Binghaixinqu), Tangshan(Nanhu), …Shanghai(Chongming Island) …

- **Eco-Civilization was called for by the 17th National Congress of CC Party (2007, 2008-)**
Eco - demonstration program under MoEP

Objectives:

- Based on the principles of sustainable development and ecological economy, to promote regional development of economy and society with environmental protection, to establish an appropriate cyclic system for the development of economy, society, and integrated natural system, to ensure adequate utilization of natural resource and improvement of ecological environment, while economic and social development meet the demand by the people.

Sustainable development is emphasized

Top down promotion / Regional development / Bottom Up approach
Application procedure for eco-demonstration

- **Step 1: Apply to MoEP for an eco-demonstration unit**
  - after the first screening, 389 out of 528 cities/counties/districts were accepted as pilot/experimenting units

- **Step 2: Conduct an ecocity plan, an outline**
  - Set up ecocity objectives
  - Survey on current situation
  - Comprehensive analysis on existing master plan and sectoral plans
  - Analysis and adjustment
  - Recommendations, with proposals for construction projects

- **Step 3: Implement the ecocity plan**
  - Establishing administrative leading group
  - Assign tasks
  - Highlight projects (e.g., eco-community, eco-industrial park…)
  - All-round promotion, public participation
  - Legal actions

- **Step 4: Official nomination**
  - Monitoring and self-evaluation
  - Applying for reviewing from MoEP, from province to MoEP
  - Nomination by MoEP as state-level Eco-district/county/city

- **Step 5: Maintenance and management**
  - Management office
  - Coordination timely among governmental departments
  - Annual reports
The 6 cities, 3 counties and 2 urban districts, officially nominated by MoEP as eco-

Observation: the location of the nomimates eco-city/county/district and the provinces aiming to eco-
development …
The 2003 evaluation 28 indices for ecocity

- Economic indices
  - Per capita GDP
  - Forest coverage
  - Proportion of protected area
  - Degraded land rehabilitation rate
  - Air quality (S,N)
  - Water quality: urban & coastal
  - SO2, COD emission

- Environment & Resc. indices
  - Drinking water Sewage treatment Industrial wastewater reuse
  - Noise level
  - Solid waste Disposal Industrial waste reuse rate
  - Urban green area per capita
  - Envir. Quality of tourism areas

- Social indices
  - Urbanization level
  - Gas utilization rate
  - Rate of centralized heating
  - Engel coefficient
  - Gini coefficient
  - Higher edu. rate
  - Envir. Edu. rate
  - Public satisfaction rate to environment

- Other indices
  - Peasants income per person
  - Urban citizen income per person
  - Percentage of third industry
  - Energy consump. per unit GDP
  - Water consump. per unit GDP
  - Clean production enterprises rate, ISO14000
  - Per capita financial income
  - Rate of centralized heating
  - Urban lineline system
  - Per capita GDP
  - Per capita financial income
  - Peasants income per person
  - Urban citizen income per person
  - Percentage of third industry
  - Energy consump. per unit GDP
  - Water consump. per unit GDP
  - Clean production enterprises rate, ISO14000
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  - Air quality (S,N)
  - Water quality: urban & coastal
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  - Rate of centralized heating
  - Engel coefficient
  - Gini coefficient
  - Higher edu. rate
  - Envir. Edu. rate
  - Public satisfaction rate to environment

- Other economic indices
  - Energy consump. per unit GDP
  - Clean production enterprises rate, ISO14000
  - Degraded land rehabilitation rate
  - Air quality (S,N)
  - Water quality: urban & coastal
  - SO2, COD emission
  - Drinking water Sewage treatment Industrial wastewater reuse
  - Noise level
  - Solid waste Disposal Industrial waste reuse rate
  - Urban green area per capita
  - Envir. Quality of tourism areas
The 2008 evaluation 19 indices for ecocity

- Rural per capita income
- Percentage share of third industry
- Energy consumption per unit GDP
- Corporation qualified in CPA
- Fresh water consumption per capita IAV
- Forest coverage
- Proportion of protected area
- Air quality
- Water quality
- COD & SO$_2$ emission intensity
- Drinking water quality
- Ratio of urban sewage treatment
- Noise level
- Disposal rate of Solid waste
- Urban green area per capita
- Investment ratio for environment
- Urbanization level
- Coverage of centralized heat-supply
- Public satisfaction rate to environment
- Economic indices
- Env & Resc. indices
- Social indices

CPA: cleaner production audit
IAV: industrial added value
Ecocity planning procedure

1. Set up office
2. Setting up objectives
3. Existing Plan Analysis
4. Ecocity Planning
5. Ecocity Plan
6. Operational Maintenance/Monitoring
7. Implementation Coordination among sectors
8. Legal action publicize
9. Master Plan
10. Sectoral Plans: Landuse, Industry, Energy, Transportation, Environmental...
11. Monitoring Surveying
12. Objectives/principles
13. Adjustment to existing plans
14. Constructional projects Monitoring program

Management is weak
Eco-city management

- Approve the eco-plan and go through a legal procedure

- Establish an office to coordinate various sectors, functions:
  - Under the municipal government or local EPB
  - Edit and publish eco-development news bulletins
  - Coordinate monitoring and feedbacks
  - Timely meetings
  - Report progresses to the municipal government and to the public

- Implement policies/measures/projects by corresponding departments, e.g. “cell projects”

- Annual assessment and report to MoEP

- Problems:
  - Local EPB or the coordinating office does not have the authority…
  - Often lack of long-term functioning of the office
  - If other activities seem more important …
EcoCity program is continuing..
14 were announced in Oct 2010;
14 were announced in April 2011.

4 cities: Zhangjiagang, Changshu, Kunshan, and Taicang under Suzhou

Miyun & Yanqing Counties of Beijing
Rongcheng City
Jiangyin City
Anji County of Zhejiang
Minghang District of Shanghai
Yantian District of Shenzhen
Eco-city building by local governments
Sample eco-building projects

- **Beijing**: Changxindian 长辛店, Mentougou 门头沟
- **Shanghai**: Chongming Island 崇明岛
- **Tianjin**: Sino-Singapore Tianjin 天津滨海新区
- **Chongqing**: in cooperation with UK
- **Hebei**: Caofeidian 曹妃甸, Wanzhuang 万庄, Tangshan Nanhu 唐山南湖, Shijiazhuang 石家庄, Zhangjiakou 张家口
- **Zhejiang**: Hangzhou Baimahu 杭州白马湖, Hushan 虎山, Hongtang 宁波洪塘
- **Yunnan**: Kunming 昆明世博园, Yuxi 玉溪
- **Shandong**: Linyi 临沂, Qingdao 青岛, Qixi 棵枝, Junan 莒南, Dongying 东营, Zibo 淄博, Yantai 烟台, Laiyang 莱阳, Qingzhou 青州
- **Heilongjiang**: Shuangyashan 双鸭山, Harbin 哈尔滨, Daqing 大庆
- **Jilin**: Changchun 长春
- **Liaoning**: Shenyang 沈阳, Fushun 抚顺
- **Sichuan**: Zigong 自贡, Guang’an 广安, Chengdu 成都
- **Jiangsu**: Changshu 常熟, Lianyungang 连云港, Yangzhou 杨州, West Taihu Lake 西太湖, Siyang 泗阳
- **Guangdong**: Shenzhen 深圳, Foshan 佛山, Huizhou 惠州
- **Hubei**: Xianning 咸宁, Ezhou 鄂州梁子湖南山 VTT involved
- **Henan**: Zhengzhou 郑州, Yongcheng 永城, Suiping 遂平
- **Jiangxi**: Nanchang 南昌, Gongqingcheng 共青城, Yongfeng 永丰
- ** Hunan**: Huaihua 常德, Changsha 长沙岳麓
- **Anhui**: Hefei 合肥
- **Fujian**: Fuzhou 福州, Changle 长乐
- **Guizhou**: Guiyang 贵阳
- **Xinjiang**: Changji 昌吉, Habaha 哈巴河

According to media:
In 22 megacities/provinces, more than 50 projects ...as to 2008
Hebei: Wan Zhuang

Tangshan: Nan Hu
Shanghai case: Chongming Eco-Island Development
Chongming Island is part of Shanghai

- Chongming eco-island development is an important part of Shanghai sustainable development strategy
- EXPO concept is to be implemented in Chongming
- Challenge: the impact of the completion of cross Yangtze tunnel/bridge
Events and progresses

- 2005, Shanghai approved “Chongming Three-Island Development Master Plan (2005-2020)” which design Chongming as a Comprehensive Eco-Island;
- Mar 2010, MoST approved Chongming as a national experimenting county for sustainable development (In 2009, MoST initiated key projects for low carbon development in Chongming and key technologies application and demonstration; also other important technical projects)
- July 2010, Shanghai Chongming Eco-Island International Forum
  - International cooperation: UNEP, Hawaii State of US, Japan Association on Environmental Art and Culture
  - To build 5 demonstration zones: low carbon consumption, low carbon industry garden, low carbon agricultural garden, natural carbon increasing, and low carbon ecological tourism etc.
Chongming Global Level Eco-Island Planning

- **Chongming**: comprehensive eco-island
- **Changxing**: marine equip-island
- **Hengsha**: eco-leisure island
Strategy:
- Combination of national strategy, Shanghai responsibility and Chongming Island desire.
- Low carbon, ecological and modernized development
- Protect the Yangtze River mouth environment and ecology
- Focus:
  - Promote **harmonic development** of resource, environment, industry, infrastructure, and social service etc.
  - Perfect **functional allocation** of the island
  - Establish eco-island assessment **indicator system**
  - Emphasize **sustainability** of natural resource, **renewable energy**, circular economy; improve water and air quality, noise level, solid waste management; promote energy saving and pollutant emission reduction; optimize industrial structure; note social service and infrastructure; enhance public participation in governance etc.
# Chongming eco-island assessment main indicators (2010)

<table>
<thead>
<tr>
<th>No</th>
<th>Index</th>
<th>Unit</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction land use</td>
<td>%</td>
<td>13.1</td>
</tr>
<tr>
<td>2</td>
<td>Number of water bird species (≥ 1% of that in the world)</td>
<td>-</td>
<td>≥10</td>
</tr>
<tr>
<td>3</td>
<td>Forestry coverage</td>
<td>%</td>
<td>28</td>
</tr>
<tr>
<td>4</td>
<td>Green field area per capita</td>
<td>m²</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Eco-protection land area</td>
<td>%</td>
<td>83.1</td>
</tr>
<tr>
<td>6</td>
<td>Natural wetland</td>
<td>%</td>
<td>43</td>
</tr>
<tr>
<td>7</td>
<td>Domestic waste reuse</td>
<td>%</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>Livestock soil utilization</td>
<td>%</td>
<td>&gt;95</td>
</tr>
<tr>
<td>9</td>
<td>Agricultural straw utilization</td>
<td>%</td>
<td>&gt;95</td>
</tr>
<tr>
<td>10</td>
<td>Capacity of renewable power generation</td>
<td>$10^4$ kW</td>
<td>20~30</td>
</tr>
<tr>
<td>11</td>
<td>Energy consumption per unit GDP</td>
<td>ton coal /$10^4$RMB</td>
<td>0.6</td>
</tr>
<tr>
<td>No</td>
<td>Index</td>
<td>Unit</td>
<td>2020</td>
</tr>
<tr>
<td>----</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>12</td>
<td>Core river water quality attains Category III standard</td>
<td>%</td>
<td>95</td>
</tr>
<tr>
<td>13</td>
<td>Centralized treatment of municipal wastewater</td>
<td>%</td>
<td>90</td>
</tr>
<tr>
<td>14</td>
<td>Days per year of air quality API attains excellent</td>
<td>day</td>
<td>&gt;145</td>
</tr>
<tr>
<td>15</td>
<td>Attainment of regional ambient noise</td>
<td>%</td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>Weight of environmental part in achievement evaluation</td>
<td>%</td>
<td>25</td>
</tr>
<tr>
<td>17</td>
<td>Public satisfaction on environment</td>
<td>%</td>
<td>&gt;95</td>
</tr>
<tr>
<td>18</td>
<td>Harmless authentication of major agricultural products (green food, organic food)</td>
<td>%</td>
<td>90 (30)</td>
</tr>
<tr>
<td>19</td>
<td>Chemical fertilizer application strength</td>
<td>kg/ha</td>
<td>250</td>
</tr>
<tr>
<td>20</td>
<td>Nemerow index of agricultural soil</td>
<td>-</td>
<td>≤0.7</td>
</tr>
<tr>
<td>21</td>
<td>Portion in GDP of tertiary industry added value</td>
<td>%</td>
<td>&gt;60</td>
</tr>
<tr>
<td>22</td>
<td>Financial output per capita for social development</td>
<td>$10^4$ RMB</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Part of Chongming:

- Area: total 215 ha, urban 73 ha, ecological park 142 ha;
- Green area per capita: 27 m²
- Housing: low rise & high density – 3 to 8 storey / 1.45 average plot ratio / 75 dwelling per ha / 80,000 people
- Transport accessibility: 3 minutes walking, 240 m
Calling for eco-civilization
Call for eco-civilization

- The need:
  - Unhealthy development still happens;
  - Unlawful/unreasonable activities;
  - Change in behavior, life style …

- Launched in Oct. 2007 at the 17th National Congress of the Chinese Communist Party, written in the report;

- It represents an ethical, cultural, and institutional enhancement on ecological development
Importance of eco-civilization

- A high sense of responsibility to ecological development and global ecologic system
- Long term importance of China’s development, also of the world’s ecological security

**Great significance to develop eco-civilization in China:**
- Huge population
- Large territory
- Glorious history
- Profound culture
- Unique language
- Special institutional system (strong and highly efficient governance)
- Distinctive society, and
- Rapid economic development
Importance of eco-civilization

- Eco-Civilization refers to the **culture and ethics** with which human society development in harmony with nature and the consideration of future generations.

- Eco-civilization emphasizes **human consciousness and self-regulation**, mutual dependence, promotion, and symbiosis with nature, and harmony among human.

- Eco-civilization is the result of the profound rethinking on the traditional industrial civilization, so that an important progress of the ethics, approach and mode of human development.
Summary and Discussion
The characteristics of eco-development in China:

- Regional development is emphasized, with sustainable development as the objective;
- Not only the harmonic relationship between human society and nature, but also the relationship with economic development;
- Large population, severe pollution, restricted resource, large gaps between poor/rich, urban/rural, eastern/western etc.;
- Rapid economic development and urbanization (dynamic) …
- Powerful governance, numerous people (and officers) are involved, so that with great significance.

Although the management of the ecocity demonstration program is by MoEP and local EPBs, and the management is relatively weak, the ecocity concept is penetrating many aspects of governmental daily work. For example, the compulsory requirement of “energy saving and (key pollutants) emission reduction”.
Problems:

- MoEP is a sectoral ministry. …
- Current ecocity planning team is mostly of environmental and/or ecological profession …
- Difficulties in planning and implementation because of growing urban population, existing severe pollution, and cross-boundary pollutant transport …
- Eco-city management is rather weak. In most cases, there is an office at local EPB for coordination and annual assessment and report;
- For projects of local governments, input/output analysis is not provided;
- The sustainability of eco-cities themselves is not sufficiently discussed.

Conclusion:

- Due to imbalance development, ecocity in China should have local characteristics;
- Nation-wide programs are specifically important in the sense of ESD and SD practice;
- Ecocity concept needs to be developed for self-sustainability;
- Eco-demonstration and eco-civilization development has long term significance both to China and the world.
Alert from an artist:

We are determined to develop sustainably. Chinese theme of the environmental day: “Work together towards eco-civilization and share a green future”

Taken on May 12, 2011, Gothenburg, Art Museum