

42nd Meeting of the APEC Energy Working Group and Associated Meetings

**APEC Low Carbon Model Town
Development in China**

National Energy Administration, China

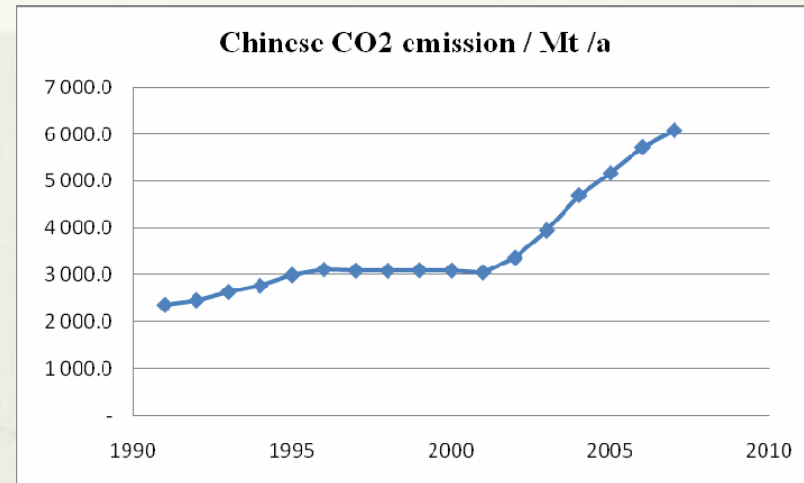
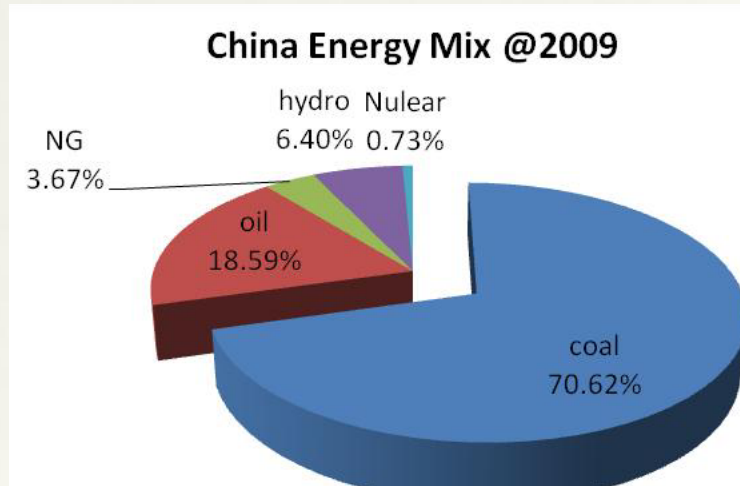
17-21 October 2011

Kaohsiung, Chinese Taipei

Outline

1. Effects of energy consumption and carbon dioxide emissions from towns in China
2. Philosophy and pathways of low-carbon towns development in China
3. Practice of low-carbon towns development in China
4. Conclusions

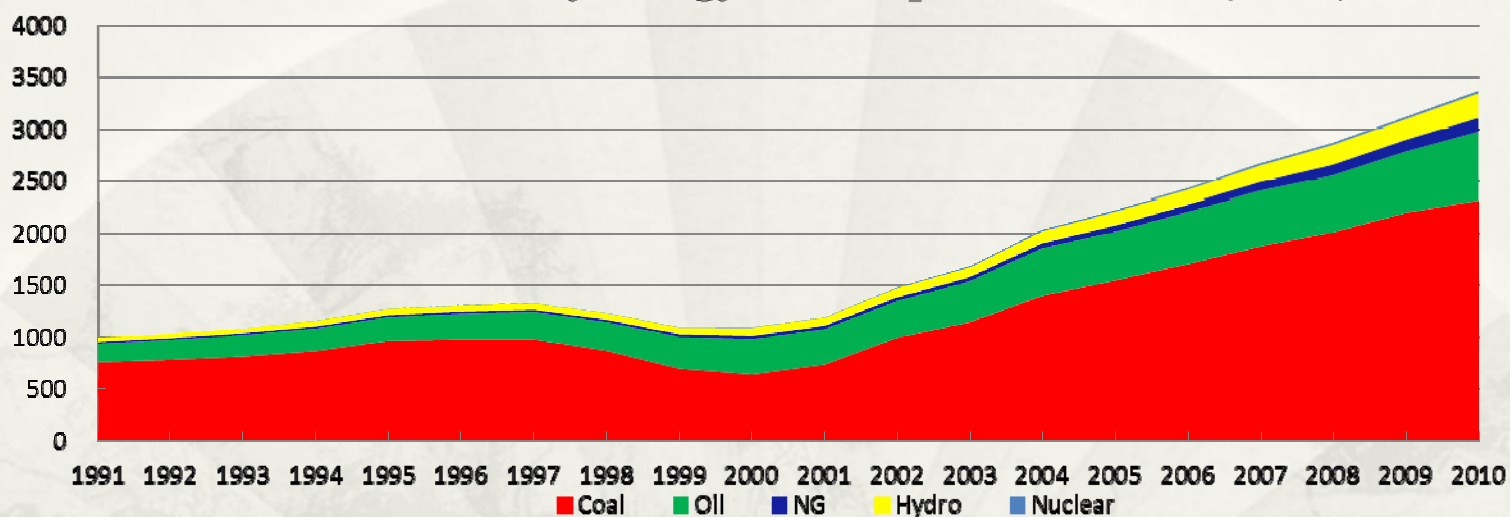
Energy Supply and Consumption in China



- * Fossil fuels dominate primary energy supply, where coal accounts for 70.4%
- * Industrial sectors account for 70.2% of the energy consumption
- * In 1990, CO₂ emissions from fossil fuels consumption were 2244 million tonnes. In 2008, it increased to 6550 million tonnes
- * CO₂ emissions from energy consumption are expected to keep on increasing due to the fast economic growth

Drivers of Energy Consumption Increase: Industrialization, Urbanization, Motorization

Primary energy consumption in China (Mtce)



industrialization



urbanization



motorization

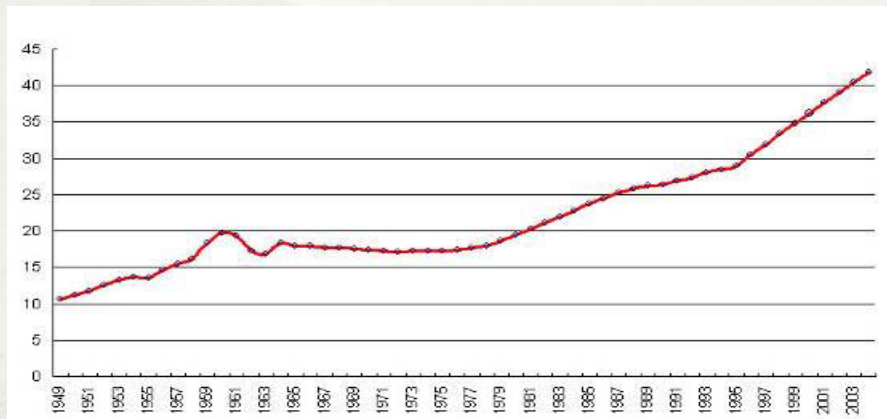
Cities and Towns are the Major Energy Consumers and Carbon Emitters in China

Urbanization Process in China between 1949-2004 (%)

Accelerating urbanization. In 2009, the urbanization rate in China was 46.6%, 10.4 percentage points higher than that in 2000. As of the end of 2009, China has 333 prefecture-level regions, including 287 prefecture-level cities; 2858 county-level regions, including 367 county-level cities and 855 districts under the jurisdiction of cities; 40858 town-level regions, including 19322 towns and 6686 street communities.

(Source: China Statistical Yearbook 2010)

In China, three city-dense areas have emerged (Yangtze River Delta Area, Pearl River Delta Area and Beijing-Tianjin-Hebei Area), and city complex in central-and-south of Liaoning, the central plains, Shandong Peninsula, Wuhan, Changsha-Zhuzhou-Xiangtan, Chengdu-Chongqing, Central Shanxi-Tianshui, Southeast of Fujian, and the Northern Gulf Area. Constituted with one or more core cities and several surrounding cities, **the city-dense areas and city complex are becoming important economic growth**



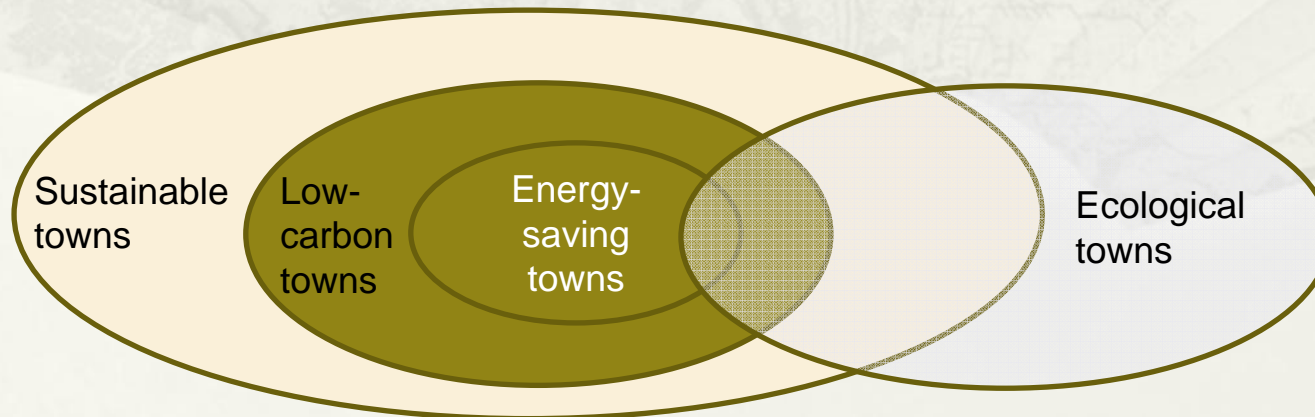
Cities and towns are the major energy consumers and carbon emitters in China. In 2006, the energy consumption of 287 cities above prefecture level was 1370 million tce, accounting for 55.6% of the national energy consumption; and the CO₂ emission was 2920 million tonnes, accounting for 54.8% of the total emissions. The “Top 100” cities’ GDP was 67.4% of China, and the carbon emissions were 41% of the total emissions. (Source: 2050 Energy and Carbon Emissions Report of China)

Development of Low-carbon Towns: Facing the Challenges of Global Climate Change and Sustainable Development

- * The central government has announced a carbon reduction target, which is to reduce carbon emissions per unit GDP by 40%-45% in 2020 compared with 2005 level. Development of low-carbon towns is a key measure to achieve this target.
- * Low-carbon development is also a practical necessity for cities and towns in China to save energy, reduce carbon emissions, restructure economy, protect environment, preserve ecology and improve traffic conditions.
- * With support of international cooperation, the central government has issued a series of policies and measures to promote development of low-carbon towns, and got wide and positive support from local governments. Low-carbon development has become a philosophy and remarkable symbol for a new round development of cities and towns in China.

Philosophy of Low-carbon Towns Development in China: Ultimately Sustainable Development

- * The concepts of ecological towns, low-carbon towns, energy-saving towns and sustainable towns relate to each other, but each of them has its specific features. **Sustainable towns are the ultimate target, and all other concepts are based on the concept of sustainability, focusing on different aspects of the target.**
- * Development of sustainable towns is based on the idea of ensuring economic growth, ecological preservation and social justice, and policies related to this target to acquire multiple benefits. **The target of developing low-carbon towns is to reduce carbon emissions according to the sustainable development promise, and to couple with energy supply, demand, and environmental impacts.**
- * Sustainability should always be considered in the course of towns development, whilst focusing on the low carbon emissions of a single unit or process could lead to increased carbon emissions of a system (relationship between units and a system). Carbon emissions should be evaluated at a systems level from life cycle and developing perspectives (sustainable development is the ultimate target, whilst low-carbon is a sub-target, and the sub-target serves for the ultimate target).



Relationship between low-carbon towns, sustainable towns, energy-saving towns and ecological towns

Source: W. Chen, Y. Lu. The Framework, Pathway and Vision of Low-carbon City Development: An Example of Shanghai. Beijing, Science Press. 2010: p93

Values of Sustainable Towns Development: Human-being Oriented

- * The sustainable development is human-being oriented development. It guarantees the well-being of the current generation without sacrificing the right of enjoying the same level of well-being of future generations.
 - * Production level: sustainable, low-carbon economy and transportation.
 - * Living standard level: comfortable housing and environment, low-carbon buildings and facilities.
 - * Social level: public participation, social justice, culture and knowledge continuity, low-carbon values and life style.
 - * Natural resources level: effective utilization of land, minimum consumption of resources
 - * Ecological level: minimum pollutions and emissions, sustainable ecological system
- * Development of low-carbon towns is to absolutely or relatively reduce the carbon emissions according to the sustainable development target. It mainly relates to the energy system and corresponding carbon emissions of towns.

Three Key Pathways of Low-carbon Towns Development

- * Spatial pathway: urban spatial structure refers to the spatial arrangement and combination status of urban components. The urban pattern is the whole form of urban spatial structure, which reflects the internal density and spatial arrangement of a city or town. The spatial pathway is to reduce the total transport demand and motor vehicles and increase the public transport shares by optimizing the spatial structure and the related urban functions.
- * Technological pathway: on energy supply side, to improve the energy efficiency and change the primary energy mix; on energy demand side, applying appropriate technologies to reduce the energy consumption of industry, transportation and buildings, while meet the same level services as demanded.
- * Social policies and system pathway: by legislating, implementing policies and education, to limit the carbon emission of industrial and service sectors, and encourage the public to form low-carbon values and life styles, and participate in the construction of low-carbon towns.

Practices of Low-carbon Towns Development in China: Government Management

- * The policies and governmental actions of low-carbon towns development in China
 - * The policies and governmental actions for dealing with global climate change
 - * The central government policies and actions of developing low-carbon towns
 - * The local government and ministry policies and actions of developing low-carbon towns

To deal with climate change

2006.12: six ministries issued the Assessment Report of Climate Change
2007.6: the State Council issued the National Plan of China to Deal with Climate Change, and set up the national leading group for facing challenges of climate change, energy conservation and emission reduction.
2008.10: the State Council issued the Policies and Actions of China in Dealing with Climate Change
2009.8: the National People's Congress passed the Report of Work on Dealing with Climate Change
2009.9: Chairman Hu made the speech at the UN's climate change summit, titled Collaboration in Dealing with the Challenge of Climate Change
2011.3: the 12th Five Year Plan, the carbon emission per unit GDP should be reduced by 17%

To develop low-carbon towns

2008.1: Baoding and Shanghai were selected into the first experimental areas of the WWF China Low-carbon Towns Development Project
End of 2008: Jilin was selected as the pilot of the Case Study of Low-carbon Economy Method and Low-carbon Economy Area Development
2010.7: the State Development and Reform Commission issued the Notice of Carrying out Experimental Work of Low-carbon Provinces and Cities, and selected five provinces and eight cities as pilots.
2011.3: the State Council issued the 7th Document (2011), titled Instructions on Key Sectors Functions of Implementing the Government Work Report, proposing to promote the low-carbon town pilots.

Local government and ministry policies and actions

2006: Ministry of Construction – Assessment Standard and Management Measures of Green Buildings, the Instruction of Promoting Renewable Energy Utilization in Buildings, the Instructions on Economic Policies of Preferentially Develop the Urban Public Transport
2009.12: Hangzhou government issued the Decision of Developing a Low-carbon Town
2010.1: Ministry of Housing and Shenzhen – the Collaboration Framework of Developing the Nation's Low-carbon Ecological Demonstration Town
2010.7: Ministry of Housing and Wuxi – the Collaboration of Developing the Nation's Low-carbon Ecological Demonstration Area – Protocol of Collaboration Framework of Wuxi-Taihu
2011.1: Ministry of Housing issued the Notice of Setting up the Leading Group for Low-carbon Ecological Town Construction
2011.4: Tongji University released the Research Report of Low-carbon Town Development Strategy of Shanghai

Practices of Low-carbon Towns Development in China: Typical Examples

- * Pilots of the State Development and Reform Commission: five provinces – Guangdong, Liaoning, Hubei, Shanxi, Yunnan; eight cities – Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang, Baoding
- * China Low-carbon Town Development Project (WWF): Shanghai, Baoding
- * China Low-carbon Economy Collaboration Project (State Development and Reform Commission): Chongqing, Nanchang, Baoding, Hubei, Guangdong
- * The Pilot Project of the Public Low-carbon Activities: Tianjin, Shanghai, Xi'an, Yinchuan, Nanjing, Changzhou, Suzhou, Guangzhou, Xiamen, Shenyang and Chongqing
- * The first low-carbon economy demonstration area (approved by the State Development and Reform Commission): Jilin
- * China-UK Low-carbon Town Pilots (Ministry of Science and Technology and the British Research Council): Guangzhou, Minxing District of Shanghai, Xi'an, Xixia County of Nanyang
- * Local governmental projects: Zhuhai, Tianjin, Hangzhou
- * Other low-carbon practices: Beijing, Chengdu, Nanning, Wuxi, Shenzhen

Practices of Low-carbon Towns Development: Renewable Energy Industry in Baoding

- * The Chinese Electricity Valley: equipment manufacturing and technical service of wind power and solar photovoltaic power.
- * Widely application of solar energy technologies in lighting and heating
- * Construct low-carbon urban transport system, encourage low-carbon trips, promote gas buses, taxis and Bus Rapid Transit systems.



**The wind turbine blade
manufacturer of Baoding**



**The solar energy
utilization in Baoding**

Practices of Low-carbon Towns Development: Ecological City Development in Tianjin

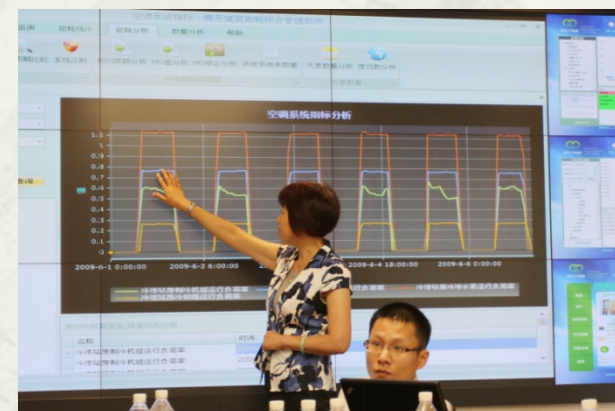
- * Adjust the industrial structure, develop high-tech and low-energy-consumption industries
- * Establish carbon exchanges to promote energy conservation and emission reduction
- * Increase the urban green coverage to add to carbon sinks
- * Establish the energy conservation standard system of low-carbon buildings, encourage the renewable energy utilization in buildings
- * Develop solar power, wind power and biomass energy



Sino-Singapore Tianjin Eco-city

Practices of Low-carbon Towns Development: Energy conservation in buildings

- * Changning Business District in Shanghai
 - * 102 public buildings, the building energy consumption is more than 80% of the total (transport excluded)
 - * The building energy consumption is mainly resulted from air-conditioners, lighting, elevators and other large electrical devices.
- * The online detection platform of buildings' energy efficiency: 45 public buildings have been connected
 - * Add wireless ammeters, data collecting, transmission and processing devices
 - * Data of the major equipments in each building is collected and transmitted every five seconds.
 - * The data is promptly analyzed online to detect the management loopholes.
 - * The platform give feedback to the buildings and helps dealing with the detected problems.
- **Effect of the platform**
 - **By adjusting the irrational operation, the energy consumption could be reduced by 5%-10%**
 - **By optimizing the operation, the total energy consumption could be reduced by 30%**
- **Later work**
 - **Value-added work: provide the optimized plans for the electrical devices operation in order to increase the efficiency and decrease the cost.**
 - **CDM: introduce the total emission reduction of the buildings in the district as whole to the Clean Development Mechanism.**
 - **Micro-grid load regulation: cooperate with Schneider, using the time switches to control the devices, and to reduce the impact on the electricity grid.**



The demonstration of the online detection platform

Practices of Low-carbon Towns Development: Business Pattern Innovation of Waste Recycle

- * The features of the development area
 - * Goal: develop an eco-industrial park
 - * 3-high-1-low industrial chain: high-tech, high added-value, high investment; low emission
- * Ecology: the public service platform of recycled resources
 - * Recycle the electronic waste and domestic waste
 - * **Internet of Things** pattern: bar code identification, on-line capital flow and off-line logistics
 - * Recover the noble metal and silicon, compress paper, rewrite CDs by advanced technologies
 - * Outsource the logistics and waste recovering, and there are only 30 workers in Pudong District
- * The effect of the recycled resource service platform
 - * Apply the infrared alarms and outsource the logistics, the transport cost is reduced by 80%
 - * The bar code is linked to individual account
 - * The Pudong District produces about 2000 electronic waste per day, 700 thousand big pieces and 500 thousand small pieces of electronic waster a year.
 - * The recycled resources service company has sales of 6 million yuan a year, and benefits 1 million yuan (excluding governmental subsidies)
- * Later work
 - * Extend the project to Shanghai



Ala recycled resources service platform



Waste recycle box demonstration



Bar code and individual account

Conclusions

1. Cities and towns are the major energy consumers and carbon emitters in China. To develop low-carbon towns is a significant measure facing the global climate change, and also necessary for the sustainable development.
2. Low-carbon towns development is fundamentally based on the philosophy of sustainability. Focusing on low carbon emissions of a unit could lead to increased carbon emissions of the whole system
3. There are technological, spatial and social policies and system pathways for low-carbon towns development, and these measures should be implemented in a integrated manner.
4. The Chinese government has issued and implemented a series of policies and actions to promote the development of low-carbon towns, and gained wide and positive support from local authorities.
5. Many outstanding practices have emerged in the course of development of low-carbon towns