

---

# Energy and Sustainable Development in China : Some Chinese Cities' Experience 中國的能源與可持續發展： 中國城市的經驗

19 November 2014

---

Speaker: Dr Winnie Law

講者：羅惠儀博士

## **1. Key concepts 主要概念**

- Sustainable development 可持續發展
- Ecological modernisation 生態現代化
- Low carbon development 低碳發展
- Green growth 綠色增長
- Green economy 綠色經濟

## **2. China: current situation and trends 中國的發展現狀與趨勢**

- Economic progress 經濟發展
- Energy consumption 能源使用
- Environmental concerns 環境關注
- Green transition in progress? 邁向綠色轉型發展？

## **3. Policy 政策**

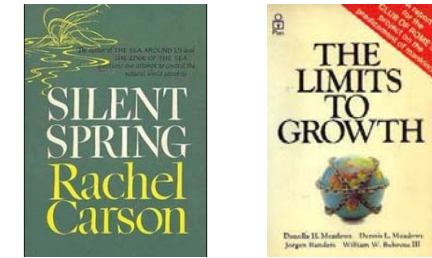
## **4. Chinese cities' experience sharing 中國城市的經驗分享**

## **5. Future challenges 未來的挑戰**

# **KEY CONCEPTS**

## 主要概念

# Sustainable development 可持續發展



## 1987 – Our Common Future (the Brundtland Report) 我們的共同未來（布倫特蘭報告）

*“...development that meets the needs of the present without compromising the ability of the future generations to meet their own needs” (WCED, 1987: 43)*

「.....既能滿足我們現今的需求，又不損害子孫後代能滿足他們的需求的發展模式。」  
(世界環境與發展委員會 WCED, 1987: 43)

Environmental concerns  
環境關注



Integrated well-being of social  
equity, economic development  
and environmental conservation  
社會公平、經濟發展與環境保  
育三方結合

## Two important concepts 兩個重要的概念

---

### 1. The concept of NEEDS 需要的概念

- *“In particular the essential needs of the world’s poor, to which overriding priority should be given to combating poverty” (WCED, 1987)* 「尤其是世界上貧困人民的基本需要，應特別優先考慮，以消除貧窮」 (世界環境與發展委員會 WCED, 1987)
- Food, shelter, water, health, security 糧食、住房、食水、健康、安全
- Emphasized on combating world poverty 尤其是應對全球貧窮問題

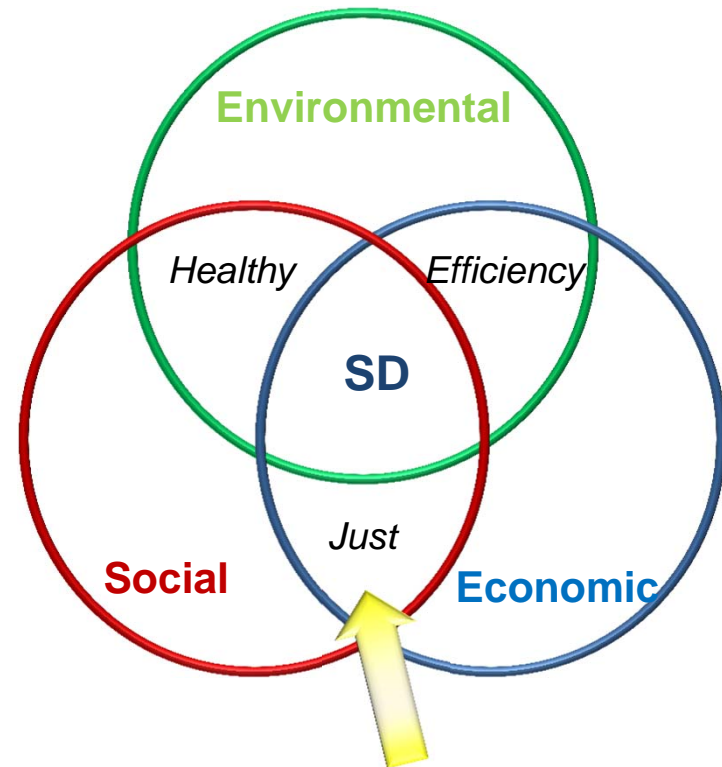
### 2. The concept of LIMITATIONS 限制的概念

- *“Limitations imposed by the state of technology and social organisation on the environment’s ability to meet present and the future needs” (WCED, 1987)* 技術狀況和社會組織對環境於滿足眼前和將來需要的能力所施加的限制」 (世界環境與發展委員會 WCED, 1987)
- Limitations in technological advancement and socio-political set up 技術進步和社會政治組織總有限制

## The 3-ring model

### 三環概念

- Aiming to bring the three together in a balanced way, reconciling conflicts – **is it possible?**
- 旨在把三者結合而使它們得到平衡，但可行嗎？
- Assumes the **separation** and **autonomy** of the economy, society and environment
- 假設經濟、社會和環境的分離和自主性
- Leads to assumptions that **trade-offs** can be made
- 三者存在著權衡取捨關係

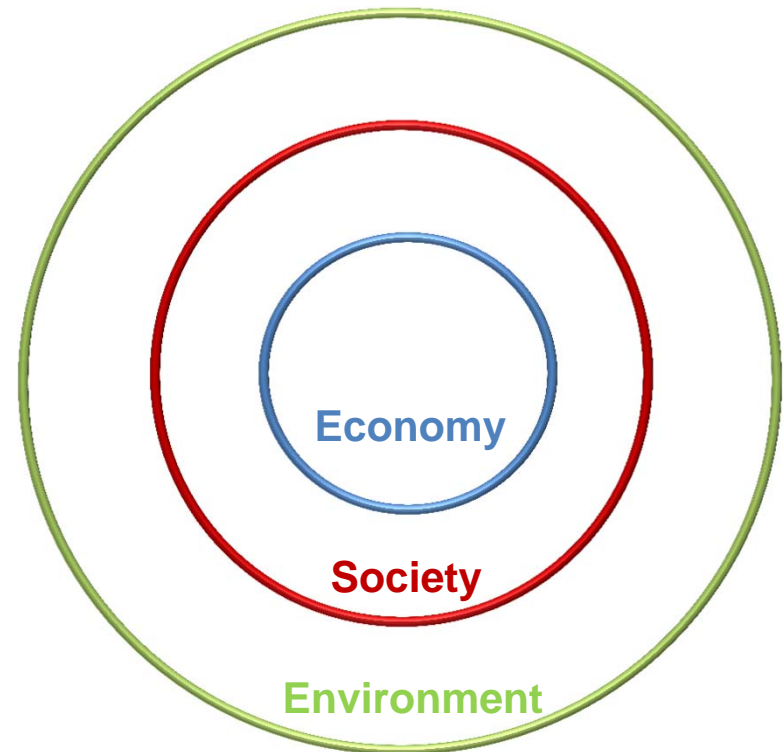


***Contradiction or integration?***

## The nested SD model

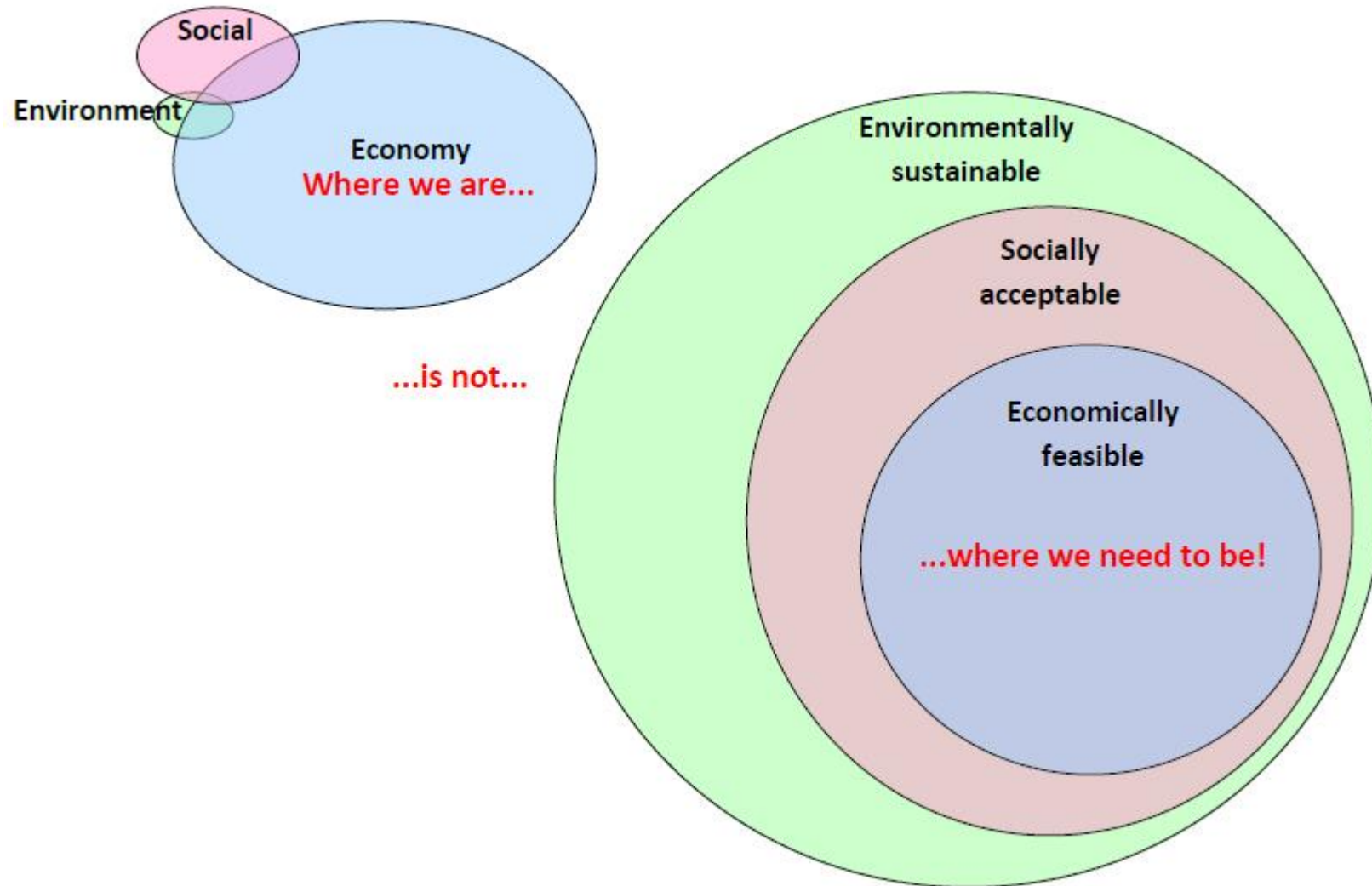
---

- Material reality: the economy is **dependent** on society and the environment 經濟增長依賴於良好的社會發展和取決於環境的承載能力
- All our material needs (e.g. heat, light, food, medicines, clothing) are made with materials and energy from nature 我們所有的物質需求（如熱能、光、食物、藥品、服裝），均採用來自大自然的材料和能源
- Products (waste or goods) eventually end up returning to the environment 衍生物品或垃圾最終還是回歸大自然
- A multi-layered and multi-faceted approach – encourage **win-win** solution 多層次，多方位，鼓勵雙贏的解決方案



## The nested SD model

---





## Ecological modernisation 生態現代化

---

- twin processes of “economizing the ecology” and “ecologizing the economy”
- 實現經濟的生態化和生態經濟化的協調發展
- to increase the environmental efficiency of the economy by reducing the rate of environmental damage caused per unit of output
- 推動經濟增長與環境退化脫鉤
- adoption of new and integrated technologies which may reduce consumption of raw materials as well as emissions of pollutants while simultaneously creating innovative and competitive products
- 通過創新技術，可減少原材料的消耗及污染物排放，同時創造出更具市場競爭力的產品

Source: Murphy, 2000; Berger et al, 2001; Andersen and Massa, 2000

# Ecological modernisation

## 生態現代化

### *Macro-economic level*

#### 宏觀經濟層面

- seek structural economic change
- 經濟結構轉型
- Move away from energy and resource intensive industries to service and knowledge-based industries
- 由能源/資源密集型轉向以服務和知識為基礎的產業
- Advocate changes in infrastructure and technology, e.g. through public transport provision, land use planning, use of information technology
- 改善基建和提升技術，如透過發展公共交通、土地利用總體規劃和採用信息技術等)

### *Micro-economic level*

#### 微觀經濟層面

- Adopt new technologies and techniques
- 採用新技術
- Shift away from 'end-of-pipe' pollution control technologies to the development and application of 'clean' technologies
- 從末端污染控制轉為促進清潔技術的開發和應用
- Integrate environmental considerations into the design and application of products and processes
- 將環境因素納入產品設計其及應用
- Tackle the pollution problem at source
- 從源頭根治污染問題

Source: Gouldson and Murphy, 1997

# Low carbon development

## 低碳發展

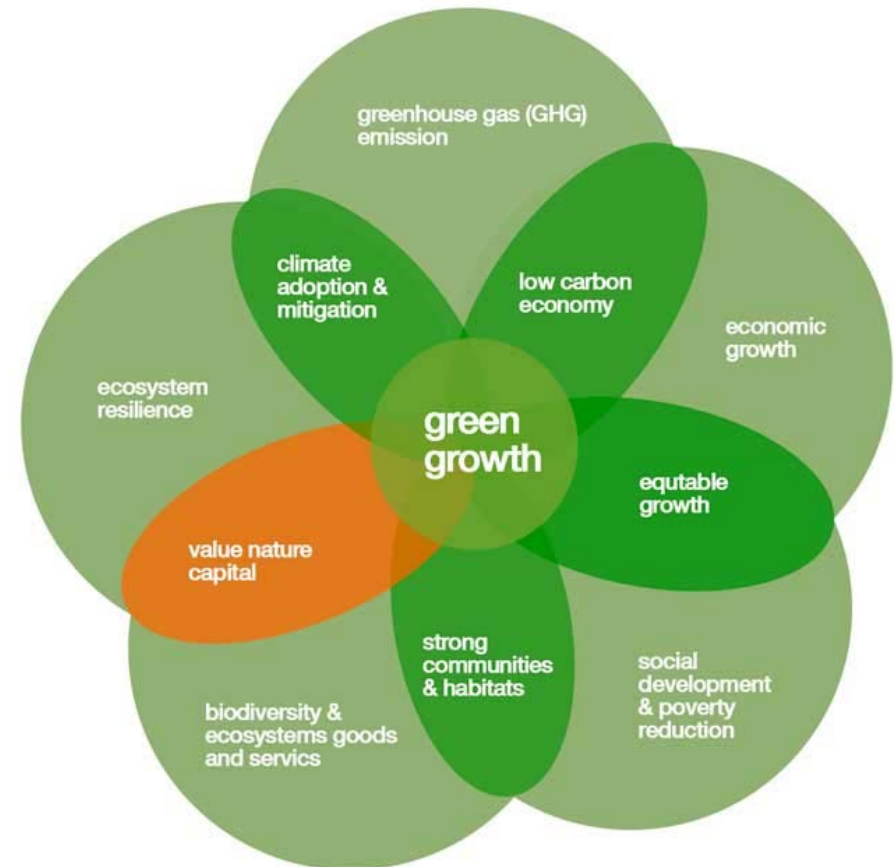
- The concept of low carbon development has its roots in the UNFCCC adopted in Rio in 1992
- 低碳發展的概念建基於1992年在里約熱內盧通過的聯合國氣候變化框架公約
- No formally agreed definition exists
- 沒有正式的定義
- Now generally expressed using the term **low-emission development strategies** - forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth (OECD, IEA, 2010)
- 普遍地理解為 “低排放發展戰略” - 即前瞻性的國民經濟發展計劃或戰略，強調低排放和/或在應對氣候變化背景下實現可持續發展的經濟增長模式



## Green growth

### 綠色增長

- 34 ministers signed a Declaration pledging to develop a "*Green Growth Strategy*" at the OECD Ministerial Council Meeting in June 2009
- 在2009年6月舉行的經合組織部長級理事會會議上，來自34個國家的部長簽署了一項綠色綠色增長戰略



## Green economy

### 綠色經濟

- In 2008, UNEP launched the “*Green Economy Initiative*” at the height of the global financial crisis and in the midst of the planet wide environmental challenges
- 在面對全球金融危機和各種環境挑戰下，聯合國環境規劃署於2008年發起了“綠色經濟倡議”



UNEP's definition of a green economy as:

*"an economic system that results in improved **human well-being** and **social equity**, while significantly reducing **environmental risks** and **ecological scarcities**". This implies that a green economy has three major characteristics of being "**low carbon**, **resource efficient** and **socially inclusive**".*

“綠色經濟是改善人類福利和社會公平，同時極大地降低環境危害和生態稀缺性的經濟模式。簡而言之，綠色經濟指的是注重低碳、資源效率與社會包容的經濟”

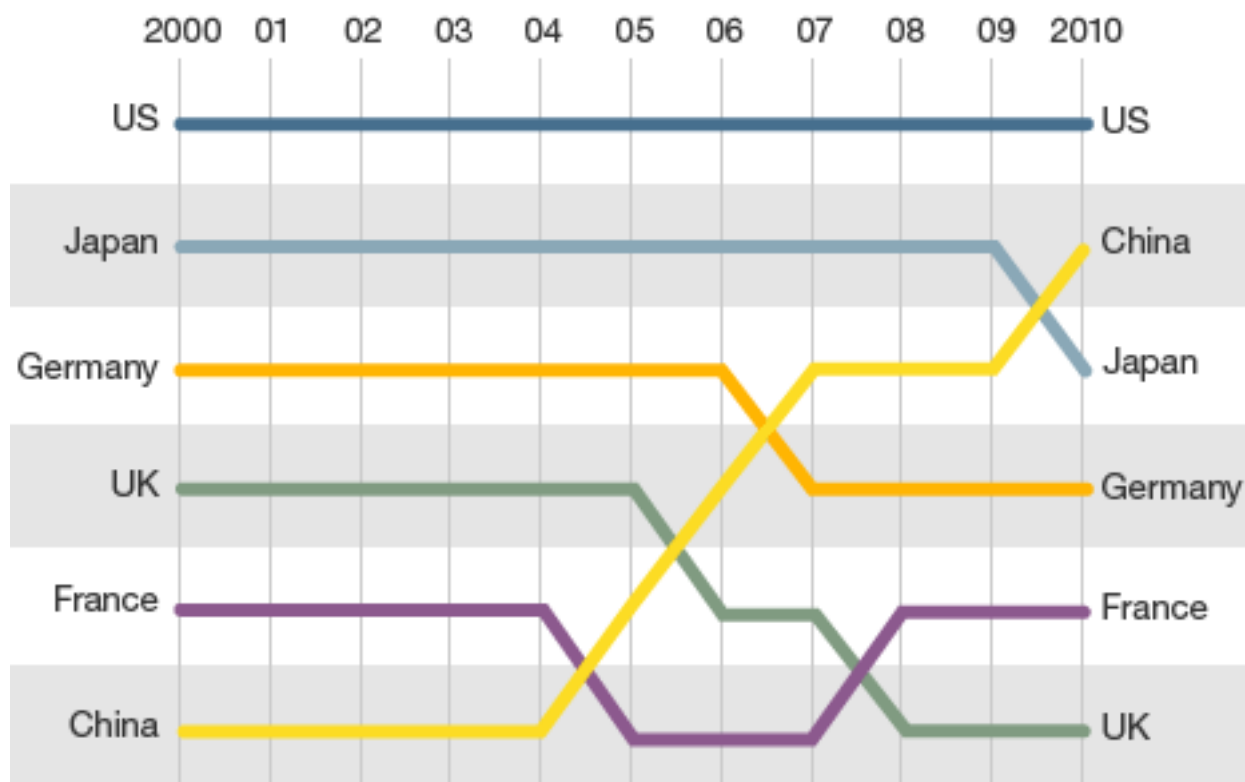
# **CHINA: CURRENT SITUATION AND TRENDS – ECONOMIC PROGRESS**

中國的發展現狀與趨勢 –  
經濟發展



## Quick facts 背景

### Who has the biggest economy?



Source: IMF October 2010

Second largest economy  
since 2010

2010年中國已經成為全球  
第二大經濟體

10% of the global economy  
佔全球經濟的10%

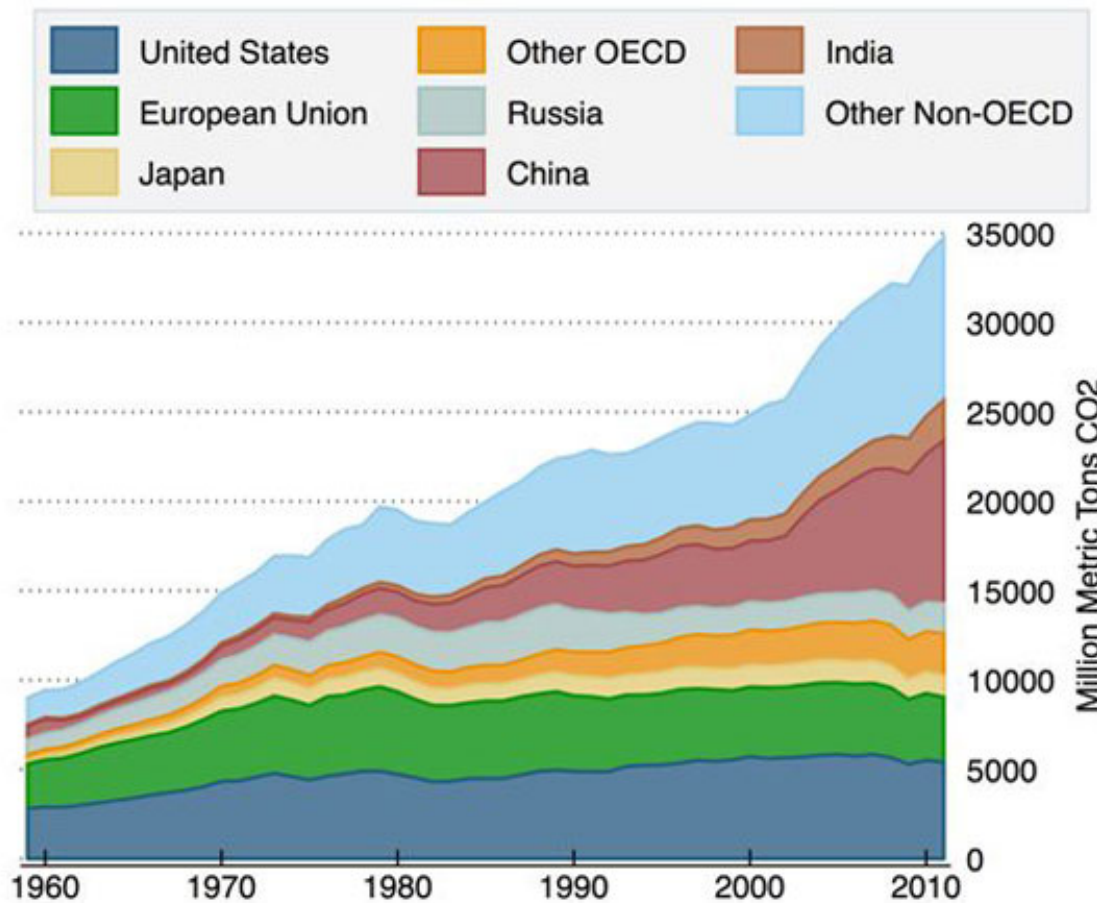
The world's biggest goods  
trading nation since 2012

2012年成為全球最大貨物  
貿易國

Source: Data from World Bank, BP, OICA and EPA

## Quick facts 背景

### Global CO2 Emissions



Based on data from the Global Carbon Budget for 1959-2011.

Largest coal consumer

最大的煤炭消費國

- 50% of the world's total
- 世界總量的50%

Largest vehicle market

最大的汽車市場

- 213% more units produced than US
- 比美國多生產213%

Largest GHG emitter

最大的溫室氣體排放國

- 23% of total global emissions
- 佔全球總排放量的23%



## Three decades of rapid economic growth 三十年的經濟高速增長

GDP and real GDP\* growth rate in China, 1978-2011



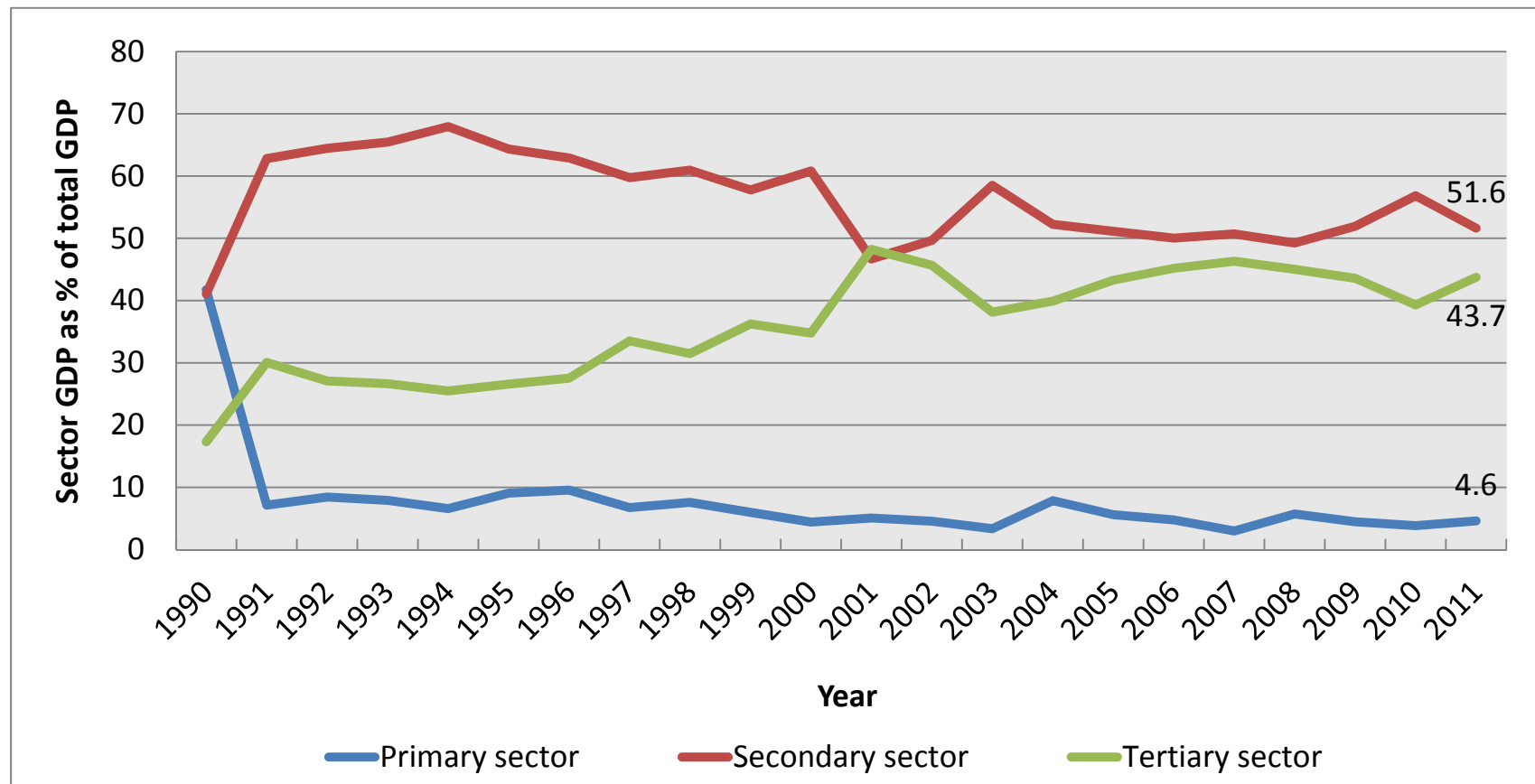
- GDP increased **129-fold** from 1978 to 2011
- 國內生產總值在1978年至2011年期間增加了129倍
- Per capita GDP rose by more than **92 times** from 381 RMB to 35,181 RMB
- 人均國內生產總值增長超過92倍 (從381元至35,181元)
- Became the **“World Factory”** – lifting millions of people out of extreme poverty
- 成為“世界工廠” - 使數百萬人擺脫極度貧困

Source: China Statistical Yearbook, 2012

\*Real GDP is a macroeconomic measure of the value of economic output adjusted for price changes (i.e., inflation or deflation)

## Sectoral structure 經濟結構

Composition of GDP by sector in China 1990-2011  
(國內生產總值按經濟行業劃分)



# **CHINA: CURRENT SITUATION AND TRENDS – ENERGY CONSUMPTION**

中國的發展現狀與趨勢 –  
能源使用

## Trends of resource utilisation: energy 資源利用的趨勢：能源



In 2009, China became the world's top energy consumer.

2009年，中國成為世界上最大的能源消費國



Coal supplied the vast majority of energy consumption in China

煤炭在能源消費結構中佔據絕大部分比例



Energy consumption for tertiary industry, residential users and transportation experienced rapid growth

第三產業、居民生活和交通運輸用能快速增長

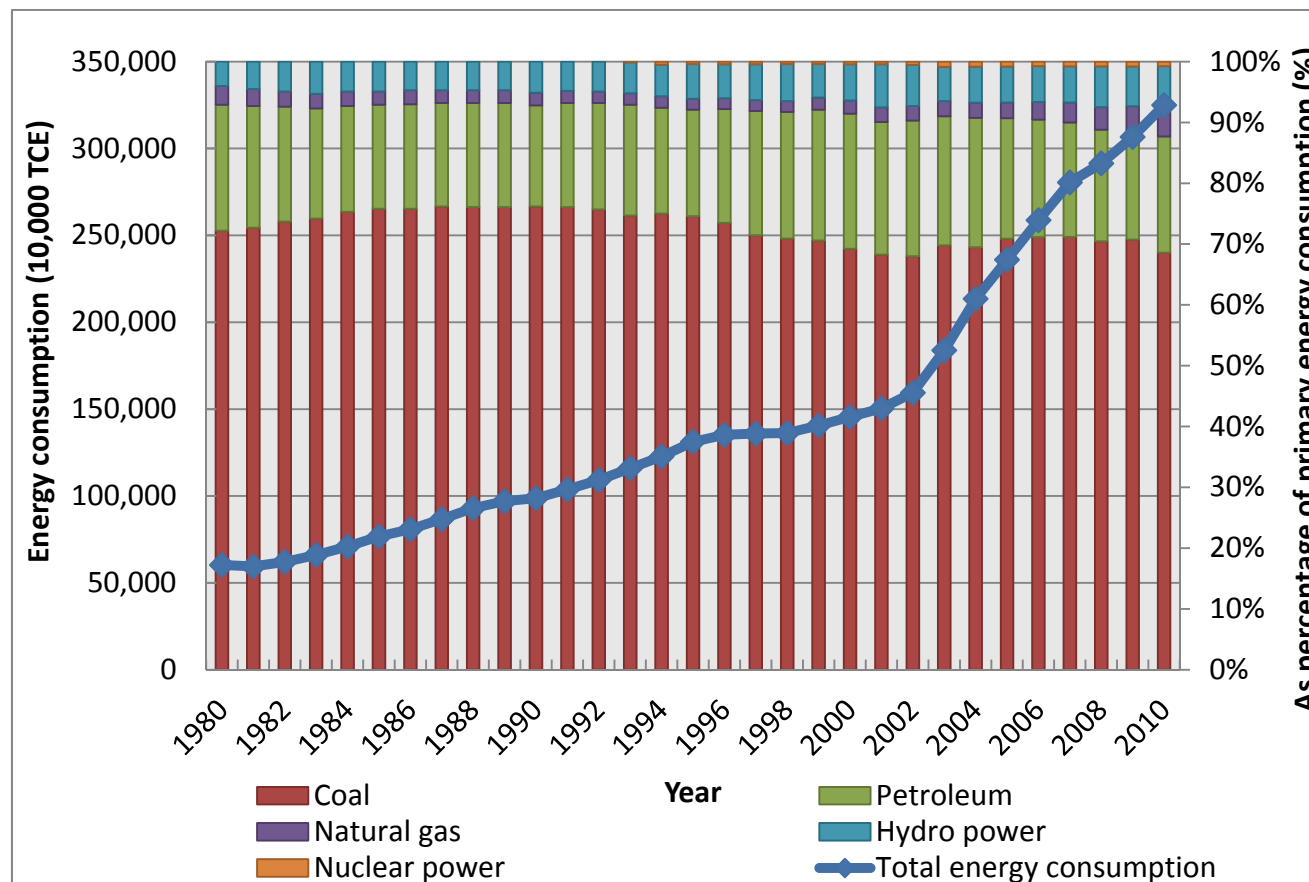


Energy consumption in the central and western region expanded faster than that of eastern areas

中部和西部地區的能源消耗增長較快

## Energy consumption growth 能源消費增長

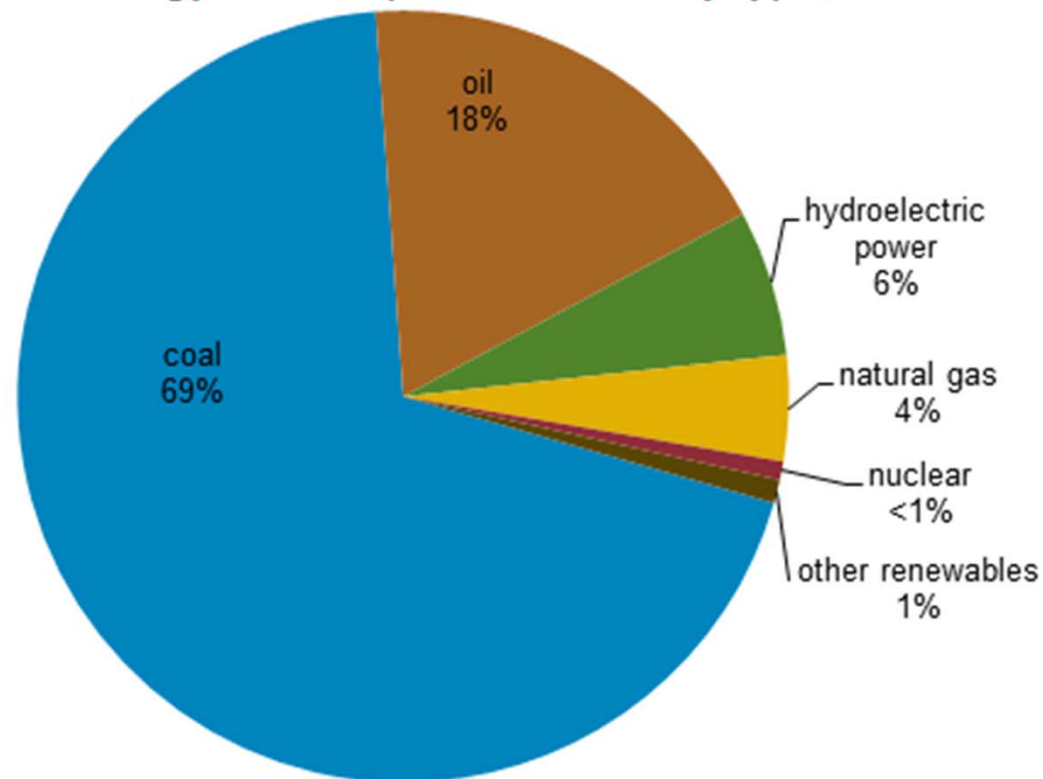
Energy consumption in China, 1980-2010




- A **soaring growth** of energy use **since 2002** with an annual growth rate of 9.4%
- 自2002年的能源使用年增長率為9.4%
- China accounted for **17.5%** of global energy demand, which will be increased to **22%** in 2035
- 中國的能源需求量在2010年時佔全球的17.5%，預計這需求將於2035年增長至22%

## Fuel type 燃料類型

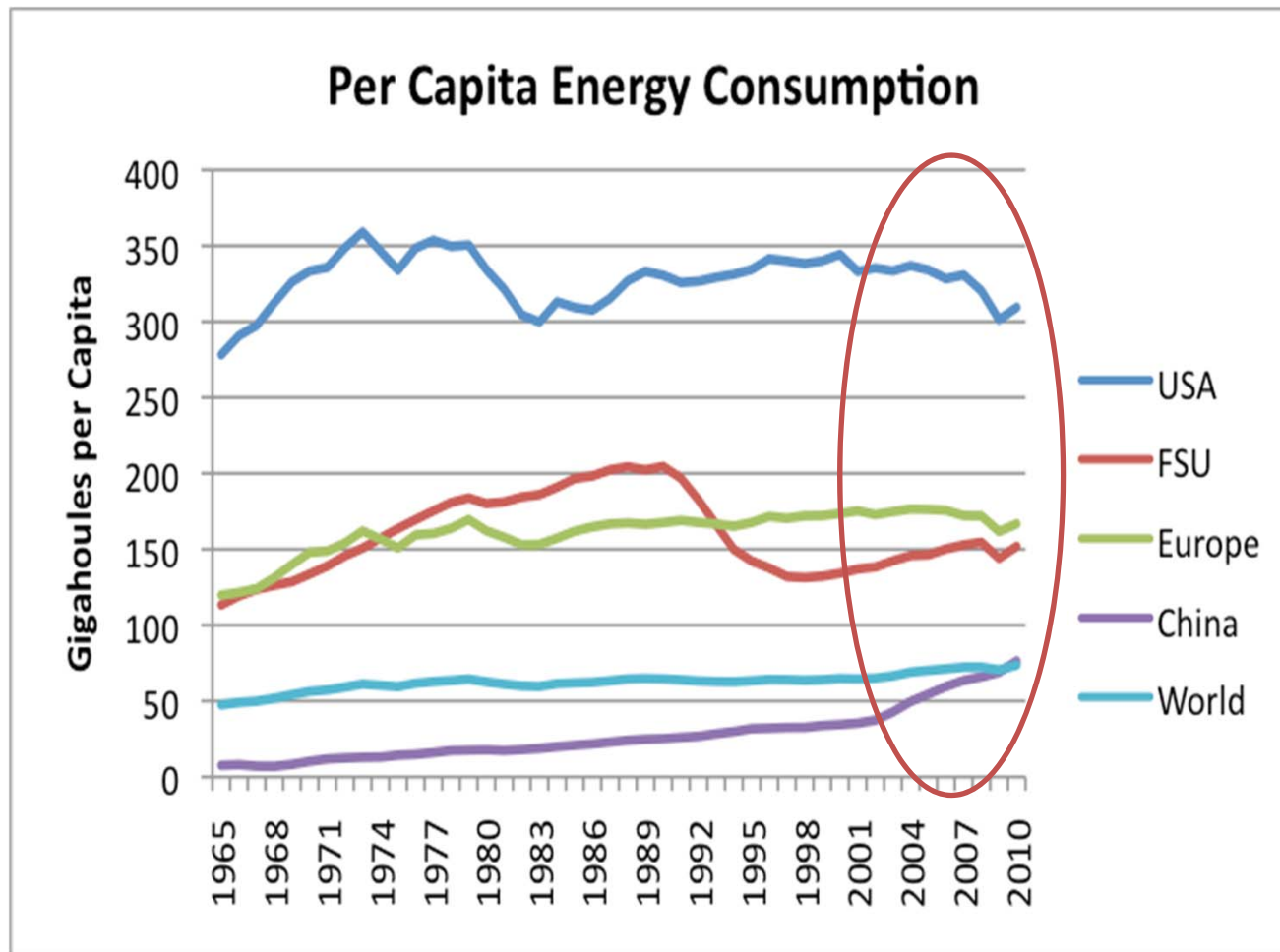
Total energy consumption in China by type, 2011



 Note: Numbers may not add due to rounding.  
Source: U.S. Energy Information Administration *International Energy Statistics*.

- Coal supplied the vast majority (nearly 70%) of China's total energy consumption in 2010
- 2009年，煤炭消費佔中國能源消費總量近7成
- Implications for the environment, society and public health?
- 對環境、社會和公眾健康的影響？

## Energy consumption per capita 人均能源消費量



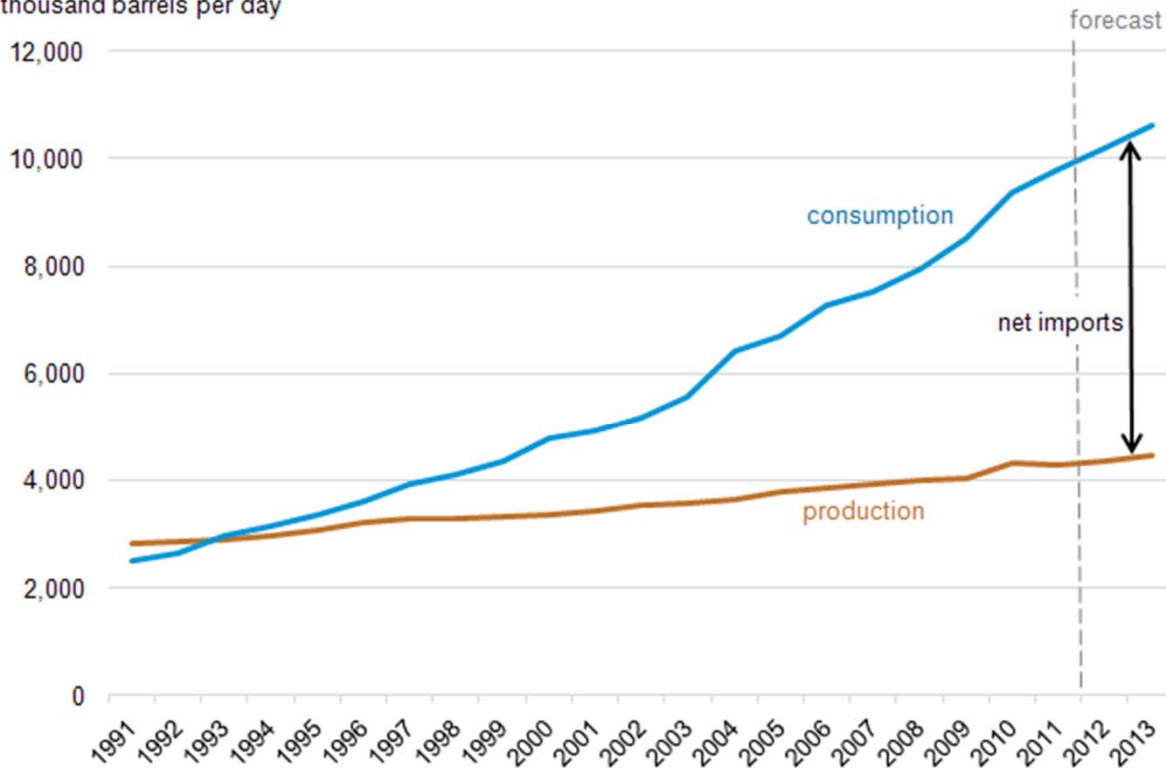
- China's energy consumption per capita has **greatly increased** in recent years
- 中國人均能源消費量近年來大幅增加
- Yet, China's per capita energy consumption was about **one-fifth** of that of the US
- 然而，中國的人均能源消費量大約為美國的五分之一

## Increased reliance on imported energy

### 對進口能源的依賴增加

China's oil production and consumption, 1990-2013

thousand barrels per day



Source: U.S. Energy Information Administration *International Energy Statistics and Short-Term Energy Outlook* (August 2012)

- China's steady growth in oil demand has led it to become the world's **largest net oil importer**, exceeding the US in September 2013
- 中國的石油需求穩步增長，導致它成為世界上最大的石油淨進口國(2013年9月已超越美國)
- Increasing **urbanization** comes increased gasoline consumption as more and more urban Chinese purchase **automobiles**
- 城市化進程的加快，人民生活水平的提高，必然伴隨著石油消費的增加

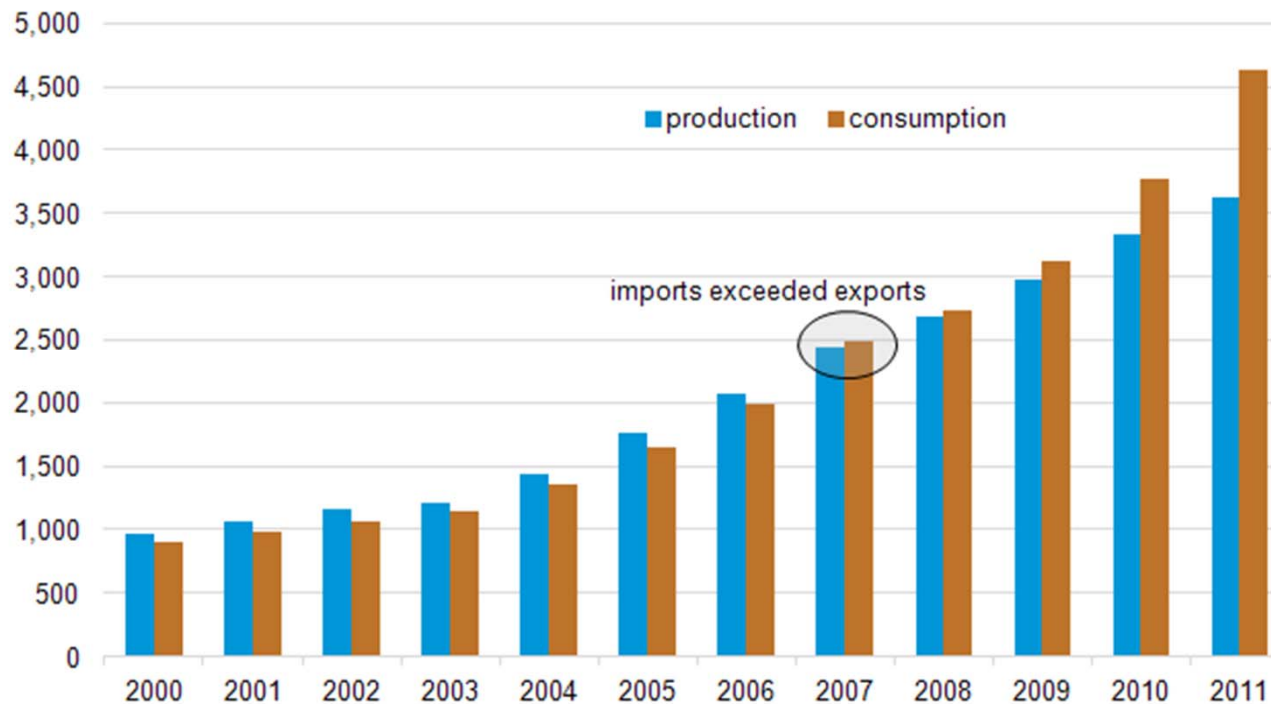


## Increased reliance on imported energy

對進口能源的依賴增加

China's natural gas production and consumption, 2000-2011

billion cubic feet



Source: U.S. Energy Information Administration *International Energy Statistics*

- China became a **net natural gas importer** for the first time in 2007
- 自從2007年成為淨天然氣進口商
- Shale gas is seen as a way to reduce dependence on imported gas?
- 開採頁岩氣以逐漸減少對進口天然氣的依賴？

Note: 1 ton of coal equivalent (TCE) is equal to 27778.25 cubic foot of natural gas

## Shale gas reserves in China – accessibility still unclear

中國頁岩氣儲量至今仍不清楚



- Majority of Chinese shale reserves are estimated to be located in 3 basins - **Sichuan, Tarim and Yangtze Platform**
- 中國頁岩儲量，預計大部分位於四川、塔里木盆地和揚子地台
- Probably lie beneath **mountainous terrain, under terraced rice and tea plantations** or in **deserts** where water is scarce
- 位處多山的地形下，或在梯田、茶園、沙漠以下
- Environmental impacts of hydraulic fracking
- 水力壓裂法的環境影響

Source: U.S. EIA, Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States, 2013.

## Development of cleaner and renewable energy

### 清潔能源和可再生能源的發展

- China's 12th Five Year Plan (12FYP) sets out a specific goal of 11.4% of total primary energy from **non-fossil fuel sources** by 2015, and **15% by 2020**
- 十二五規劃規定 2015年非化石能源佔一次能源消費比重達到 11.4%，到2020年達到15%
- Types of cleaner energy sources 清潔能源類型：
  - Coal-bed methane 煤層氣
  - Supercritical coal fired plants 超臨界燃煤電廠
  - Fluidized bed coal technology 循環流化床燃煤技術
  - Waste to Energy 轉廢為能
- China currently ranks **first in** terms of installed **wind power** and **hydropower**
- 在風力發電和水力發電方面中國是世界上的領先者
- China is also the world's **leading manufacturer** of **solar photovoltaic cells**
- 中國也是世界領先的太陽能光伏電池生產國



Solyndra received a 527 million dollar loan guarantee from the government before filing for bankruptcy in Sep 2011



Rooftops with numerous SWH: because of government subsidies (Liu & Liu, 2013)

# **CHINA: CURRENT SITUATION AND TRENDS – ENVIRONMENTAL CONCERNS**

中國的發展現狀與趨勢 –  
環境關注

## Most pressing environmental issues and its impacts: some figures 最緊迫的環境問題及其影響



The costs of environmental degradation and depletion of natural resources = 9% of China's GDP in 2012  
(World Bank, 2012)



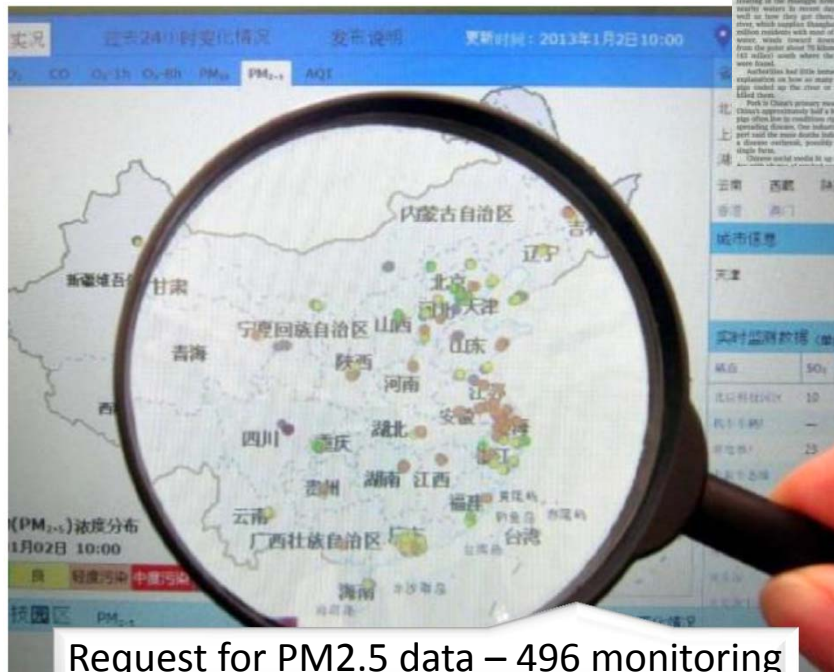
China is home to seven of the world's ten most polluted cities  
(Manning, 2013)



## Most pressing environmental issues and its impacts: some figures 最緊迫的環境問題及其影響

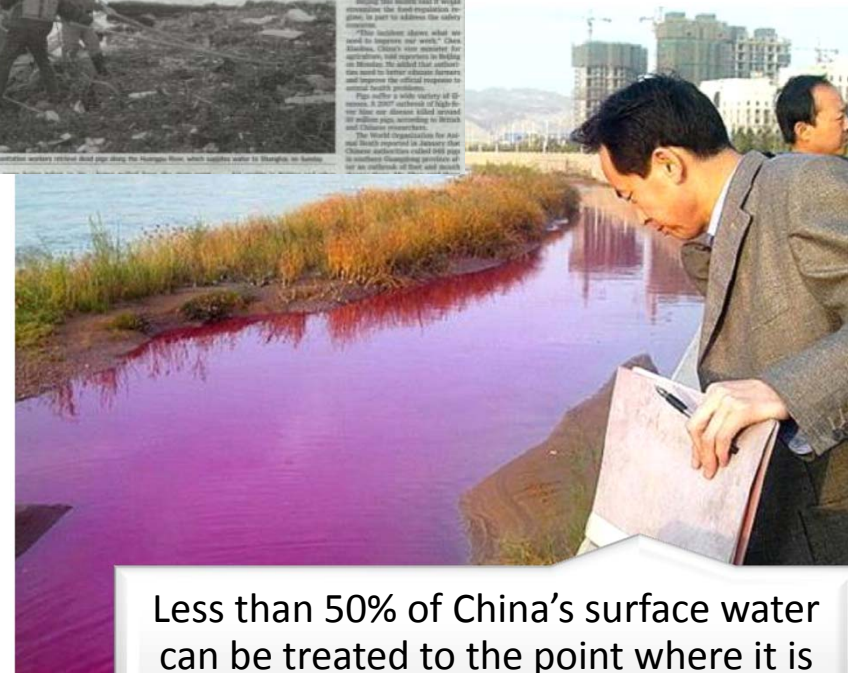


## Most pressing environmental issues and its impacts: some figures 最緊迫的環境問題及其影響



Request for PM2.5 data – 496 monitoring sites were set up in 74 cities

PM2.5數據 – 於74個城市共設置了496監測點



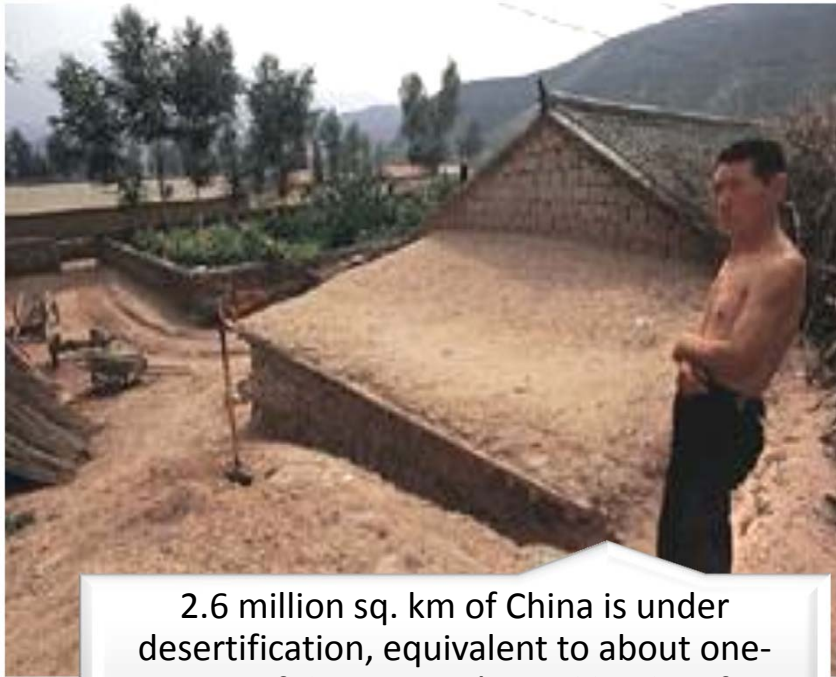
Less than 50% of China's surface water can be treated to the point where it is safe for drinking

中國的地表水不足50%可以安全飲用

(The Economist, 2012)

## Most pressing environmental issues and its impacts: some figures

### 最緊迫的環境問題及其影響



2.6 million sq. km of China is under desertification, equivalent to about one-quarter of the country's total land surface

中國荒漠化面積已達260萬平方公里，佔全國陸地面積的1/4

*(People's Daily, 2011)*



16,306 species (animals and plants) under threat, among which 800 species are located in China

全球目前有16306種動植物面臨滅絕危機，其中800種分佈在中國

*(ICUN, 2007)*



Most pressing environmental issues and its impacts: some figures  
最緊迫的環境問題及其影響



China's 'Operation Green Fence' (2013)

綠籬行動 (2013)



No longer be accepting poorly sorted or dirty shipments of recyclable waste from foreign exporters

不再隨便接受草率分類、夾雜著各類雜質的可回收廢料

# Quest for better environment and quality Life

## 追求更好的環境和優質生活

- Growing influence of environmental activists, advocacy groups and the **internet**
- 環保團體、倡議組織和互聯網的影響力越來越大
- Increasing pressure from the **growing Chinese civil society** – basic rights to fresh air, clean water and safe food
- 良好公民社會的基本權利：清新的空氣、潔淨的水源及安全的食品
- 50,000 riots and protests during 2012
- 於2012發生約5萬場騷亂和抗議活動
- **New wave of environmental justice movement?**
- 興起新一波的環境正義運動？



Quest for better environment and quality Life

追求更好的環境和優質生活

---

Quest for better environment and quality Life

追求更好的環境和優質生活

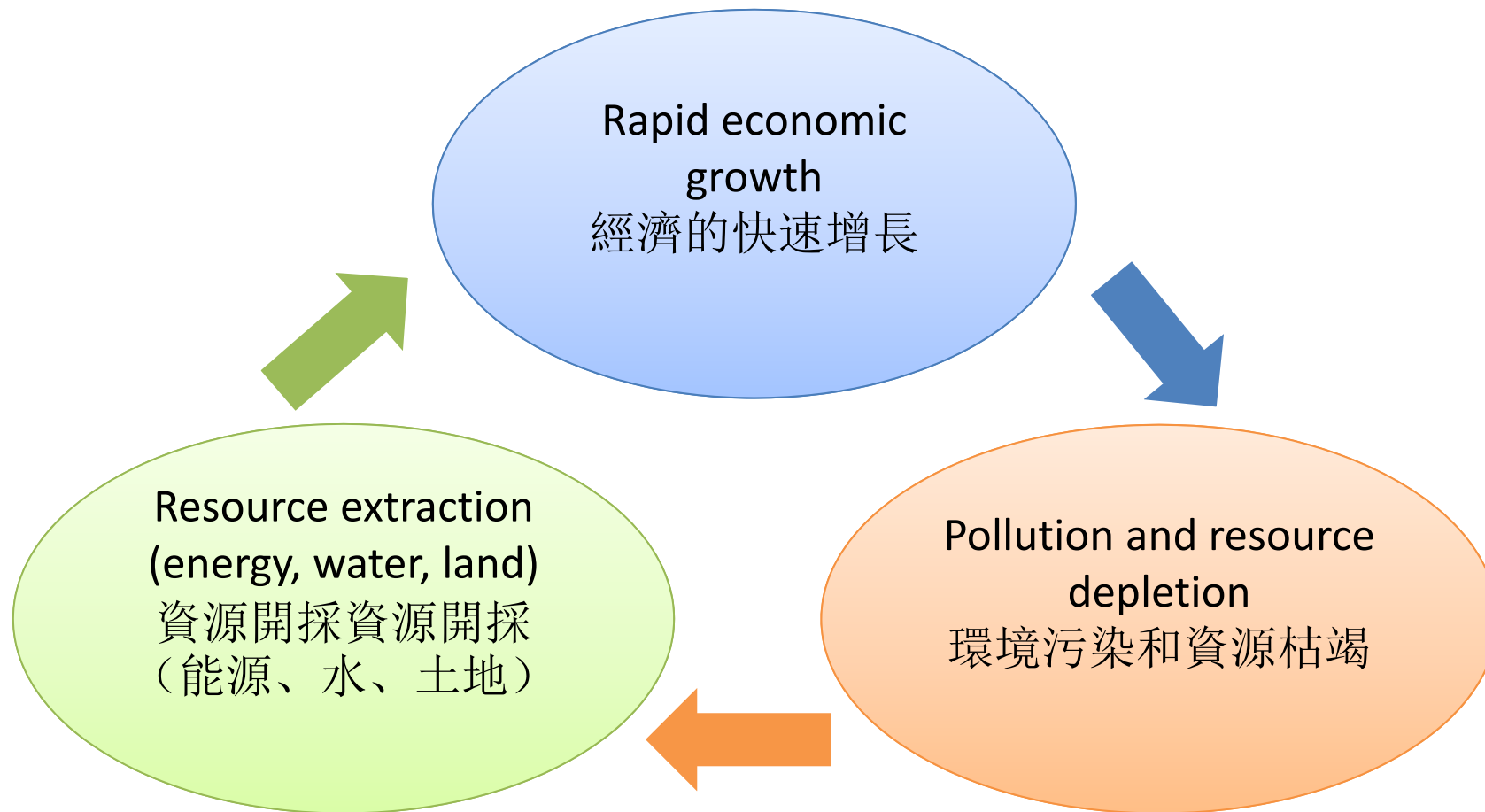
---

# **Green transition in progress?**

## **邁向綠色轉型發展？**

## Unsustainable development 不可持續發展

---



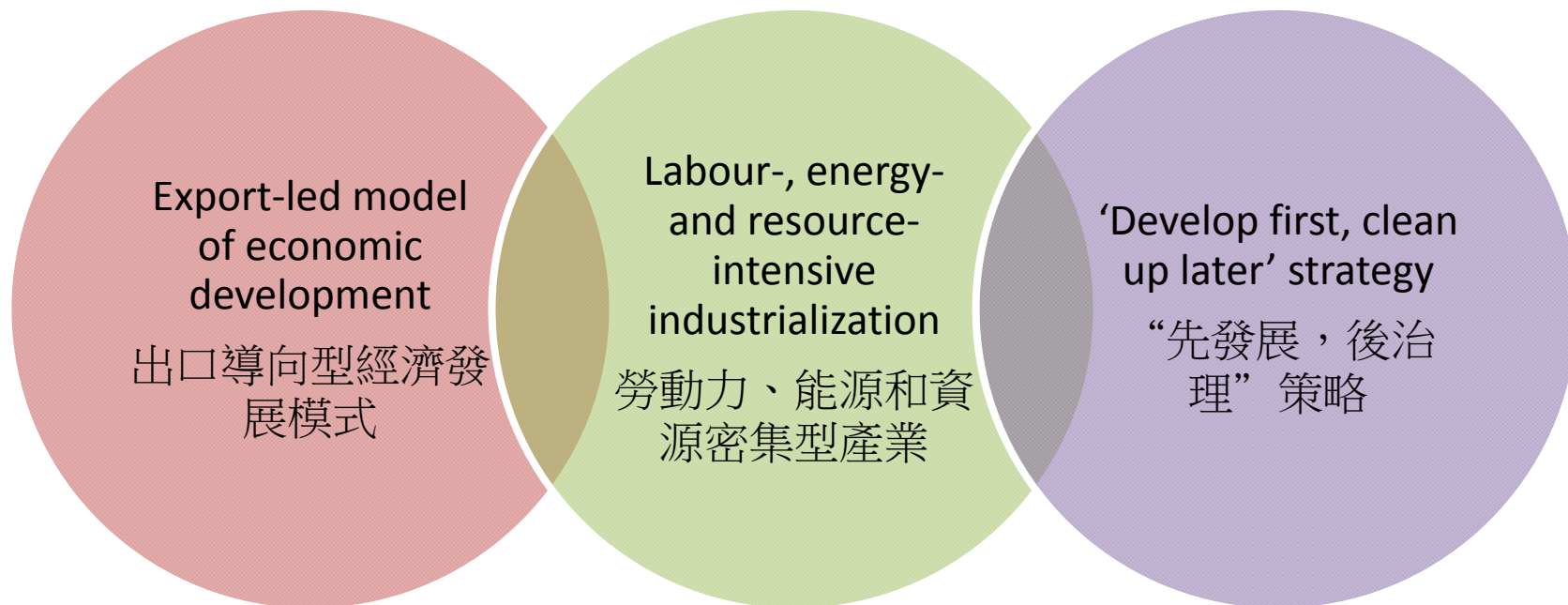


## The Chinese growth model

### 中國的增長模式

Irreversible damage to the ecosystem is already threatening the economy,  
human health and social stability

對生態系統造成不可逆轉的傷害已經威脅到經濟、人類健康和社會穩定



Towards a green development path (driven by more efficient use of resources and  
productivity improvement through innovation and industrial upgrading)

邁向綠色發展之路（通過創新、產業升級、更有效地利用資源和提高生產力）

# Drivers for resource efficiency in China

## 促進中國提高資源效率的根本原因

- Rising resource consumption in an era of scarce resources
- 在資源日益稀缺的背景下，不斷增加資源消耗是促進中國提高資源效率的根本原因
  - Population growth, rapid urbanization, urban-rural migration
  - 人口增長、急速城市化、城鄉移民
  - **shrinking** domestic resources + **increased dependence** of foreign resources
  - 國內資源供應不足 + 對國外資源的依賴程度逐漸提高
- Emerging middle-class and growing public health concern
- 中產階級冒起和對公共健康的關注
  - Public demand for greater information **transparency** & more **public involvement** in resource management
  - 以更加透明和公開的方式提供更多有關於環境議題的資訊，同時逐漸要求參與管理公共環境資源
- Global pressure and expectation on China to curb global carbon and GHGs emissions
- 在減少溫室氣體及碳排放、遏制全球變暖趨勢的議題上，中國成了談判的焦點





## Energy intensity of China

### 中國的能源強度



Note: 1 tonne of oil equivalent (TOE) = 1.42857142857 TCE

## Economic restructuring and changes of environmental conditions in Eastern China region

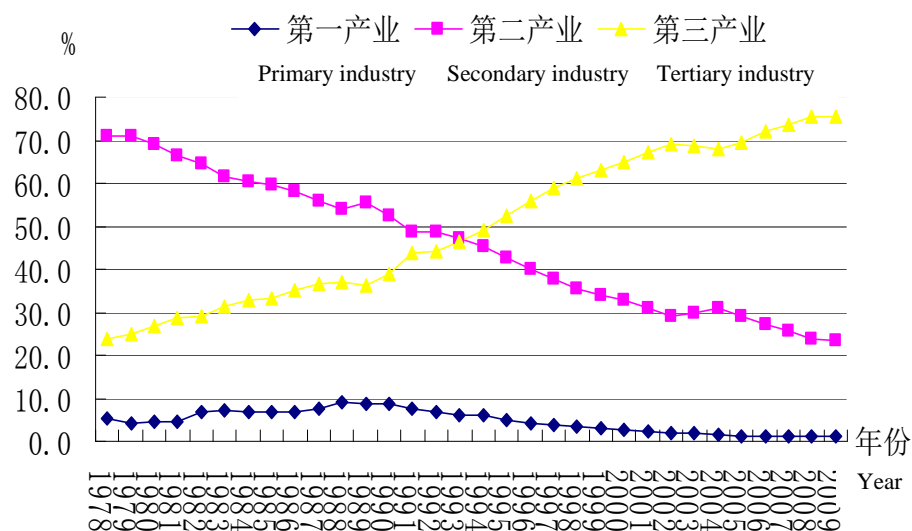
### 中國東部地區的經濟轉型及環境條件的變化

- Different parts of Eastern China had different development patterns and trajectories as each area has its unique historical context and strategic function
- 由於歷史背景、區位、資源稟賦和發展戰略方面的差異，東部不同地區的發展模式和軌跡各不相同
- Eastern China region is undergoing economic restructuring, with the service-related industries growing rapidly at the expense of manufacturing industry (especially after 2000), resulting in the establishment of a “3-2-1” economic structure
- 東部地區經濟轉型正在進行，區內服務相關行業取代了製造業成為了增長最快的產業(尤其在2000年後)。經濟結構出現了第三產業最大、第二產業其次、第一產業最小的“3-2-1”格局



## Changes in composition of primary, secondary and tertiary industries in Beijing, 1978-2009

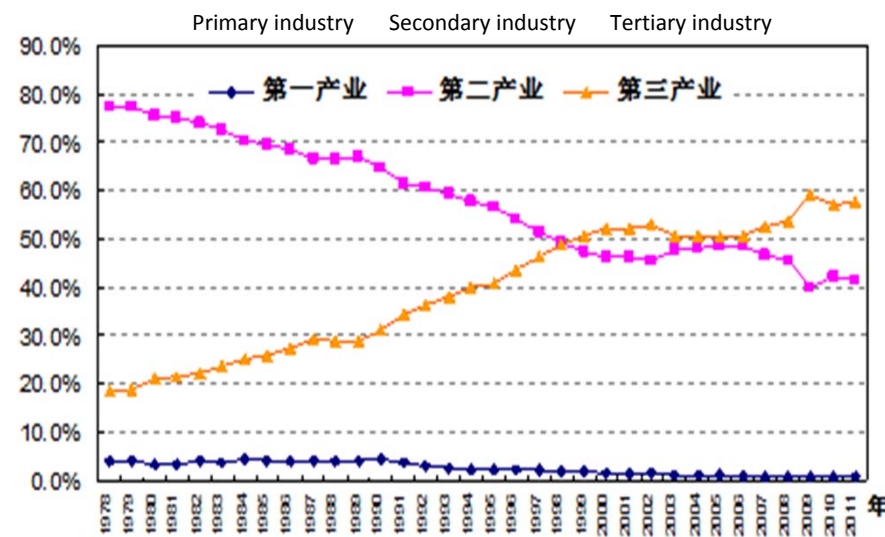
### 北京三次產業分佈及變化



Source: Beijing Statistical Yearbook (1979-2010), Beijing Municipal Bureau of Statistics

## Changes in composition of primary, secondary and tertiary industries in Shanghai, 1978-2010

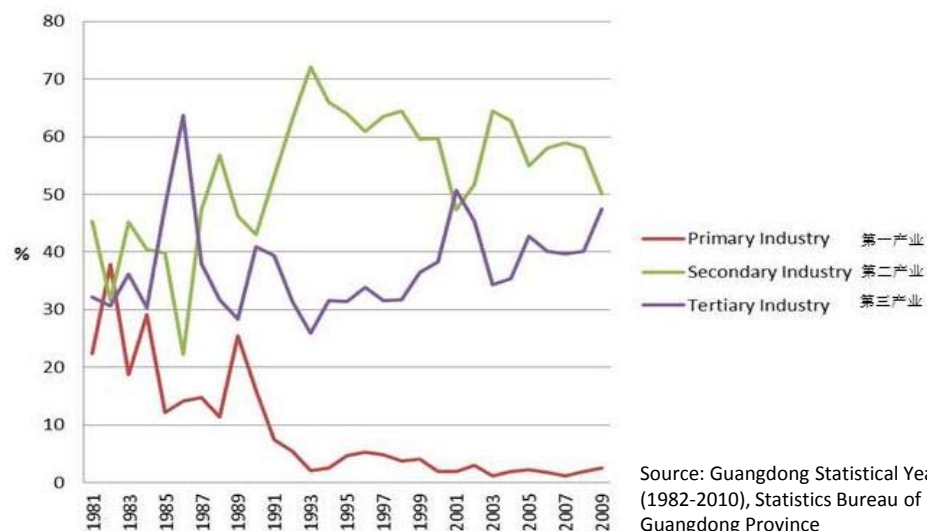
### 上海三次產業分佈及變化



Source: Shanghai Statistical Yearbook (1979-2011), Shanghai Municipal Statistics Bureau

## Changes in composition of primary, secondary and tertiary industries in Guangdong, 1981-2009

### 廣東三次產業分佈及變化



Source: Guangdong Statistical Yearbook (1982-2010), Statistics Bureau of Guangdong Province

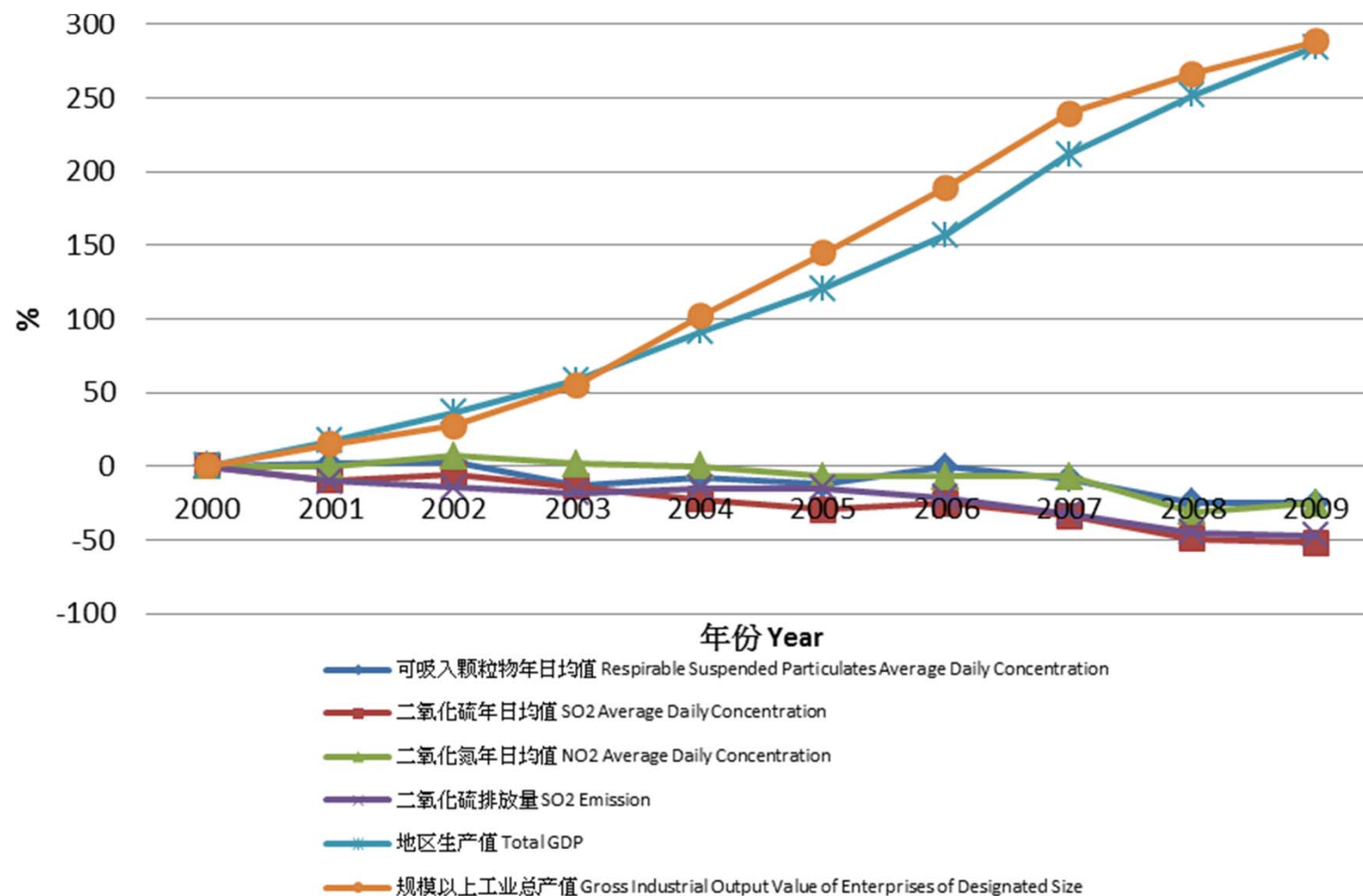
## Economic restructuring and changes of environmental conditions in Eastern China region

### 中國東部地區的經濟轉型及環境條件的變化

---

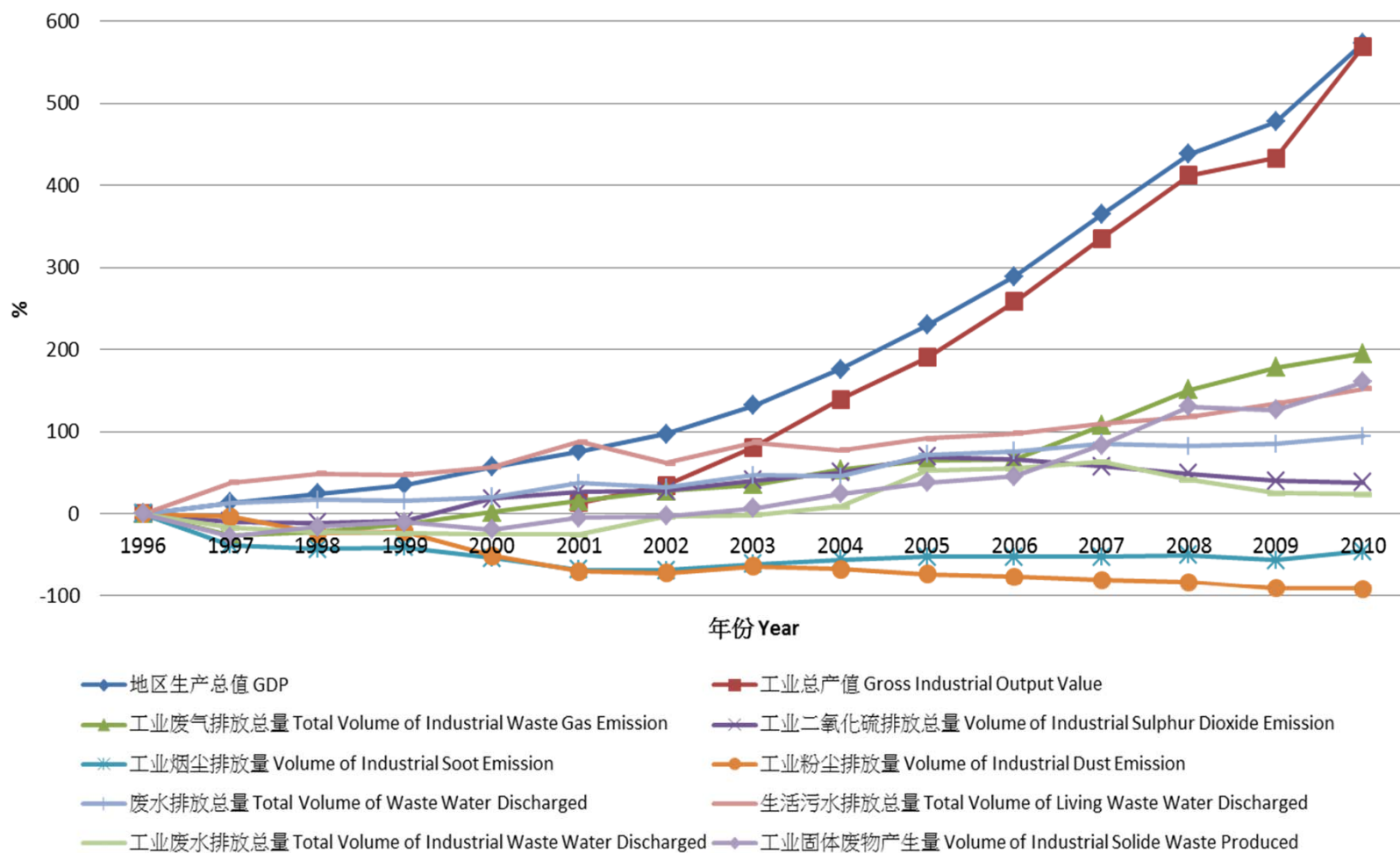
- Economic restructuring through industrial upgrade shows some success in **localized environmental improvements** in terms of reduction in the rate of environmental deterioration:
- 產業轉型和結構調整在減少環境污染和減緩環境品質惡化趨勢方面發揮了促進作用：
  - manufacturing plants that use diesel-powered generators have been closed;
  - 關閉使用柴油發電機組的工廠;
  - cleaner power plants have been progressively introduced into the market;
  - 工業用能源的清潔化以及清潔能源發電;
  - the development of centralized heating systems for urban households and encouraging urban residents to use more natural gas instead of coal, etc.
  - 集中供熱供暖取代一家一戶的分散供熱供暖方式、以天然氣替代居民燃煤等
- Trends of economic and environmental variables of the three study areas demonstrate the **relative decoupling** of economic growth and environmental quality (i.e. the economy grew faster than the rate of emissions)
- 經濟增長與環境品質存在相對脫鉤狀態，即三個地區的經濟增長率均遠高於其污染物排放量和環境濃度惡化速率

# Changes in economic development and pollutant emissions and concentration in Beijing (2000-2009) 北京市經濟發展與污染物排放及濃度變化情況 (2000-2009)



Source: Beijing Statistical Yearbook (2001-2010), Beijing Municipal Bureau of Statistics

## Changes in economic development and pollutant emissions in Guangdong (1996-2010) 廣東省經濟發展與污染物排放的變化情況 (1996-2010)

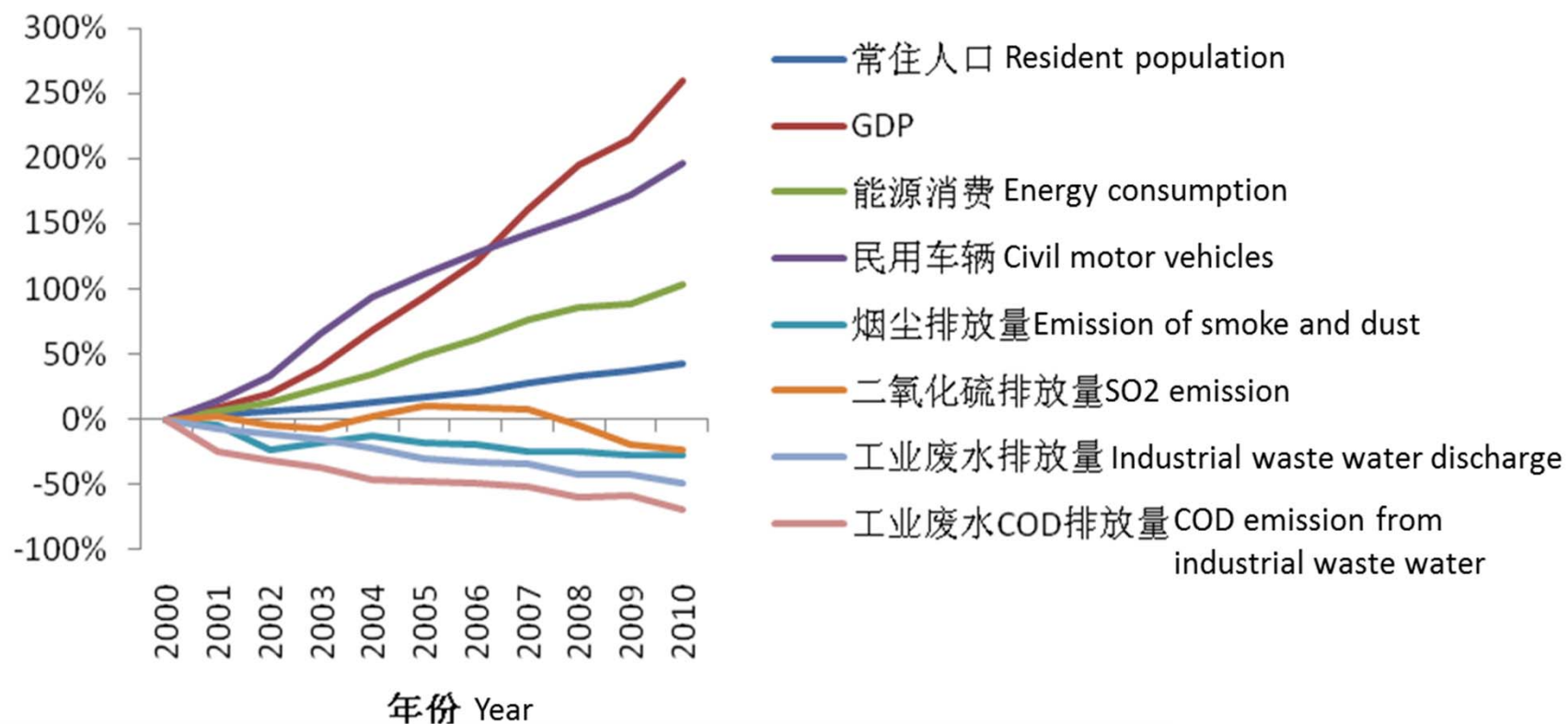


Source: Guangdong Statistical Yearbook (1997-2011),  
Statistics Bureau of Guangdong Province



## Changes in economic development and pollutant emissions in Shanghai (2000-2010)

### 上海市經濟發展與污染物排放變化情況 (2000-2010)



Source: Shanghai Statistical Yearbook (2001-2011), Shanghai Municipal Statistics Bureau

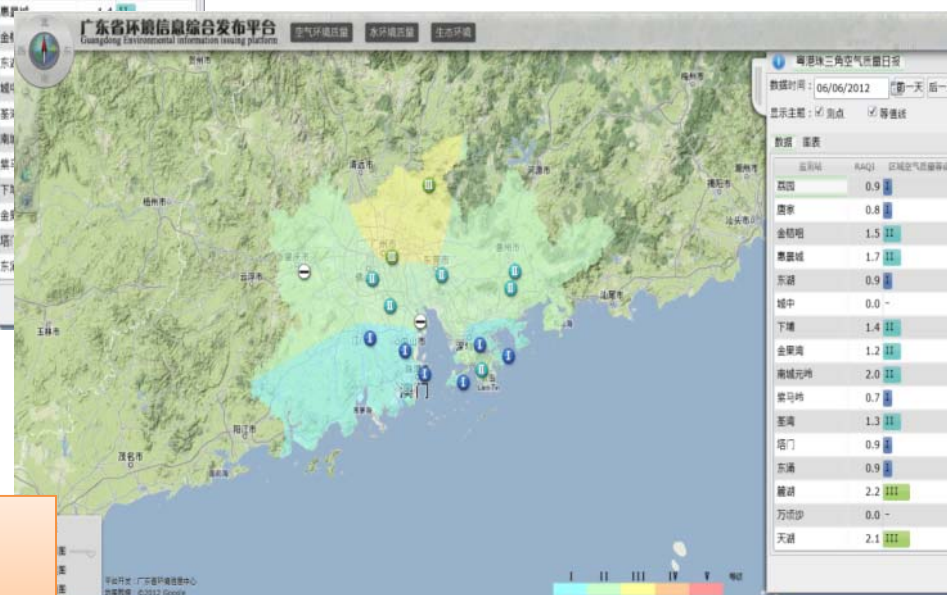
Some signs of pollution dispersion, the “pollution heaven effect”?  
 污染擴散、“污染天堂效應”現象？

Air quality grading in PRD region (6 June 2006)  
 珠江三角洲地區空氣品質評級 (6/6/2006)



- Regional Air Quality Monitoring Network since 2005
- 區域空氣監控網路 (2005開始運作)
- 16 automatic air quality monitoring stations in the Delta, 3 located in HK
- 十六個空氣品質自動監測子站，其中三個位於香港

Air quality grading in PRD region (6 June 2012)  
 珠江三角洲地區空氣品質評級 (6/6/2012)



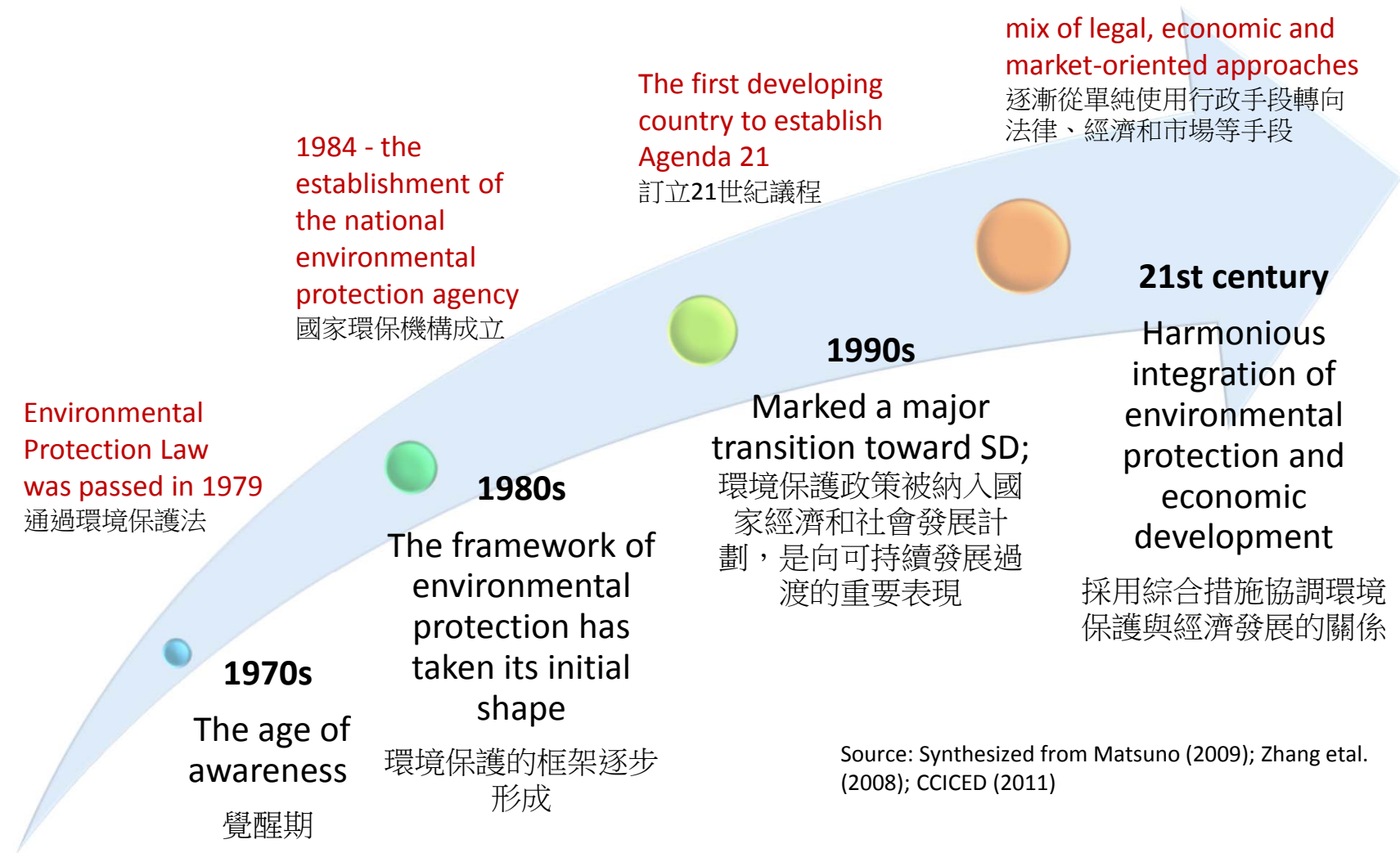
In search of lower land, labour and environmental costs)?  
 轉向土地、勞動力和環境成本較低的地區？

# **POLICY**

## 政策

# Transition in China's Environmental Policy

## 中國環境政策的轉向



Source: Synthesized from Matsuno (2009); Zhang et al. (2008); CCICED (2011)

## Transition toward the route of SD 邁向可持續發展

---

### 1990s

- From the early 1990s, regulators attempted to encourage the “three shifts” in pollution control strategy:
- 90年代初起，監管部門提出環境保護戰略的“三個轉變”：
  - end-of-pipe waste treatment to whole-process control and to source control
  - 由末端治理向生產全程序控制轉變
  - from pollution concentrations toward total discharge volume/total-load control
  - 由濃度控制向濃度與總量控制相結合轉變
  - from disperse-source control (requiring individual enterprise to resolve its emission problems), to a more integrated approach with centralized /regionalized control
  - 由分散治理向分散與集中/區域性控制相結合轉變
- In 1994, China published its national Agenda 21 and various central departments and local governments formulated their sectoral and local versions of Agenda 21
- 1994年，中國頒佈了《中國21世紀議程》。與此同時，多個中央部門和當地政府也相應制定部門及當地版的21世紀議程

# Towards harmonious integration of environmental protection and economic development

## 採用綜合措施協調環境保護與經濟發展的關係

---

### 21<sup>st</sup> Century

- the notion that economic development (**environmental-friendly and resource-saving**) should be based on '**circular economy**' was officially confirmed in 2004 along with the establishment of '**scientific outlook on development**'
- 2004年，中國政府正式確立了經濟發展應當建立在“迴圈經濟”的基礎概念之上，並提出了“科學發展觀”，旨在推進環境友好型和資源節約型的和諧社會的發展
- The concept of developing '**ecological modernization**', and a '**low carbon economy and society**' have been introduced since 2007
- 自從2007年以來，“生態文明”、“低碳社會與經濟”的概念和戰略逐漸形成
- Too much jargon?
- 過多專業術語？



## Chinese-style green development

### 中國式的綠色發展

---

- China has embarked on her own form of **green development**
- 中國開始推行其獨特的綠色發展模式
  - The stipulation of **28 laws and administrative regulations** in the field of environment and resources conservation during the 2000s
  - 制定了28條有關環境及資源保護的法律及行政法規
  - “Circular Economy Promotion Law”, “**Cleaner Production Promotion Law**”, “**Energy Conservation Law**”, “**Environmental Impact Assessment Law**”, “**Renewable Energy Law**”, “Solid Waste Pollution Prevention Law”, “Civil Building Energy Conservation Ordinance”, “Regulations on the Implementation of the Forestry Law”, etc.
  - 如《中華人民共和國迴圈經濟促進法》、《清潔生產促進法》、《中華人民共和國節約能源法》、《中華人民共和國環境影響評價法》、《中華人民共和國可再生能源法》、《中華人民共和國固體廢物污染環境防治法》、《民用建築節能條例》、《中華人民共和國森林法實施條例》等

## Chinese-style green development 中國式的綠色發展

---

- The **12th FYP (2011-2015)** opens a new chapter for green development in China:
- “十二五”規劃（2011-2015年）為中國綠色發展開啟了一個新的篇章：
  - towards a **sustainable growth model** - to restructure the Chinese economy by encouraging **domestic consumption**, developing the **service sector**, shifting to **higher value-added manufacturing**, **conserving energy**, and **cleaning up** the environment
  - 向可持續增長模式轉型 - 調整經濟結構，包括鼓勵內需、發展服務行業、轉向高附加值製造業、節約能源以及清潔環境等具體目標
- A Green Development Framework and a total of **24 binding and non-binding targets** related to an inclusive, green and competitive economy were laid down in 12<sup>th</sup> FYP
- “十二五”規劃奠定了綠色發展框架，並訂下了**24**個約束性及非約束性的目標
- The long-term aspiration - to become an **Ecological Civilization** (renamed as **Ecological Progress**), a view strengthened at the **18th CPC Congress** in November 2012
- 中國共產黨第十八次全國代表大會將生態文明建設列入重要議題

## Resources and Environmental Targets

### 資源管理及環保目標

Target	11th FYP (2010 Target)	2010 (Actual)	12 <sup>th</sup> FYP (2015 Target)
Reduction in energy intensity 降低能源消耗強度	-20% (R)	-19.1%	-16% (R)
Reduction of water consumption per unit of industrial value added 降低每單位增值工業產出的耗水量	-30% (R)	-36.7%	-30% (R)
Forest Coverage 森林覆蓋率	20% (R) (+1.8%)	20.36%	21.66% (R)
Reduction in carbon emissions per unit of GDP 二氧化碳減排量	N/A	N/A	-17% (R)
Non-fossil fuel as a percentage of primary energy consumption 非化石燃料佔一次能源總使用量比例	N/A	8.3%	11.4% (R)

Source: U.S. - China Economic and Security. (2011)

Note: (R) = restricted (binding) targets and (E) = expected (guiding) targets; N/A indicates this was not a designated key indicator in the relevant FYP

Target	11th FYP (2010 Target)	2010 (Actual)	12 <sup>th</sup> FYP (2015 Target)
Reduction of emission of major pollutants 主要污染物總減排量	-10% (R)	CO2 -14.29% COD -12.45%	N/A
Reduction in Chemical Oxygen Demand (COD) 化學需氧量減排量	N/A	N/A	-8% (R)
Reduction in Sulphur Dioxide (SO2) 二氧化硫減排量	N/A	N/A	-8% (R)
Reduction in Ammonia Nitrogen 氨氮減排量	N/A	N/A	-10% (R)
Reduction in Nitrous Oxides 氮氧化物減排量	N/A	N/A	-10% (R)

Source: U.S. - China Economic and Security. (2011)

Note: (R) = restricted (binding) targets and (E) = expected (guiding) targets; N/A indicates this was not a designated key indicator in the relevant FYP

Command and Control 指令性措施
<ul style="list-style-type: none"> <li>Control of concentration of discharged pollutants 控制污染物排放濃度</li> <li>Control of total amount of emissions 控制總排放量</li> <li>Environmental impact assessment system 環境影響評價</li> <li>“Three simultaneity system” “三同時”計劃</li> <li>Setting deadlines for control of pollution sources 制定控制污染源治理期限</li> <li>Pollution discharge permits 污染物排放許可</li> <li>Centralized control of pollutants 污染物集中控制</li> <li>Quantitative examination on integrated management of urban environment 定量檢查城市環境的綜合治理情況</li> <li>Environmental administration: supervision and inspection 環境保護行政執法：監督及檢查</li> </ul>
Market Economy 市場經濟
<ul style="list-style-type: none"> <li>Levy of pollutant discharge fees 徵收排污費</li> <li>Penalties for exceeding pollution standards 污染物超過規定排放標準的罰款</li> <li>SO2 emission charges 二氧化硫排放收費</li> <li>SO2 emission permit trading system 二氧化硫排放許可系統</li> <li>CO2 emission permit trading system 二氧化碳排放許可系統</li> <li>Subsidies for energy saving products 節能產品補貼</li> <li>Ecological compensation fee pilots 生態補償費試點</li> </ul>
Voluntary Actions 自願性願行動
<ul style="list-style-type: none"> <li>Environmental labels 環保標籤</li> <li>ISO14000 environmental management standards 環境管理標準</li> <li>Green manufacturing 綠色生產</li> <li>Eco-agriculture 生態農業</li> <li>Eco-model areas (prefectures, cities, provinces) 生態示範區(鎮、市、省)</li> <li>Eco-industrial parks 生態工業園</li> <li>Environmental NGOs 環保非政府組織</li> <li>National model cities for environmental protection, environment-friendly enterprises 國家環保典型城市，環保企業</li> <li>Green GDP accounting pilot projects 綠色GDP審計試點專案</li> </ul>
Transparency 透明度
<ul style="list-style-type: none"> <li>Publishing environmental status report 發佈環境狀況報告</li> <li>Publishing environmental statistics 發佈環境統計資料</li> <li>Publishing river water quality at key monitoring stations 發佈主要水質監測站的河水品質情況</li> <li>Publishing ambient air quality indices 發佈環境空氣品質指數</li> <li>Publishing enterprise environmental performance 發佈企業環保表現情況</li> <li>Public hearings on environmental impact assessment 舉行環境影響評價的聽證會</li> <li>Enhancing environmental education at all school levels 加強在大中小學校層面的環境教育</li> <li>“All-China Environment Protection Century Tour” (supervision campaign by the public and media) “中國環保世紀行”(公眾和媒體的監督活動)</li> </ul>

Source: Synthesized from Matsuno (2009); Zhang et al. (2008); CCICED (2011)

## Province/City-level: Pilot low-carbon city initiative

### 省級/市級：低碳城市試點項目

#### Pilot low-carbon city initiative (launched in 2010)

#### 低碳城市試點項目（2010年推出）

- 5 low-carbon pilot provinces and 8 pilot cities
- 五省八市國家低碳試點

#### Required by NDRC to 發改委要求:

- develop a **low carbon development plan** and formulate supporting policies
- 發展低碳發展規劃，制定扶持政策
- develop **low carbon industry**
- 發展低碳產業
- establish CO2 emission **statistics and data management system**
- 建立二氧化碳排放的統計和數據管理系統
- Encourage **low carbon lifestyles and consumption**
- 鼓勵低碳生活方式和消費

N. Khanna et al. / Sustainable Cities and Society 12 (2014) 110–121

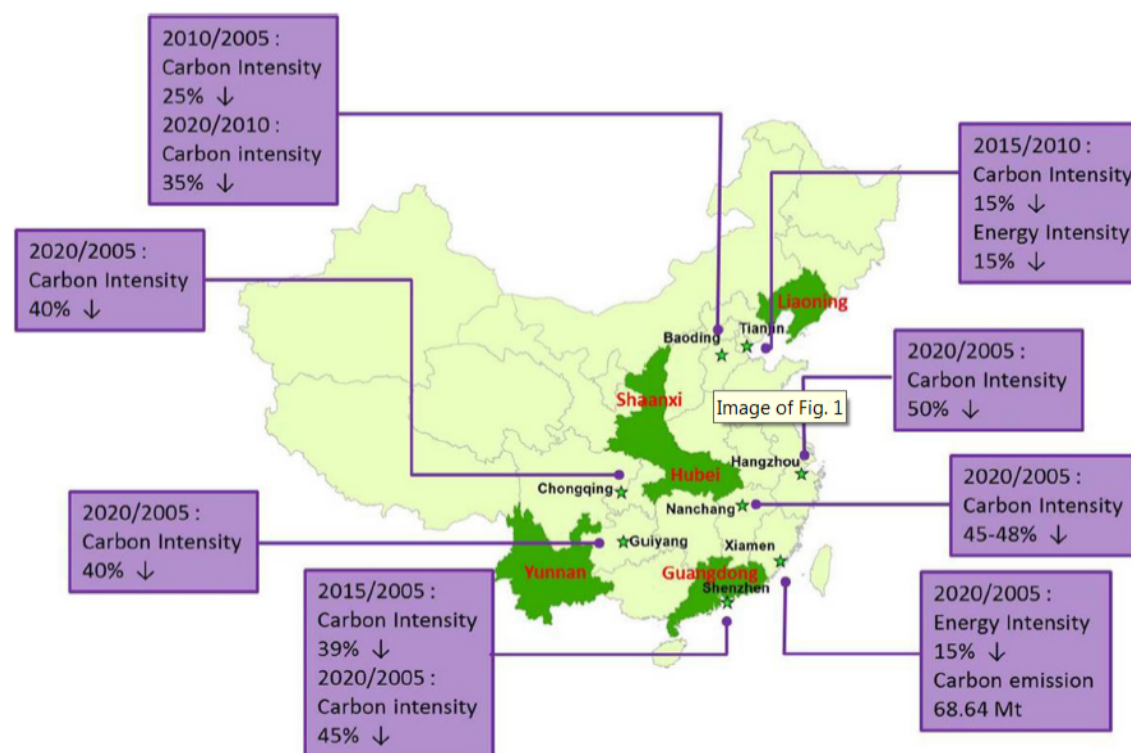


Fig. 1. Location and major targets of NDRC's eight low carbon pilot cities.



## Province/City-level: Pilot low-carbon city initiative

### 省級/市級：低碳城市試點項目

#### Overall and sectoral targets 整體及部門目標

Comparison of overall and sectoral targets in low-carbon pilot cities.

Target	TJ	BD	HZ	CQ	NC	GY	XM	SZ
<i>Overall targets</i>								
Carbon intensity (CO <sub>2</sub> per unit GDP)	X	X		X	X	X		X
Carbon emissions		X		X			X	
Energy intensity (tce per unit GDP)	X						X	
Share of non-fossil fuels				X	X			X
Energy saving				X				
<i>Industrial targets</i>								
Industry emissions							X	
High-tech industry's share of total value-added		X	X	X	X			
Service sector's share of total value-added			X		X			
Cultural/creative industry's share of total value-added			X					
Low carbon industry's share of total value-added				X				X
<i>Building targets</i>								
Building emissions							X	
Green buildings' share of total new construction								X
<i>Transport targets</i>								
Transport emissions							X	
Share of public transport in modal split			X					X
Buses per 10,000 people			X					
Electric bus share			X					
Metro length			X					
Increase in number of alternative energy cars by 2015					X			X
Increase in number of free public bicycles by 2015			X					
<i>Ecological targets</i>								
Forest coverage rate	X		X	X	X			
Wetland coverage rate	X							
Number of natural reserves	X			X				
Water saving	X			X				
Pollution control	X							
Per capita public green area			X					
<i>Other targets</i>								
R&D investment in low carbon technologies								X
Information dissemination				X				X

Notes: TJ, Tianjin; BD, Baoding; HZ, Hangzhou; CQ, Chongqing; NC, Nanchang; GY, Guiyang; XM, Xiamen; SZ, Shenzhen.

Source: Khanna et al, 2014

## Province/City-level: Pilot low-carbon city initiative

### 省級/市級：低碳城市試點項目

Comparison of main supporting measures in low carbon city plans.					Supporting measures 扶持政策			
Measure	TJ	BD	HZ	CQ	NC	GY	XM	SZ
<i>Administrative</i>								
Advisory group	X	X	X	X	X	X	X	X
Performance evaluation system	X	X	X		X			X
GHG emission statistics, verification and management	X	X	X	X	X			
Energy audit and label	X		X	X	X			
Low-carbon industrial park enterprise requirements							X	
<i>Planning and legal framework</i>								
Special planning	X	X	X	X	X	X	X	X
<i>Regulation</i>								
Preferential policies (land, fiscal, procurement policies)			X	X	X			X
<i>Financial and tax-based</i>								
Low-carbon fund	X			X	X			
Financial incentives			X					
Financial funding	X		X	X	X			
Consumption tax						X		
Energy price	X							
<i>Market</i>								
CDM				X	X		X	
Energy and carbon trading market	X		X	X		X	X	X
Industry and technology trading center								X
<i>Scientific research</i>								
Low carbon research center	X	X		X	X			
Low carbon service center					X			X
Talent introduction			X	X	X			
<i>Other</i>								
Information disclosure	X		X	X	X			
International collaboration	X	X	X	X	X	X	X	X
Public awareness and promotion	X	X	X	X			X	

Notes: TJ, Tianjin; BD, Baoding; HZ, Hangzhou; CQ, Chongqing; NC, Nanchang; GY, Guiyang.

## Province/City-level: Pilot low-carbon city initiative

### 省級/市級: 低碳城市試點項目

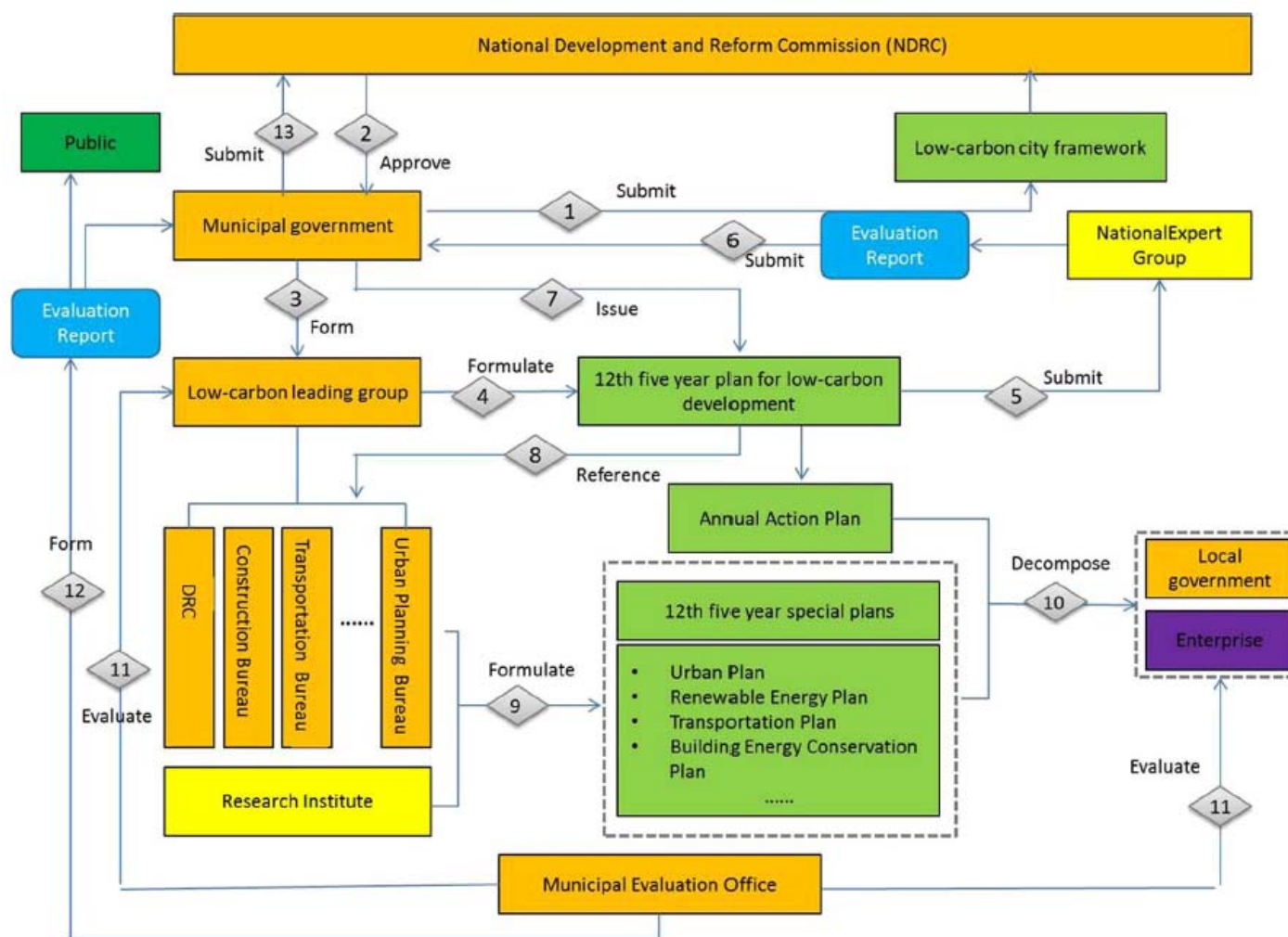


Fig. 3. Hangzhou's model for low carbon planning.

(杭州低碳規劃過程)

Source: Khanna et al, 2014

## Province/City-level: Pilot low-carbon city initiative

### 省級/市級：低碳城市試點項目

- Hangzhou city strives to develop a "five in one" public transport system, including subway, public buses, taxis, water buses and free bicycles
- 杭州堅持公交優先、構建地鐵、公家車、計程車、水上巴士、免費單車“五位一體”的大公交體系



\* 60,000 台自行車; >2,000 自行車站

### 電動車即時租賃服務 – “微公交” Instant electric car rental service



\* 單次租車的保證金為1,000RMB; 2座車20 RMB /1小時，4座車25 RMB /1小時



## Province/City-level: China green development index

### 省級/市級: 中國綠色發展指數

- "China Green Development Index Report" was jointly issued by the National Bureau of Statistics China, Beijing Normal University and Southwest University of Finance
- 《中國綠色發展指數報告》由國家統計局、北京師範大學及西南財經大學聯合發佈
- Covering 30 provinces (autonomous regions and municipalities) and 100 cities
- 報告公佈了30個省(區、市)和100個城市的綠色發展指數
- Three areas: green economic growth, resources and environment carrying capacity and government policy support
- 經濟增長綠化度、資源環境承載能力和政府政策支持力度
- 57 indicators (e.g. energy intensity, per capita CO2 emission, urban sewage treatment rate, forest coverage, etc.)
- 57項指標 (如單位地區生產總值能耗、人均二氧化碳排放量、城市污水處理率、森林覆蓋率等57個項目)



## Company level

### 企業層面

---

#### NDRC's **Top-10,000** Energy-Consuming Enterprises Program (2011)

#### 發改委：萬家企業節能低碳行動實施方案 (2011)

- To improve energy management and upgrade the level of energy efficiency at **key-energy consuming enterprises**
- 推動重點用能單位加強節能工作，強化節能管理，提高能源利用效率
- Target 目標群體：
  - **15,000 industrial enterprises** that use **more than 10,000 tce per year**
  - 15,000 家(綜合能源消費量1萬噸標準煤以上)的工業企業
  - **public buildings** (hotels, restaurants, and schools) that use more than 5,000 tce per year
  - 綜合能源消費量5 千噸標準煤及以上的賓館、飯店、商貿企業、學校等
  - **160 large transportation enterprises**
  - 160 家(綜合能源消費量1萬噸標準煤或以上)的客運、貨運企業和沿海、內河港口企業
- covering **2/3 of total national energy consumption**, or 85% of the total industrial energy use
- 佔全國總能耗的2/3，或總工業能耗的85%



## Company level 企業層面

### Requirements on the Target Group

#### 對目標群體的要求:

- Implementation of the **target responsibility** system
- 強化節能目標責任制
- Establishment of **energy management systems** at enterprises
- 建立能源管理體系
- Implementation of energy audit systems and energy conservation planning
- 開展能源審計和編制節能規劃
- Conduct energy efficiency benchmarking
- 開展能效達標對標工作
- Acceleration of energy conservation retrofits
- 加快淘汰落後用能設備

### Assessment results (2012)

#### 2012年萬家企業節能目標責任考核結果

地 区	企业数量 (家)		企业节能目标考核情况 (家)				“十二 五”节能 量目标 (万吨标 准煤)	2011-2012 年累计完成 节能量 (万 吨标准煤)
	国家公告 万家企业 数量	实际考核 企业数量	超额完成 企业数量	完成企业 数量	基本完成 企业数量	未完成企 业数量		
北 京	241	234	21	87	82	44	224	271
天 津	211	195	46	97	20	32	456	320
河 北	803	730	257	363	89	21	2175	1185
山 西	638	546	48	266	156	76	1395	892
内 蒙 古	697	555	90	261	158	46	1160	751
辽 宁	524	513	61	322	79	51	1402	870
吉 林	247	231	84	113	14	20	437	383
黑龙江	489	414	127	148	66	73	626	344
上 海	269	269	74	96	57	42	685	772
江 苏	1221	1139	510	575	25	29	2205	1453
浙 江	1220	1184	259	760	76	89	1006	902
安 徽	349	335	143	134	17	41	840	426
福 建	458	435	44	235	147	32	525	319
江 西	297	261	115	100	10	36	620	483
山 东	1188	1110	401	605	20	84	2530	2349
河 南	1032	723	67	424	170	62	1584	752
湖 北	812	812	219	375	218	0	996	610
湖 南	552	505	222	208	26	49	619	449
广 东	970	905	76	549	240	40	1563	718
广 西	440	424	81	175	45	123	446	227

## Company level 企業層面

### Government support 政府支持:

- Expansion of the **training pilots of Energy Managers** to more provinces and cities
- 擴大能源管理培訓至更多省市
- Promotion of energy-efficient technologies
- 推廣節能技術
- Financial incentives and financing support for energy-efficient technical retrofits
- 財政激勵措施和節能技術改造的融資支持
- Fiscal and financial incentives to encourage and promote **energy performance contracting** and energy service companies (ESCOs)
- 財政和金融激勵措施，以鼓勵和推動合同能源管理和節能服務公司（ESCO）



Source: IPEEC, 2014; The Institute for Industrial Productivity, 2013)

# **Chinese cities' experience sharing**

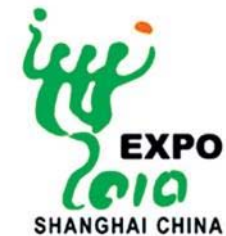
## 中國城市的經驗分享

## Lessons learnt from mega-events 大型活動的經驗和教訓

---

### A catalyst for green development 綠色發展的催化劑

- Higher **environmental standards** with stringent enforcement
- 更高的環保標準及嚴格執法
- encouraging **regional cooperation and cross-departmental collaboration**
- 鼓勵區域和跨部門合作
- Attracting **financial investments** from local and overseas (e.g. commercialization of green technologies and products)
- 吸引本地及海外的資 (綠色技術和產的商業化)
- Triggering the growth of **environmental awareness** in civil society
- 引發環保意識在公民社會的成長
- Providing the impetus for the public to take ownership in the **“green” life-style movement**
- 推動全民“綠色”生活運動





## Major environmental protection measures on the preparation for the Beijing Olympic Games 籌備北京奧運會的主要環保措施

---

- Reduce coal consumption and retrofit coal-burning facilities
- 降低煤耗和改造燃煤設施
  - In the central city zone, 16,000 coal burning boilers of less than 20 steam ton were retrofitted for cleaner energy
  - 開展燃煤設施治理改造，中心城區1.6萬台20蒸噸以下燃煤鍋爐全部完成清潔能源改造治理
  - Four major coal burning power plants completed de-sulphurization, de-dusting and de-nitrification
  - 四大燃煤電廠完成脫硫除塵脫硝治理，400多台20蒸噸以上燃煤鍋爐採取了脫硫除塵措施



## Major environmental protection measures on the preparation for the Beijing Olympic Games 籌備北京奧運會的主要環保措施

- *Policies to control point source pollution*

### 控制面源污染

- Some 200 highly polluting and energy-consuming factories (primarily serving the chemical industry) had been **relocated away from** the urban center
- 約200名高污染、高耗能的工廠（特別是化工行業）已遷離市中心
- **Environmental upgrading** of the two largest industrial polluters, the Beijing Capital Steel Works (or the Shougang Group) and the Beijing Huaer Company (chemicals).
- 北京首都鋼鐵廠（首鋼）和北京華爾(化工)兩大企業進行升級改造
- Sand and gravel sites and clay brick factories in the suburban areas of Beijing were **shut down** or made to **suspend operations** during the Games period
- 奧運會期間關閉或暫停營運位於北京郊區的砂礫石場地和粘土磚廠進



Shougang's plant was relocated to Caofeidian, an islet 220 km east of Beijing  
首鋼工廠搬遷到曹妃甸(北京市以東部220公里的小島)





## Major environmental protection measures on the preparation for the Beijing Olympic Games 籌備北京奧運會的主要環保措施

- *Strengthen control on vehicle emissions*  
加強對車輛排放的控制

- The National Second-Phase (Euro II), National Third-Phase (Euro III) and National Fourth-Phase (Euro IV) **vehicle emission standards** were implemented in Beijing in 2003, 2005, and 2008 respectively (i.e. two years ahead of the national timetable)
- 分別於2002年、2005年、2008年3月執行國Ⅱ、國Ⅲ、國Ⅳ機動車新車排放標準，比全國開始實施時間平均提前兩年
- Accelerated progress in the **phase-out of old and high-polluting vehicles** (i.e. yellow-label vehicles). By June 2008, over 50,000 taxis and over 10,000 public buses have been upgraded, replaced or taken off road
- 加快淘汰老舊高排放車輛(黃標車)，累計更新淘汰了5萬多輛計程車、1萬多輛公車
- **Odd and even** number vehicle policy
- 實行單雙號限行



## Major environmental protection measures on the preparation for the Beijing Olympic Games 籌備北京奧運會的主要環保措施

---

- Measures for air quality assurance 空氣品質保障監管
  - MEP formed the **coordination group of air quality assurance** with participation from **municipal governments** (i.e. Beijing, Tianjin, Inner Mongolia, Shanxi, Shandong and peripheral areas)
  - 國家環保總局牽頭,成立奧運空氣品質保障工作協調小組,在北京市和天津、河北、內蒙古、山西、山東等周邊省區市推行奧運會賽前的綜合治理措施
  - **Emergency plan** 應急預案:
    - 105 enterprises or industries emitting SO<sub>2</sub>, NO<sub>x</sub>, and VOC were required to suspend their operations
    - 要求105家企業暫停業務,以減少二氧化硫、氮氧化物和VOC的排放
    - Inspections targeting the power and metal refinery plants within the Hebei and Tianjin Provinces
    - 加強視察河北、天津等省市內的電廠和金屬精煉廠。
  - Strengthen the **monitoring, forecasting and evaluation of air quality** – involving experts from Chinese Academy of Sciences - use of 3D modelling, multi-model ensembles forecasting etc.
  - 組織國內外知名專家包括中科院等,運用立體觀測和多模式預報分析,以強化空氣品質監測、預報和評估

## Major environmental protection measures on the preparation for the Beijing Olympic Games 籌備北京奧運會的主要環保措施

---

- Other people-based environmental initiatives, e.g. “Green community”, “Green school” and “Green Commuting” projects, the development of ecological districts/demonstration zones , etc.
- 其他以人為本的環保措施，如：“綠色社區”、“綠色學校”和“綠色出行”等項目；生態區示範區等
- The challenge of turning them into a “green legacy” in the long term
- 如何堅定落實有關措施及綠色發展框架是未來一大挑戰



Haikou & Shenzhen

海口、深圳





Haikou

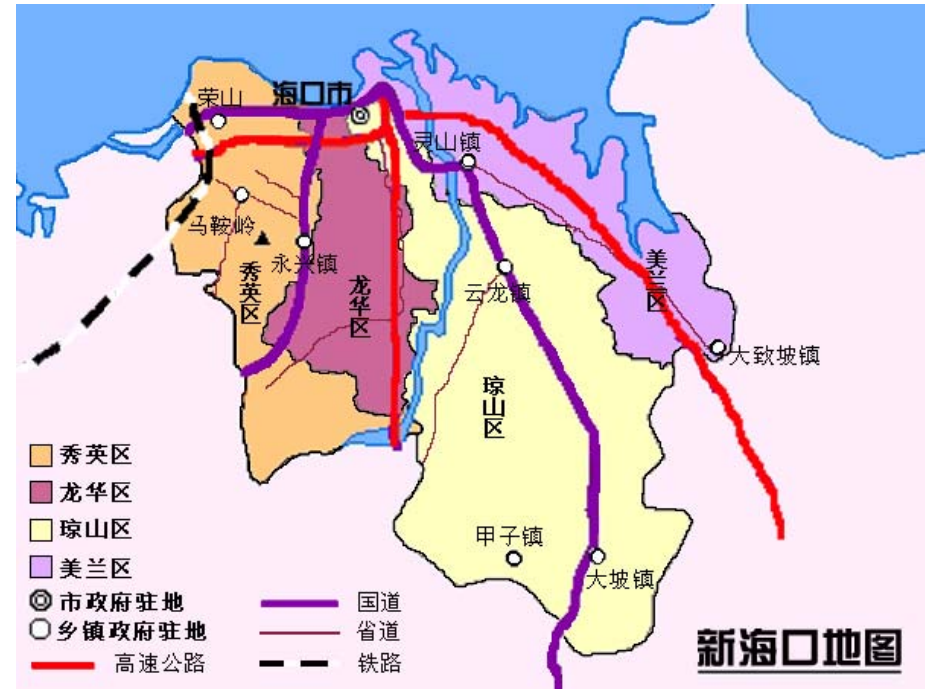
海口



## Background

### 背景

- 位處海南島北部，是全省政治、經濟、科技、文化中心、交通郵電樞紐
- Located in the northern part of Hainan Island; the political, economic, technological, cultural, and transportation hub
- In 2013, the city recorded a GDP of 90.464 billion yuan (an increase of 9.9% over 2012)
- 2013年，全市實現地區生產總值904.64億元，比2012年增長9.9%





Background  
背景

	面積 Area (平方公里)	2013年常住人口 permanent population (萬)	2013年GDP (億人民幣)	人均GDP (人民幣)
香港	1,104	719	16,767	233,267
克拉瑪依市	7,700	39	854	218,846
深圳市	1,992	1,063	14,500	136,947
北京市	16,400	2,115	19,501	93,213
上海市	6,341	2,415	21,602	90,100
海口市	2,305	205	905	41,955

## Development strategy

### 發展戰略

- 2005年海口市提出「四地一中心」的產業發展定位 (sectoral development focus)
  - 把海口建設成為全省以高新技術產業為導向的**新型工業**基地 (new industry)、全國熱帶濱海**旅遊休閒**勝地 (tourism and recreation)、全省**都市型農業**基地 (urban agriculture)、國家**海島生物產業**基地 (bio-industry)、區域**交通樞紐** (transportation hub) 和**現代服務** (modern service)中心。
- 國務院2011年批復《海口市城市總體規劃(2011-2020年)》
  - More balanced urban-rural development, reasonable control of city size, enhancement of urban infrastructure, and carrying out resource-saving and environment-friendly urban construction
  - 要求海口市重視城鄉統籌發展，合理控制城市規模，完善城市基礎設施體系，開展資源節約型和環境友好型城市建設

## Develop high and new technology industries

### 發展高新技術產業

#### Expansion of the five pillar industries

##### 壯大五大支柱產業

- Automotive Manufacturing
- 汽車製造業
- Pharmaceutical Industry
- 製藥工業
- Chemical fiber & textile industry
- 化纖紡織工業
- Food and Beverage Industry
- 食品飲料工業
- Agricultural processing industry
- 農副產品加工業

#### Five potential industries

##### 培育五大潛在優勢產業

- Electronic and communication industry
- 電子資訊產業
- Fine chemical Industry
- 精細化工業
- Rubber-processing chemicals industry
- 橡膠化工業
- Tourism industry
- 旅遊工業
- Eco-production industry
- 生態環保產業

#### Adjust the industrial layout

##### 合理調整工業佈局

- Accelerate the development of “Medicine hub”, Automobile Industrial Park and Hi-Tech Industrial Park
- 加快「藥谷」、汽車工業園、高新技術產業園區建設

Promote eco-tourism

推動生態旅遊業



Construction of Wetland Park and Forest Park  
around the core city area

建設濕地公園和森林公園，圍繞主城區

東寨港紅樹林自然保護區綜合整治  
(圖為東寨港紅樹林自然保護區)





## Develop service type urban agriculture

### 發展都市服務型農業

- Towards the development of “**ecological agriculture**”
- 以發展“生態農業”為重點
- Transition from traditional suburban farming to **modern urban agriculture**
- 加速傳統城郊農業向現代都市農業轉變

“農產品美食、農事體驗、農業觀光、  
農業休閒度假、農業科普教育”



海南（演豐）現代生態農業產業園



海口市龍浩生態農業示範園二期設施大棚

## Developing bio-tech industries

### 發展生物產業

- Focus on the development of **bio-medicine, bio-agriculture and bio-marine industry**
- 重點發展生物醫藥、生物農業、生物海洋產業
- Hainan's pharmaceutical industrial output value reached 8.593 billion yuan
- 海南省醫藥工業總產值達85.93億元



海口藥谷是海南醫藥產業的核心區



海南生產的螺旋藻膠囊

**Development of Green medicine-based economy** 海口市全力發展綠色醫藥特色經濟



Enhancing the functions of being a regional transportation hub and a modern service centre  
增強作為區域交通樞紐和現代服務中心的功能

- 2013 《海口市低碳交通運輸體系建設城市試點實施方案》
  - A **three-pronged approach** (highway, marine transport and urban transportation)
  - 重點從公路交通、水路交通、城市客運三方面入手
  - to build a low-carbon transportation system up to the standard of international tourism city and logistics hub
  - 構建符合國際旅遊城市和物流港特點的低碳交通運輸體系



海口市主要交通樞紐濱海立交橋



Haikou monorail and tram system 海口有軌電車



Achieving low-carbon development  
through the city layout  
透過城市布局實踐低碳發展

- 78平方公里的海南東寨港國家級自然保護區
- 118平方公里的雷瓊世界地質公園等重點生態資源保護區



A “green space” system connecting the city and its peripheral regions  
構建主城區內與主城區周邊的生態綠地系統

# Shenzhen 深圳





## Background

### 背景

- National Bureau of Statistics released the "2012 China Green Development Index Report" in 34 cities, Shenzhen **topped the list of green development index**
- 國家統計局發佈的《2012中國綠色發展指數報告》在34個大中城市中深圳綠色發展指數高居榜首
- Since the 12<sup>th</sup> FYP, Shenzhen maintained **double-digit GDP growth**, whereas the **new land supply**, **water use** and the total emissions of **major pollutants** continued to **decline**
- “十二五”以來，深圳GDP保持著兩位數的增長，新增土地供應、用水總量和主要污染物排放量持續下降



In July 2010, the NDRC issued a notice regarding the development of a nationwide pilot programme of low-carbon cities/provinces. Shenzhen is one of the selected cities

2010年7月，發改委發出通知，在全國開展國家低碳省區和低碳城市試點。深圳是其中一個試點

Background

背景

	面積 Area (平方公里)	2013年常住人口 permanent population (萬)	2013年GDP (億人民幣)	人均GDP (人民幣)
香港	1,104	718.8	16,767.2	233,267
克拉瑪依市	7,700	39	853.5	218,846
深圳市	1,992	1,062.89	14,500.23	136,947
北京市	16,400	2,114.8	19,500.6	93,213
上海市	6,341	2,415	21,602.12	90,100
海口市	2,305	205	904.64	41,955

# Low carbon development strategy

## 低碳發展策略

調整產業結構  
Sectoral  
adjustment

優化能源結構  
Energy structure  
optimization

加大節能降耗力  
度  
Energy saving

推進科技創新  
Technological  
innovation

創新體制機制  
Institutional  
upgrade

挖掘碳匯潛力  
Carbon trading  
opportunities

倡導綠色消費  
Green  
consumption

優化空間佈局  
Spatial planning

開展試點示範  
Pilot projects

保障措施  
Support policies

## Shenzhen's low carbon development indicators

### 深圳低碳發展主要指標

类别□	序号□	指·标□	单·位□	2015 年□	2020 年□
低碳产出□	1□	单位 GDP 二氧化碳排放下降率□	%□	39□	>45□
	2□	单位 GDP 二氧化碳排放□	吨二氧化碳/万元□	0.90□	0.81□
	3□	单位 GDP 能耗□	吨标准煤/万元□	0.398□	0.366□
	4□	高新技术产业增加值占 GDP 比重□	%□	35□	40□
	5□	现代服务业增加值占第三产业比重□	%□	60□	65□
	6□	战略性新兴产业增加值占 GDP 比重□	%□	40□	50□
	7□	单位工业增加值能耗□	吨标准煤/万元□	0.394□	0.355□
	8□	绿色建筑占新建建筑比重□	%□	40□	80□
	9□	公共交通占机动化出行分担率□	%□	56□	65□
	10□	新能源汽车保有量□	万辆□	5□	10□
低碳资源□	11□	非化石能源占一次能源比重□	%□	15□	>15□
	12□	清洁能源占能源消费比重□	%□	50□	60□
	13□	森林覆盖率□	%□	41.2□	≥41.2□
	14□	单位面积绿道里程□	公里/平方公里□	1.0□	≥1.0□
	15□	人均公园绿地面积□	平方米/人□	16.9□	17.4□
低碳环境□	16□	研发投入占 GDP 比重□	%□	4.0□	4.5□
	17□	低碳技术投入占研发投入比重□	%□	10□	15□
	18□	碳排放统计、核算和考核体系□	——□	基本□ 建立□	比较□ 完善□
	19□	市民对低碳理念的认知率□	%□	80□	90□

注：1、单位 GDP 二氧化碳排放和单位工业增加值能耗指标均以 2005 年不变价计算；单位 GDP 碳排放下降率的基准年为 2005 年，其余指标规划基准年为 2010 年。□

2、2015 年指标均以《深圳市国民经济和社会发展第十二个五年规划纲要》以及各部门专项规划为依据，2020 年为预测数，不作为约束性指标，实际考核指标根据“十三五”实际情况调整。□

深圳市低碳發展中長期規劃（2011—2020年）



# Industrial structure and energy policy

## 產業結構和能源政策

### Sectoral adjustment 調整產業結構

- Develop low-carbon new industries (**new energy, internet industry and cultural industries**, etc.) 大力發展低碳型新興產業 (新能源產業、互聯網產業、文化創意產業等)
- Accelerate the transformation and upgrading of high-carbon industry 加快改造升級高碳產業
- Steadily promote the waste-to-energy (electricity) developments, waste recycling industry, etc.) 穩步推進靜脈產業 (廢棄物焚燒(發電)產業、廢棄物回收再利用產業等)

### Energy structure optimization 優化能源結構

- Increase the proportion of clean energy 著力提高清潔能源利用比例
- Reduce carbon emissions from energy production sector 降低能源生產部門碳排放
- **Smart grid pilot projects** 試點智能電網建設

### Energy-saving 加大節能降耗力度

- Increase **industrial energy efficiency** 提高工業能效水準
- Construction of low-carbon transport network 構建低碳交通網絡
- Promote **green buildings** (such as establishing green building lifecycle management philosophy) 推廣綠色建築 (如樹立綠色建築全生命週期管理理念)
- Reduce energy consumption in public institutions 降低公共機構能耗

## Industrial structure and energy policy 產業結構和能源政策



- 配電網架
- 分散式能源
- 智慧計量
- 電動汽車充放電裝置
- 使用者能效終端
- 智慧配電房
- 通信監控系統

“2014年9月11日，前海管理局和深圳供電局召開聯席會議，討論了從基礎設施、通信系統、主站系統等三個方面搭建智慧電網的整體架構”



## Carbon trading 碳排放權交易

- Shenzhen is **the first carbon emissions trading pilot city** 深圳是全國首個正式啟動碳排放交易試點的城市
- Since June 18, 2013, the GHG emissions of the 635 industrial enterprises involved in the carbon trading system has dropped by 3.7 million tons (i.e. a decrease of about 11%) 從2013年6月18日碳排放權交易啟動以來，納入深圳碳交易體系的635家工業企業，溫室氣體排放量較基期下降了370萬噸，下降率約為11%
- As of May 30, 2014, the total turnover of Shenzhen's carbon market is more than **380,000 tons (equivalent to 27.44 million yuan)**, which accounted for **19% of the national's total** (i.e. the largest carbon market trading market in China) 截至2014年5月30日，深圳碳市場共成交超過38萬噸，總成交額為2744萬元，佔全國成交額19%，成為全國交易量最大的碳市場



## Energy Performance Contracting

### 合同能源管理

- Through energy performance contracting, “Shenzhen’s civic centre” saved at least 4.2 million KWh annually (i.e. energy-saving rate of more than 21%), equivalent to **saving 1,501 tons of tce** and a **reduction of 3,998 tons of carbon emission** 市民中心以合同能源管理方式進行節能改造，在不增加政府投入的前提下，每年節電至少420萬度，年節能率達到21%以上，折合節約標準煤1,501噸，減少二氧化碳排放3,998噸。
- By the end of 2014, **60% of public institutions in Shenzhen** will complete the signing of energy-saving contracts 到2014年年底，深圳60%的公共機構將完成節能改造簽約



2010年，深圳啟動了市民中心合同能源管理試點專案



## New energy vehicles 新能源汽車

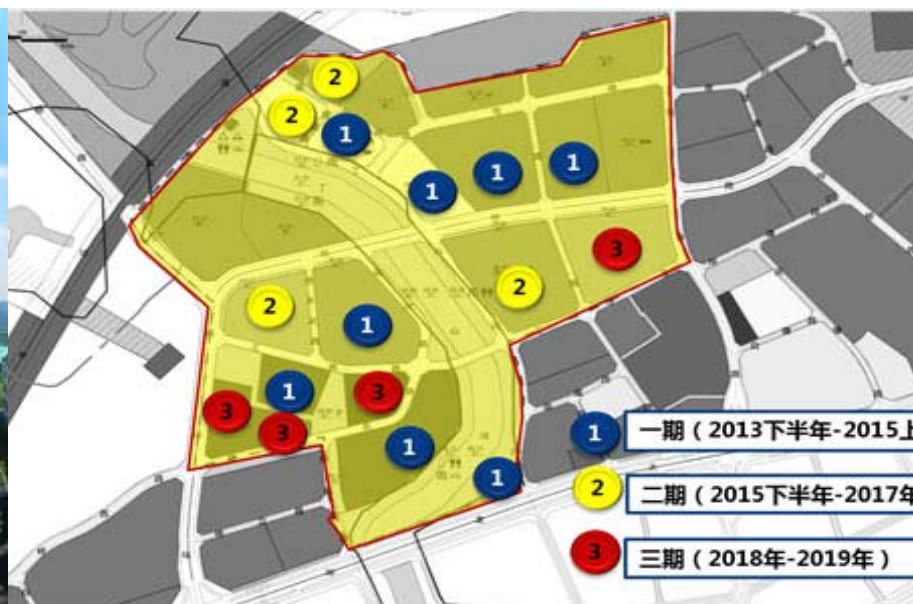
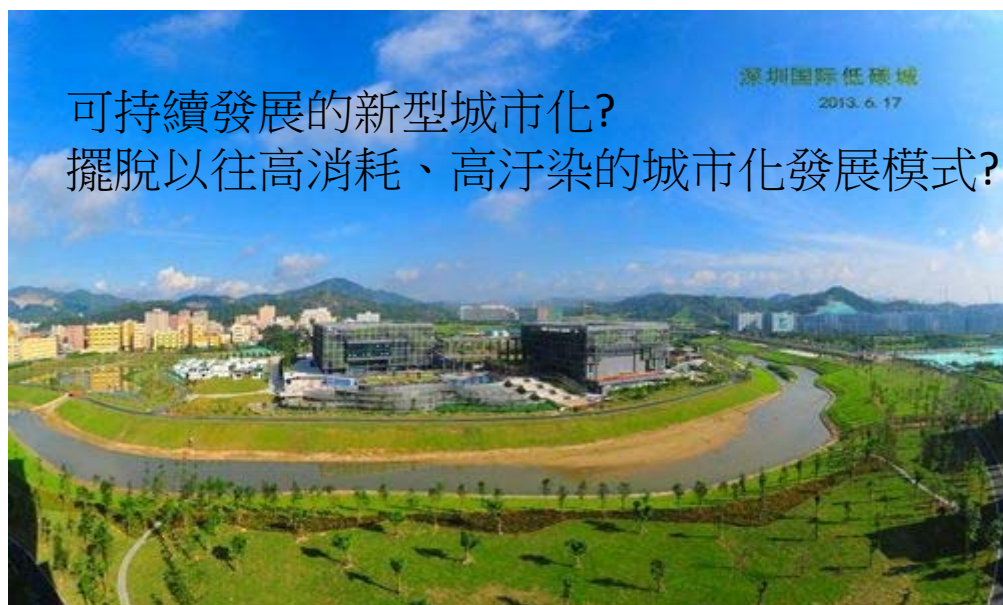
- In 2010, Shenzhen announced the “Energy-saving and new energy- vehicle demonstration plan“. **Public urban transportation, business trips and family vehicles** are the three key areas of promotion. Financial subsidizes were provided by the state and local government
- 2010年深圳市公佈了《深圳市節能與新能源汽車示範推廣實施方案》，在**公交、公務、家用車**等三個重點領域示範推廣各類新能源汽車。推廣期間，國家及地方財政均予以補貼
- As of June 2014, Shenzhen city has 6,958 new energy vehicles (**out of ~2.5 million vehicles**) running on the road. (i.e. top-runner at the national level) 截至2014年6月，深圳全市累計推廣應用新能源汽車6,958輛，一直走在國家前列



# Shenzhen International Low-carbon City

## 深圳國際低碳城

- Since June 2010, Shenzhen cooperated with Japan, Germany, USA, Netherlands and other countries to build an **low-carbon development area in Longgang District**
- 2010年6月以來，深圳聯合日本、德國、美國、荷蘭等國家開展廣泛多元合作，在龍崗區坪地建設國際低碳城，擬建設成為全球標杆性低碳發展綜合示範區
- The total planning area is about 53sq.km (integration of various aspects: water resources, transportation, energy, environmental protection and waste disposal) 總規劃範圍53平方公里，規劃整合了水資源、交通、能源、環保和垃圾處理等
- The **Paulson Institute**, in cooperation with the **China Center for International Economic Exchanges**, awarded the **2014 Prize for Cities of the Future** to the Shenzhen International Low-Carbon City on November 10, 2014
- 2014年11月10日深圳國際低碳城獲得美國保爾森基金會和中國國際經濟交流中心合作推出的可持續發展規劃專案獎





# Shenzhen International Low-carbon City 深圳國際低碳城



Set an example for other cities/district?  
為其他城市和地區提供了可複製的範本?



## 以國際低碳城建設為契機 努力打造綠色低碳宜居新坪地



# **FUTURE CHALLENGES**

## 未來的挑戰

## The latest 最新消息



- China pledged to **cap its rapidly growing carbon emissions by 2030** and increase the **share of non-fossil fuels to 20%** of the country's energy mix by 2030
- 中方首次正式提出2030年左右中國碳排放有望達到峰值，並計畫到2030年將非化石能源在一次能源中的比重提升到20%
- Obama announced a target to **cut U.S. emissions 26 – 28% below 2005 levels by 2025**, the first time the president has set a goal beyond the existing 17% target by 2020
- 美國首次提出到2025年溫室氣體排放較2005年整體下降26%-28%，刷新美國之前承諾的2020年碳排放比2005年減少17%

## What's next ? 下一步

