Environmental Policy, Technology and Trade in Environmental Goods: What about China?

Giovanni Foresti, Silvia Guizzo, Stefania Trenti
Research Department

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Outline

1. Environmental Protection

- Institutional and legal framework
- Environmental policy in national plans, main laws related to “green” technologies and environmental protection investments

2. Environment and Energy Conservation

- Institutional and legal framework
- Energy conservation policy in national plans, main laws related to energy conservation and renewable energy (RE) and measures supporting the development of related technologies

3. China’s role in the environmental goods market

- Trade flows, in particular in energy efficiency, RE and pollution treatment technologies
- Patents detained

Environmental Policy, Technology and Trade in Environmental Goods: What about China?

1. Environmental Protection

Institutional framework: first steps in the 1970s

- **Environmental Protection begins to be an important part of Chinese National Policy since the early 1970s**
  - 1972: United Nation Conference on Human Development in Stockholm
  - 1973: First National Conference on Environmental Protection
  - 1974: Environmental Protection Leading Group and Environmental Protection Office, under the State Council.
- **Environmental protection is given formal recognition in the Constitution since the 1979 version and then in the 1982 version.**
  - 1979: Environmental Protection Law, for trial implementation

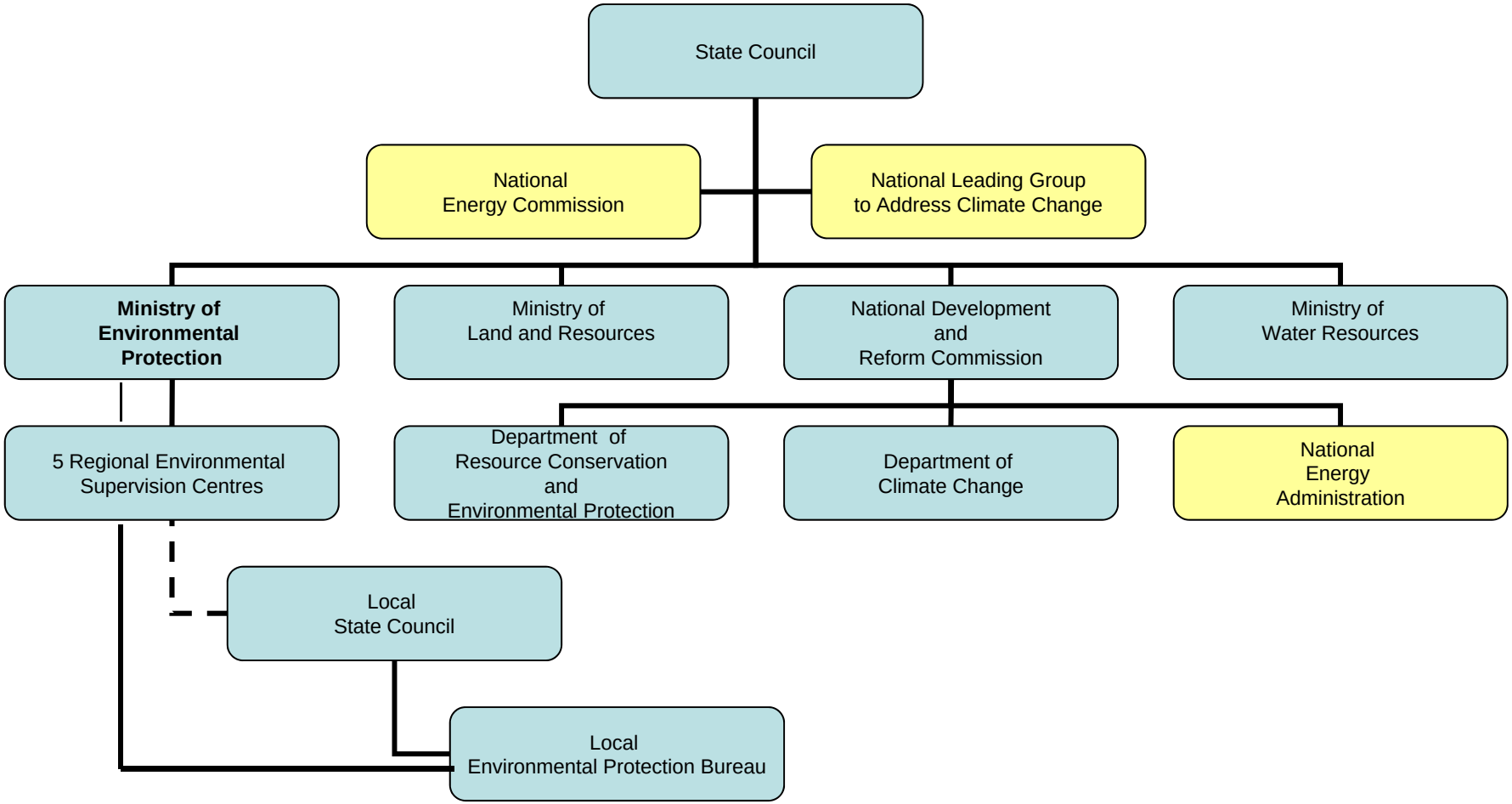
Institutional framework: the 1980s

- Environmental Protection administrative bodies are progressively established, transformed and built up during the **1980s** on the wave of Deng reform process initiated in 1978. Environmental Protection is declared a **Fundamental State Policy** in 1983, during the Second National Conference on EP.
  - 1982: Environmental Protection Office, Ministry of Construction and Environmental Protection
  - 1984: National Environmental Protection Bureau (NEPB) under the Ministry of Construction; Environmental Protection Commission
  - 1988: National Environmental Protection Agency, independent from Ministry of Construction, vice-ministerial status reporting to the State Council

Institutional framework: the 2008 restructuring

- Environmental Protection bodies are further reformed in the 1990s
  - 1998: The EP Commission is dissolved and NEPA is transformed into the State Environmental Protection Agency (SEPA), with ministerial status but with no voting rights
- **Most important reform in 2008** with the creation of Super Ministries
  - 2008: SEPA becomes the **Ministry of Environmental Protection (MEP)**, full ministerial status with voting rights in the State Council (SC)
    - Cannot be easily modified: **greater institutional stability**
    - Can influence directly SC policies and decisions: **greater power and authority**

Current institutional framework



Environmental Protection: national vs local

- **MEP**: formulation of policies, draft laws and plans, coordination, supervision and guidance of environmental protection at **national level**
- **Regional Environmental Supervision Centers**: supervision, enforcement, coordination **among different level of the government**
- **Environmental Protection Bureaus**: responsible for environmental protection at **local level**. They have the same authority on environmental issues at all levels within their jurisdiction.
  - Depend on MEP for operational issues
  - Depend on Local Governments for administration and budget

Environmental Protection: enforcement issues

- Ambiguous vertical allocation of responsibility
  - EBPs' lack of financial and administrative independence
  - Clash between the targets of the EPBs at different levels, and especially between local administrations and EPBs
- Ambiguous horizontal allocation of responsibility and lack of sector administrative organic law
  - Overlapping of competencies between departments of different ministries (i.e. setting standards, area functions of water bodies)
- Lack of operative legislations and regulations

Legislation framework: the 1980s and the 1990s

- During the **1980s** the first specific Environmental Laws are approved
  - 1982 (1999) : Marine Environmental Protection Law
  - 1984 (1996): Law on Water Pollution Prevention
  - 1989: Environmental Protection Law, final version
- In the course of the **1990s**, new laws are promulgated and a number of existing ones are amended in the attempt to bring them closer to the principles of the Rio Conference of 1992 and Agenda 21.
  - 1995: Solid Waste Prevention and Control Law
  - 1996: Noise Pollution Prevention and Control Law

Legislation framework: the 2000s

- Very important laws are promulgated in the late 1990s and in the 2000s
  - 1997: (rev. in 2008): Energy Conservation Law
  - 2002: Cleaner Promotion Production Law
  - 2003: Environmental Impact Assessment Law
  - 2006: (rev. in 2009) Renewable Energy Law
  - 2008: Circular Economy Law
- Very innovative legislation, bold in setting guidelines, but often not enforced.

Environmental protection policies in national plans

- China finalized its Agenda 21 in March 1994 and integrated its objectives in its national environmental policy starting with the 9th Five-Year Plan (1995-99).
- Objectives were subordinated to the priority target of achieving relatively fast economic growth.
- Important changes: 11th Five-Year Plan (2006-10)
  - Acknowledgement that 10th Five-Year Plan (2001-2005) targets, especially EP targets, were mainly missed
  - Development should be not only relatively rapid but also steady and sustainable: *scientific development*, *harmonious socialist society*

11th Five-Year EP Plan principles

- Environmental protection is **critical** in achieving modern sustainable growth, and environmental management is as a **key instrument** in the structural adjustment of the economy
- **Pollution prevention** more important than the “end-of-pipe” approach
- Appropriations addressed to investments in environmental protection, almost doubled compared to the 10th Five-Year Plan
- Key importance of developing a **Circular Economy**, or Recycling Economy, and of **Clean Production** to achieve the country’s sustainable growth objectives.
- Active promotion of the **environmental protection industry** development

11th Five-Year Plan and 11th Five-Year EP Plan targets

	Variable	Unit measure	2005	2010	Annual Growth Rate or period change	Type of Target
Population, Resources and Environmental Protection	Total population	10,000 people	130756	136000	< 8.0%	Obligatory
	Reduction of energy consumption per unit of GDP	%			20	Obligatory
	Reduction of Water consumption per Unit Industrial Added Value	%			30	Obligatory
	Efficient Utilization Coefficient of Agriculture Irrigation Water		0.45	0.5	0.05	Expected
	Comprehensive Utilization Rate of Indutrial Solid Wastes	%	55.8	60	4.2	Expected
	Total Cultivated Land	100 milion ha.	1.22	1.2	-0.3%	Obligatory
	Reduction of total Majour Pollutants Emission Volume	%			10	Obligatory
	Sulphure Dioxide (SO_2)	million tons	25.494	22.944	10%	Obligatory
	Chemical Oxygen Demand (COD)	million tons	14.142	12.728	10%	Obligatory
	Forest Coverage	%	18.2	20	1.8	Obligatory
	Water sections under national monitoring program failing to meet Grade V National Surface Water Quality Standard	%	26.10	>22	-4.1%	Obligatory
	Water sections (of 7 big waters of China) under national monitoring program meeting Grade III National Surface Water Quality Standard	%	41.00	>43	2.0%	Obligatory
	Key cities in which urban air quality is superior to Grade II National Air Quality Standard fore more than 292 days a year	%	69.40	75	5.6%	Obligatory
Source: 11th Five-Year National Economic and Social Development Plan and 11th Five-Year National Plan for Environmental Protection						

Cleaner Production Promotion Law (2002)

- Adoption of technologies which reduce pollution and increase efficiency in the use of resources enacted and strengthened
- Environmental certification of both production processes and products further encouraged, with standard label listing material composition and voluntary certification:
  - ISO14000 Environmental Certification, adapted into equivalent national standards since 1997
  - Eco-label Certification, introduced since 1993
- List of major polluting enterprises proposed

Circular Economy Law (2008)

- "**three R**" approach, i.e. **reduction**, **reuse** and **recycling** in production processes as well as in the end consumption of goods. Industrial policies, at both the national and local levels, must be based on these principles
- **Technologies**, equipment, materials, and end products, that are **incompatible** with circular economy, must be **eliminated** and cannot be imported or produced. Sanctions for users/importers of "eliminated" goods. Limit to exportation of polluting or high-energy-consumption products.
- Fiscal incentives to promote "green technology"
- A system of trial indicators has already been in place since 2007 to evaluate the progress of "circularity" in the economy and activities.

Investment in EP in Five-Year Plans

- The 11th Plan for Environmental Protection planned investments accounting for 1.35% of cumulated GDP in the period, i.e. CNY 1.5 trillion (USD 225Bn) to achieve the objectives identified.

- Actual investments were close to the target already in the 2006-09 period, adding up to CNY 1.49 trillion, or 1.32% of cumulated GDP in the period.

Table 1.2 – Investments in environmental protection

	(CNY mln)	in % of period GDP	in % of period fixed asset investments
6th Five-Year Plan 1981-85	17.000	0,52	
7th Five-Year Plan 1986-90	47.642	0,65	2,41
8th Five-Year Plan 1991-95	130.657	0,68	2,05
9th Five-Year Plan 1996-00	347.060	0,82	2,50
10th Five-Year Plan 2001-05	839.930	1,18	2,84
11th Five-Year Plan 2006-10*	1,496,890	1.32	2.32

* Cumulative data from 2006 to 2009
Source: CEIC, CAEP and Intesa Sanpaolo elaborations

Investment in EP: definitions and definitions issues

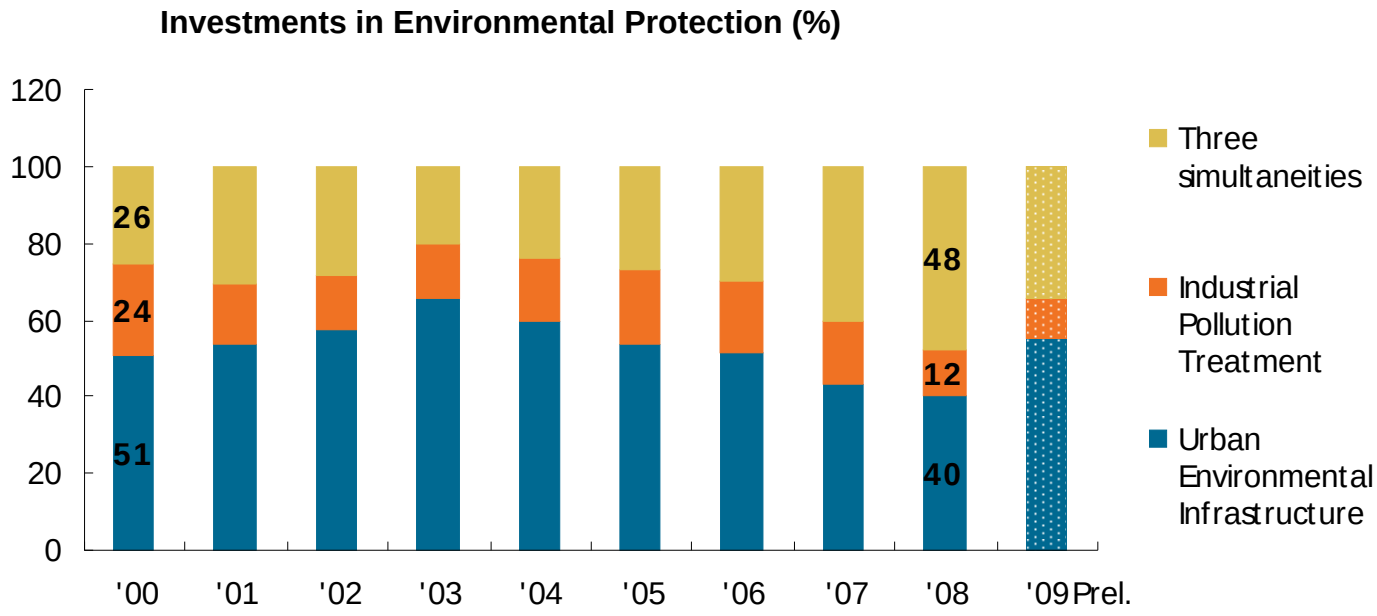
- Investments in the **treatment and reduction of industrial pollution**: i.e. pollution caused by industrial waste water, gas emissions, industrial solid waste, noise pollution, and all other forms of pollution produced by the industrial sector. Pollution Abatement and Control (PAC)Investment.

- Investments in **urban environmental infrastructure**: these include investments in drainage works, environmental sanitation, Gardening, Greening & Landscape, but also Gas Supply and Centralized Heating.

  - Controversial definitions: gas and heating, gardening, flood control.

- Investments in the **Three Synchronizations** (or **Three Simultaneities**): investments in installations for pollution prevention and control based on the “three synchronizations system”, i.e. designed, built, and made operational simultaneously with the industrial plant they serve. (PAC)

Investment in Environmental Protection: evolution of components

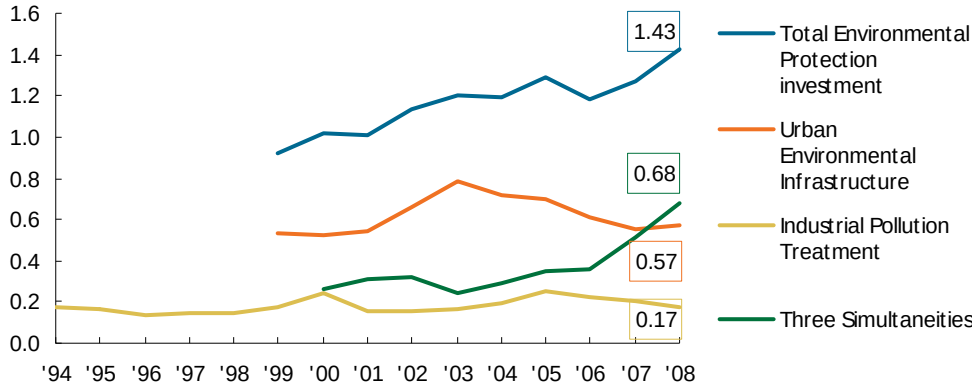


Source: CEIC

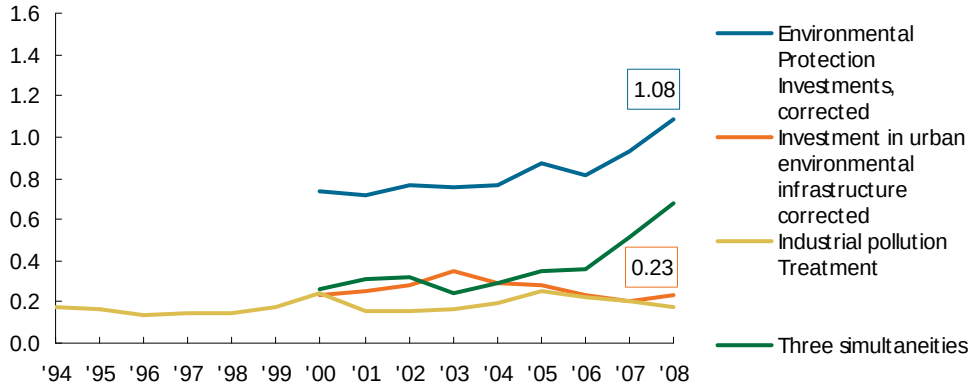
- Most investments in the treatment of industrial pollution are financed by enterprises, with own funds (82%) and/or collected independently, and only a minimal portion are financed by government funds or by foreign direct investments (2%).

Adjusted investments in EP

Investments in environmental protection (% of GDP)



Investments in environmental protection adjusted (% of GDP)



Source: CEIC

- The separation from investments in urban environmental infrastructure of investments in Gardening, Greening & Landscape, investments in Gas Supply, and in Centralised Heating, implies a sharp decline in those classifiable as environmental protection investments.

2. Environment and Energy Conservation

Environment and Energy

- The Government’s main objective is to quadruple GDP from its 2000 level by 2020, hence increasing the population's wealth to the point of making China a middle-income country.
- According to the IEA (International Energy Agency) China surpassed the US in energy consumption in 2009, and shortly after 2025 China will surpass the US as the biggest importer of oil and gas (WEO 2009).
- Since the 1950s authority over China’s energy sector at the national level has been fragmented among many government agencies.
- Periodic restructuring produced a series of agencies that often lacked the authority, autonomy, and tools to effectively govern the energy sector.
- State-owned energy had a dominant role in shaping the energy sector.

Main Energy current institutional bodies

- 2008: **National Energy Agency** (NEA) replaced the NDRC's Energy Bureau and absorbed other energy offices from NDRC. NEA has a broad mandate and should carry out the daily specific work of the NEC and function as its operating branch.

- 2008-2010: **National Energy Commission** (NEC) is chaired by the Premier and formed by a number of leaders from relevant ministries and commissions as well as by military members. It is responsible for energy development strategy planning, energy security, domestic exploration coordination and international cooperation.

- **Energy Law Draft**, in discussion since 2006, introducing a regulatory framework governing all energy development, exploitation and management within China, in addition to supply security and the role of foreign investors.

Energy conservation policies: plans ...

- **Medium and Long-Term Energy Conservation Plan (2004)**
  - It requires both major industrial plant and equipment, as well as household appliances and car engines, to achieve 1990 international standards by 2010 and sets energy intensity reduction targets to 2020
  - Energy and environmental management improvement and technology upgrading, together with energy statistics measurement systems.
  - Outline of 10 Key Projects: the renovation of coal-fired industrial boilers; district-level combined heat and power projects; oil conservation and substitution; and energy efficiency and conservation in buildings.

... and programs

- The Program of **Large Substituting for Small**
  - Closure of small-scale thermal power units with high energy consumption and poor pollution control.
- **Energy Conservation Scheduling** Program
  - create a market mechanism by substituting the current even load power generation scheduling rule on the grids with an energy efficiency based rule favouring lower carbon energy
- **Top 1000 Energy-Consuming Enterprises** Program
  - sets specific targets for the 1,000 companies with the highest energy intensity belonging to nine key industries.

Energy conservation legislation

- **Energy Conservation Law (1997, revised in 2008)**
  - high energy consumption products, technologies and production techniques are prohibited, and products must have energy efficiency certification through a labeling system
  - energy efficiency measurement system for investment projects, that must satisfy minimum standards to receive approval
  - incentives and tax breaks to stimulate the production and use of low-energy consumption technologies and products, also encouraging financial companies to issue favourable terms loans
- **National Energy Efficient Standard For Public and Private Buildings (2005-2008, State Council and Mohrud Regulations)**

Energy conservation and emission reductions

- **Medium and Long-Term Development Plan for Renewable Energy (2007)**
  - share of primary energy consumption from renewable sources: from 8.9% in 2008 to 10% in 2010 and to 15% in 2020.
  - Install capacity targets for all kind of renewables. Biomass is an important priority: access to electricity in rural areas and recycling.
- **Renewable Energy Law (2006, revised in 2009)**
  - compulsory grid connection mainly not enforced. 2009 revision: introduces a system based on specific purchase targets to be set later.
- **Clean Development Mechanism** projects

Support for the “green technology” industry

- Active promotion of the environmental protection industry development (11th Five-Year Plan, National Medium and Long Term Plan for Science and Technology): Indigenous Innovation
- Government Procurement (2005) and proposed implementation measures (2009)
- Regulations on Implementation of Corporate Income Law: Tax reduction and exemptions (2001-2008)
- New guidelines for FDI (2010) encourage investments in the “green” sectors of the economy, imposing restrictions on investments in projects which imply high pollution levels and high energy consumption

3. China's role in the environmental goods market

Environmental goods: a large potential market

- Environmental protection and CO_2 reduction requirements will need huge investments in:
  - Industrial goods used to provide services to address pollution and waste affecting water, soil and air (**waste management and pollution control**);
  - Technological solutions to reduce carbon emission through:
    - Clean power generation: **renewable energy**;
    - Solutions to enhance **energy efficiency**.

Environmental goods: a difficult definition

- **Trade flows**: UNCTAD Comtrade database Harmonised System 96 (6 digit)
  - Waste management and pollution control (list of around 150 codes from the OECD/APEC list)
  - Renewable energy: Hydro, Wind, Solar, Biomass (list of 30 codes defined with industrial experts)
  - Energy efficiency: electric motors, UPS, condensers, lighting elements, and air conditioning units (list of 22 codes defined with industrial experts)
- **Patents:** patent applications filed under the Patent Cooperation Treaty (PCT). Three classes of green patents identified by OECD within its Patent Database
  - Waste management and pollution control
  - Renewable energy
  - Energy efficiency
- **Strong similarity between the two definitions (trade and patents).** Hence, a comparison may be drawn, albeit approximate, between foreign trade market shares and shares of the technology market.

Industrialised countries still advantaged

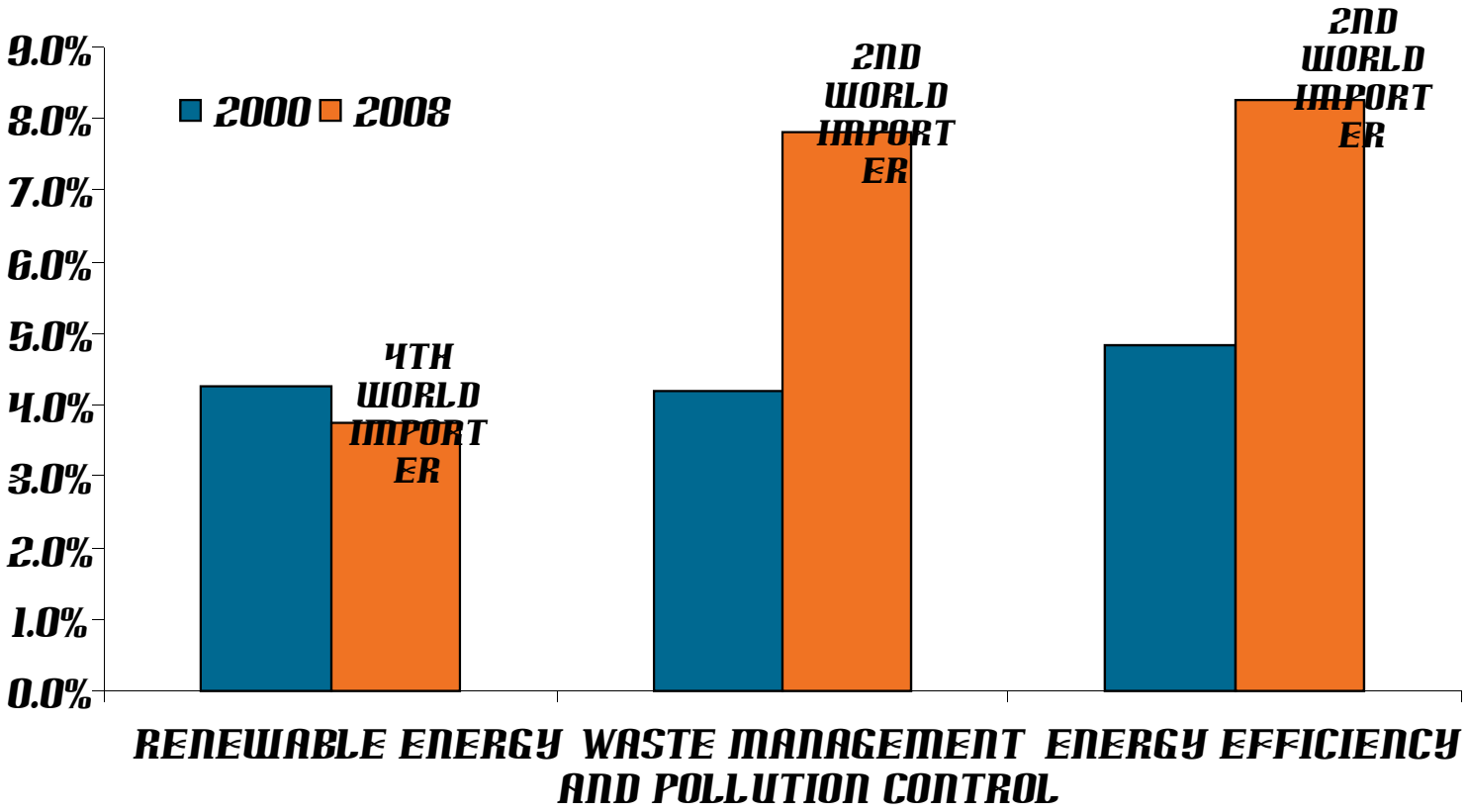
Revealed Symmetric Comparative Advantage in environmental goods

	Waste management and pollution control		Renewable energy		Energy efficiency		Total Environmental goods	
	2000	**2008**	**2000**	**2008**	**2000**	**2008**	**2000**	**2008**
Industrialised countries	0,10	0,09	0,15	0,14	0,01	-0,01	0,09	0,08
Developing manufacturing	-0,15	-0,06	-0,53	-0,22	0,18	0,20	-0,12	-0,02
CIS	-0,52	-0,51	-0,42	-0,47	-0,54	-0,63	-0,52	-0,53
Oil exporters	-0,73	-0,59	-0,90	-0,81	-0,84	-0,83	-0,76	-0,64
Other LDC	-0,59	-0,47	-0,79	-0,68	-0,81	-0,65	-0,63	-0,51

Source: Intesa Sanpaolo on UNCTAD Comtrade data

China is already one of the main importers ...

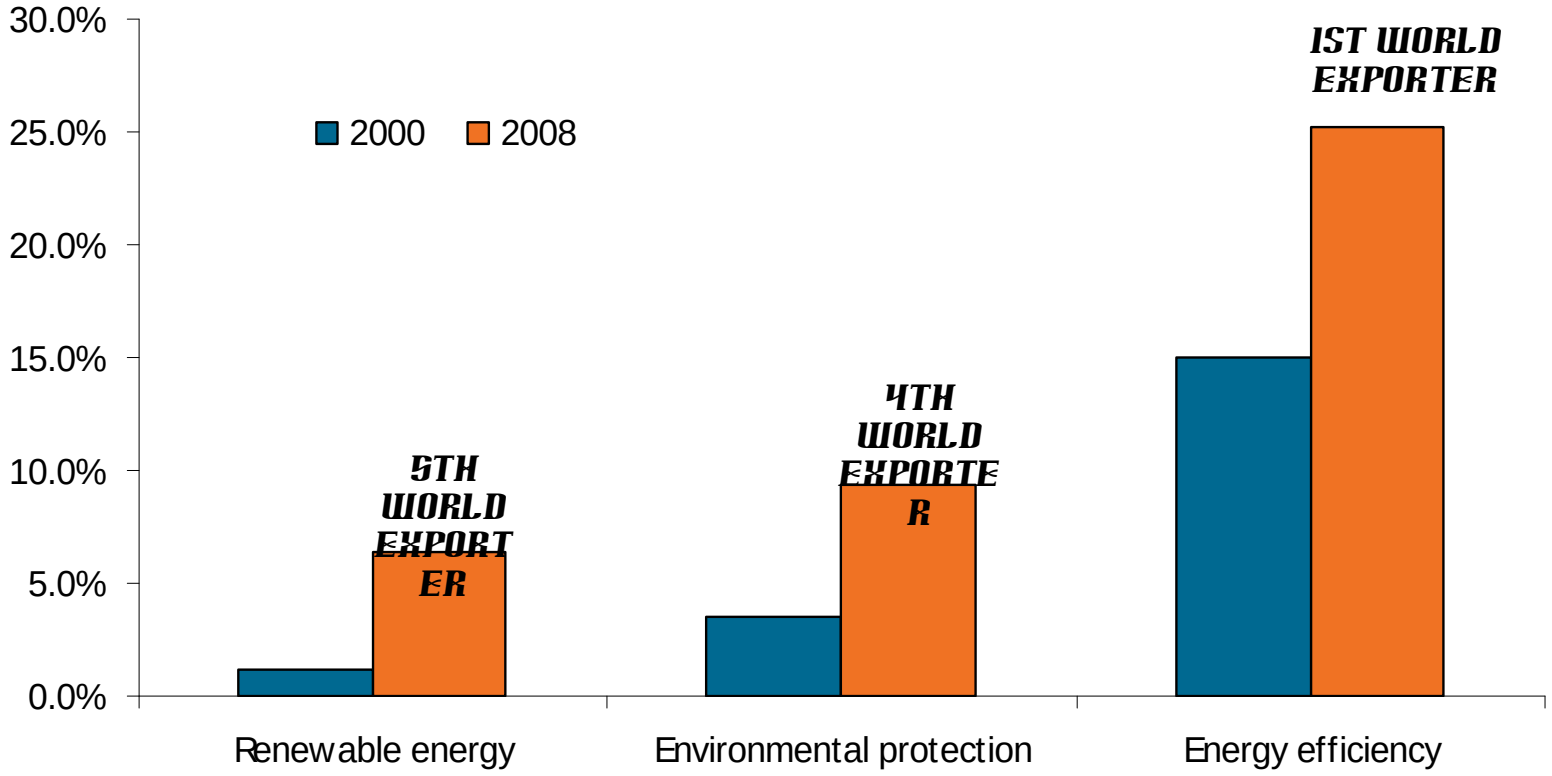
China shares on world imports in technologies for environmental protection, renewable energy and energy efficiency
(% share, current US$)



Source: Intesa Sanpaolo on UNCTAD Comtrade data

... and exporters

China shares on world exports in technologies for environmental protection, renewable energy and energy efficiency
(% share, current US$)



Source: Intesa Sanpaolo on UNCTAD Comtrade data

A positive normalised trade balance

Normalised Trade Balance in Environmental Goods

	Waste management and pollution control		Renewable energy		Energy efficiency		Total environmental goods	
	2000	2008	2000	2008	2000	2008	2000	2008
USA	0.08	-0.08	0.16	0.21	-0.26	-0.27	0.05	-0.07
Germany	0.30	0.38	0.18	0.33	0.24	0.31	0.28	0.37
China	-0.08	0.09	-0.70	0.30	0.18	0.39	-0.06	0.17
Japan	0.49	0.41	0.37	0.53	0.25	0.29	0.46	0.41
France	-0.08	-0.07	0.23	0.32	0.09	0.10	-0.03	-0.02

Source: Intesa Sanpaolo on UNCTAD Comtrade data

A special relation with US

Chinese normalised Trade Balance in Environmental Goods by country

	Waste management and pollution control		Renewable energy		Energy efficiency		Total environmental goods	
	2000	2009	2000	2009	2000	2009	2000	2009
World	-0,08	0,08	-0,70	0,38	0,18	0,33	-0,06	0,15
USA	0,13	0,29	-0,78	-0,12	0,27	0,59	0,14	0,33
China, Hong Kong SAR	0,59	0,85	0,54	0,98	0,60	0,98	0,60	0,90
Japan	-0,48	-0,36	-0,88	-0,51	0,30	0,08	-0,35	-0,30
India	0,63	0,68	0,76	0,95	0,65	0,90	0,64	0,83
Germany	-0,29	-0,57	-1,00	-0,82	-0,24	-0,39	-0,35	-0,54
Rep. of Korea	-0,52	-0,28	-0,69	0,17	-0,39	0,11	-0,49	-0,18
United Kingdom	0,14	0,31	-0,99	-0,32	0,06	0,22	-0,02	0,28
Indonesia	0,65	0,66	0,94	1,00	0,52	0,69	0,64	0,78
Netherlands	0,56	0,25	-0,92	-0,51	0,54	0,79	0,52	0,33
Australia	0,51	0,65	0,88	0,70	0,58	0,97	0,54	0,71
Italy	-0,18	-0,23	-0,87	-0,36	0,25	0,13	-0,12	-0,18
France	-0,07	-0,01	-0,99	-0,75	0,06	0,20	-0,19	-0,04
Viet Nam	0,97	0,86	1,00	1,00	0,95	0,79	0,97	0,89

Source: Intesa Sanpaolo on UNCTAD Comtrade data

Environment-related technologies: USA, Japan and Germany the most active countries...

Main world countries in environment-related technologies, 2006-'07 (% share)

	Waste management and pollution control	Renewable energy	Energy efficiency	Total environmental goods
USA	24.6	22.9	14.4	22.4
Japan	22.0	9.7	32.9	20.8
Germany	12.7	12.1	15.3	13.0
France	5.3	3.5	2.5	4.3
United Kingdom	4.0	4.4	2.7	3.9
China	2.8	5.0	3.2	3.4
Rep. of Korea	3.0	4.3	3.5	3.4
Netherlands	1.6	1.8	10.4	3.2
Italy	2.4	4.2	1.3	2.7
Canada	2.9	2.6	3.6	2.9
Australia	2.7	2.5	1.2	2.4
Denmark	1.0	5.3	1.0	2.1
Spain	1.0	5.5	0.8	2.1
Sweden	1.9	1.5	0.8	1.6
Switzerland	1.3	1.1	1.0	1.2

Source: Intesa Sanpaolo on OECD Patent Database

... but China is gaining momentum...

Evolution of environment-related technologies shares between 2003-2004 and 2006-2007 (absolute difference between shares in the two periods)

	Waste management and pollution control	Renewable energy	Energy efficiency	Total environmental goods
USA	-1.3	5.9	-4.1	-0.6
Japan	1.2	-3.2	-8.3	-3.4
Germany	0.6	-5.0	3.0	0.2
France	0.0	0.1	1.1	0.2
United Kingdom	-0.8	-2.0	-0.4	-0.8
China	1.3	2.9	1.0	1.7
Rep. of Korea	-1.1	2.4	-0.9	-0.4
Netherlands	-0.1	-0.2	3.7	0.4
Italy	0.2	1.9	0.5	0.8
Canada	0.3	-0.8	0.9	0.2
Australia	-0.6	-3.0	-0.1	-0.8
Denmark	-0.3	-0.6	0.5	0.3
Spain	0.1	3.1	0.6	1.2
Sweden	-0.5	0.2	0.2	-0.2
Switzerland	0.5	-0.4	0.2	0.3

Source: Intesa Sanpaolo on OECD Patent Database

... even if its technology share is lower than its market share in clean environment goods

Difference between environment-related technologies share (2006-'07) and trade market share in environment goods (2008): first ten countries in terms of PCT clean patents

	Waste management and pollution control	Renewable energy	Energy efficiency	Total environmental goods
USA	12.9	2.8	7.1	10.6
Japan	12.3	2.7	27.1	11.9
Germany	-4.1	0.9	1.5	-2.9
France	1.3	-2.1	-2.4	0.0
United Kingdom	0.2	-1.5	-1.1	-0.1
China	-6.6	-2.1	-16.6	-7.3
Rep. of Korea	0.9	2.9	1.8	1.4
Netherlands	-1.8	0.1	8.4	0.2
Italy	-2.7	-3.2	-3.7	-2.6
Canada	0.7	0.9	2.2	0.9

Source: Intesa Sanpaolo on OECD Patent Database

- Economies whose trade share is greater than their technological weight (i.e. China), are often used as production centres by foreign multinationals, or are more specialised in basic environment-related productions.

What does affect export shares?

Dependent Variable: difference between Trade share in 2008 and Trade share in 2000

	Estimate	t	P
Intercept	0.60	2.15	0.034
Labor costs$_{2000}$	-0.06	-2.85	0.005
Tech. Share$_{2006/07}$ - Tech. Share$_{2003/04}$	0.37	2.94	0.004
R-Square = 0.1485	F = 9.68		
Adj R-Sq = 0.1331	Pr > F = 0.0001		

- The lower the **labour costs**, the higher the gain in export share. This indirectly may also be a consequence of the processes of delocalization in low cost country by multinationals.
- Change in export share is positively influenced by the increase of the **clean technology base**.

The increasing presence of Chinese environment goods on international markets is explained by low costs of labour of this economy, but also by the impressive improvements of Chinese technology base.

Conclusions

- China environmental legislation has consistently evolved over time and offered progressive support for the preservation of natural and energy resources, eco-innovation as well as the use of renewable energy sources
- In parallel, during the last decade China has developed specific technological abilities and a leadership in environmental goods in the international market
- The increasing presence of Chinese environment goods on international markets is explained by:
  - Delocalization process by multinationals: low costs of labour
  - Impressive improvements of Chinese technology base, also helped by legislation and policy support
  - Environmental situation still severe despite improvements