Trends in China's Atmospheric Environment and Comprehensive Countermeasures Including International Cooperation

Based on the Report *Is a Global Alliance Feasible to Reduce the Air Pollution of East Asia?*

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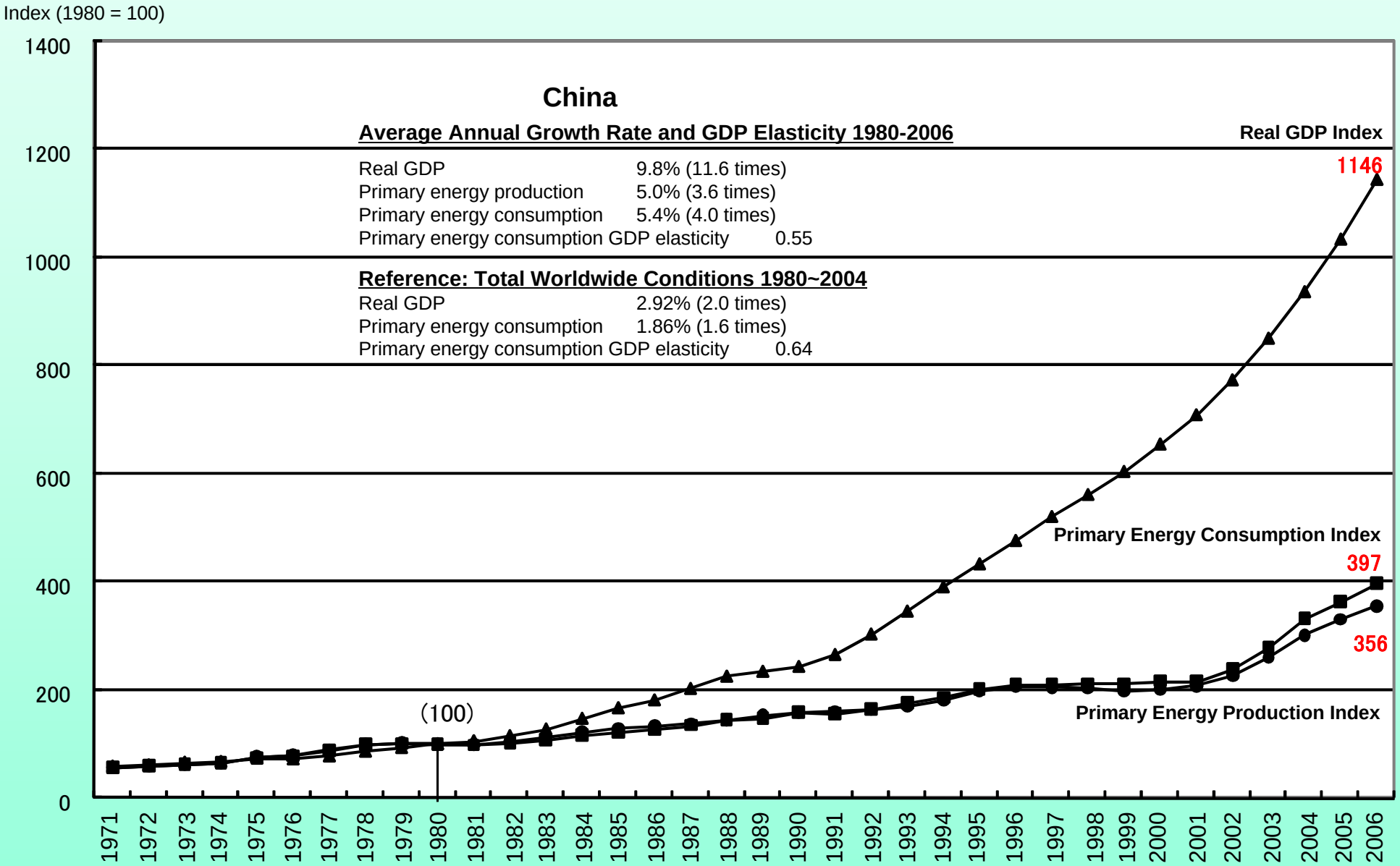
1. Present Conditions and Future Outlook for the Atmospheric Environment in China

1.1 High Economic Growth and Rapid Increase in Energy Consumption



Source：Prepared by Zhidong Li from “IEA statistics 2006”, “China Statistics Yearbook 2006”, “China’s National Economy and Social Development Statistics Bulletin”, “Energy Economics Statistics Survey 2007”, etc.

1.3 Middle to Long-term Economic Outlook

☆Economic growth → ☆Many optimistic projections

	Actual	Middle to Long-term Projection			
	1980-2006	2000-2010	2010-2020	2020-2030	2030-2050
Generalized Range	9.8	5.1-7.0-8.9	4.0-6.0-8.0	3.9-5.1-6.3	3.2-3.4-4.8
ERI Project team (1996/11)		8.0-8.2-8.6	5.9-6.0-6.4	4.4-4.6-4.8	3.2-3.4-3.6
Chinese Academy of Engineering (1997/5)		8.0-8.3	5.9-6.1		3.3-3.5
Energy Research Institute (1999/2, p289)		7.3	6.6	6.3	
Energy Research Institute (2000)		7.2	6.2		
Development Research Center of the State Council (2003/11)		7.2	7.2		
State Information Center (2003/12)		7.5	7.3	5.5	5.0→4.5
Government target (2003/3)		7.2	7.2		
11th 5-Year Plan (2006/3)		(05-10) 7.5			
IEA (1998)		5.8	4.5		
IEA (2002)		5.7	4.7	3.9	
IEA (2004)		(02-10) 6.4	(10-30) 4.4		
IEA (2006)		(04-15) 7.3	(15-30) 4.3		
EIA/DOE/USA (2001)	(1997-2010)→	5.1-7.4-8.9	4.0-6.5-8.0		
EIA/DOE/USA (2003)		4.5-7.0-8.0	3.5-6.0-7.0	2.8-5.3-6.3	←(2020-25)
Li (2004/3)		6.2-7.8-9.0	5.0-6.6-7.7	4.0-5.5-6.5	
Li (2007/1)		(04-10)	(10-15)	(15-20)	(20-30)
		7.5-8.7-9.5	5.5-7.1-8.0	4.5-5.8-7.4	4.0-4.9-6.0

GDP scale of 4 times the 2000 level by 2020

Notes: ERI Research team, "China's Energy Strategy Studies, 2000-2050", China Electric Power Publishing, 1996/11.
Chinese Academy of Engineering, "Comprehensive Report on Studies of Sustainable Energy Development Strategies in China, Ver. 1", 1997/5
Energy Research Institute (1999/2): Zhou Fengqi and Zhou Dadi, editors in chief, "China's Mid- to Long-term Energy Strategy", 1999/2
Energy Research Institute, "Report on Natural Gas", 2000
Development Research Center of the State Council (2003/11): High Level Forum on China's Development, Development Research Center of the State Council
(Ma Fei, Zhou Fengqi, Wang Qingyi), "Basic Framework of National Energy Strategies", 2003/11/17
State Information Center (2003/12): Liang Youcai, "Review and Outlook of China's Economic Development", 2003/12/7
IEA, World Energy Outlook, 1998, 2002, 2004, 2006; EIA/DOE/USA, International Energy Outlook, 2001, 2003
Research by Zhidong Li shows simulation analysis results using China 3E-Model Ver. 2004 and Ver. 2007.

Zhidong Li (2007) is a 3E-Model simulation using the latest data and considering the 11th Five-year Plan.

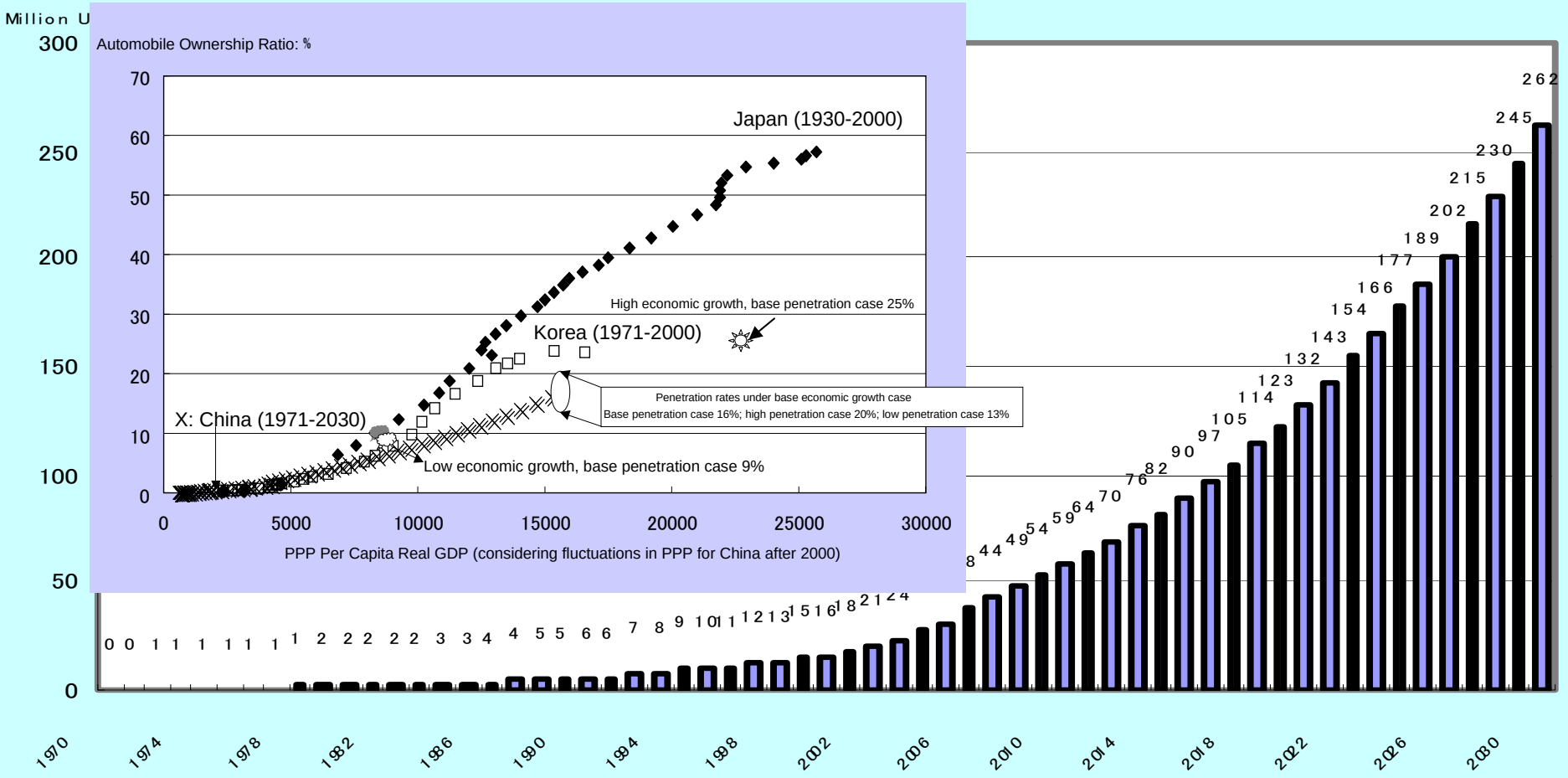
The economic growth rates for each case (2004-2030) are 6.4% base case, 7.5% high growth, and 5.2% low growth.

The likelihoods of each case are 60% base case, 30% high growth, and 10% low growth.

The 11th Five-Year plan target is 7.5%. ☆ Could become higher. For example, the Bureau of Energy assumes 8.5%.

- **Modernization of the industrial structure:** Primary industry 13% (2004) → 5% (2030); secondary industry 46% → 49%; tertiary industry 41% → 46%. 41%→46%
- **Sharp increase in high energy consumption products:** Cement 970 million → 1.24 billion tons; ethylene 6.30 million to 26.20 million tons; steel 300 million tons
- **Income levels rising to 15,000 PPP$ in 2030, reaching the level of medium-developed nations**

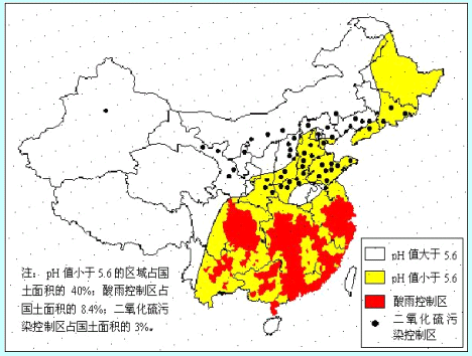
- **Popularization of automobiles:** Under the base case **132 million units with an ownership ratio of 9.3% in 2020 and 262 million units with an ownership ratio of 17.8% in 2030**



Source: Prepared by Zhidong Li based on the base case simulation results using China

Japan – China Comparison of Sulfur Oxides Pollution Countermeasures

	Japan	China
Environmental Countermeasures, Supervisory Systems		
Basic environmental regulations	Established	Established
Concentration regulations	Through 1967	Through 1997
Total volume regulations for specified areas	Since 1968, ’70, ’74	Since 1998
Fuel regulations	Since 1971	For specified areas; vague
Emissions tax	None	Established, but too low
Obligation to install desulfurization equipment	None	Established, but not enforced Strong
Administrative supervision,	Strong	**Weak**
society’s capacity for supervision		
(Consequent effectiveness of regulations)	High	**Low**
Environmental Energy Policies		
Energy Conservation Measures	Law enacted 1979	Regulations enacted 1986, law enacted 1997 **Lacks specifics. Efficiency declined 2003~2005**
Fossil fuels sulfur reduction measures	Cabinet resolution 1969	Air pollution control law 1995, coal law 1996 **Lacks specifics.**
Fuel conversion measures	Since 1974	Still firmly coal centered, renewable energy law in effect 2006
Energy policy	**Agency of Natural Resources and Energy staff of 1,247**	**National Development and Reform Commission Energy Research Institute staff of about 30-50**



The SO2 Reduction Targets under the 10th Five-year Plan Were Not Achieved

	Actual		Level vs. 10th Plan Targets		Actual	Level vs. 11th Plan Targets	
	2000	2005	2005 Target	2005 Actual/Target	2006	2010 Target	2006 Actual/Target
	(10,000 tons)	(10,000 tons)	(10,000 tons)	(%)	(10,000 tons)	(10,000 tons)	(%)
SO2 Emissions	1,995	2,549	1,800	142	2,589	2,294	113
Mining & Manufacturing Emissions	1,613	2,168	1,450	150			
Household-related Emissions	383	381	350	109			
Particulate Matter Emissions	2,257	2,094	2,000	105			
Soot Emissions	1,165	1,183	1,100	108			
Mining & Manufacturing Emissions	95	949	850	112			
Household-related Emissions	212	234	250	93			
Mining & Manufacturing Dust Emiss	1,092	911	900	101			

Source: Prepared by Zhidong Li from the Environmental Five-year Plan, environmental conditions bulletins for each year, statistics bulletins for each year, etc.

China Industrial Sector and Thermal Power Generation SO2 Emissions and Desulfurization Rates (2000-2005)

	Industrial Sector				Thermal Power Generation			
	Volume Generated (10,000 tons)			Desulfurization Ratio	Volume Generated (10,000 tons)			Desulfurization Ratio
		Emissions Volume	Desulfurization Volume			Emissions Volume	Desulfurization Volume	
2000	2,206.4	1,612.5	593.9	26.9	794.6	720.0	74.6	9.4
2001	1,989.7	1,566.6	423.1	21.3	725.6	654.0	71.6	9.9
2002	2,259.8	1,562.1	697.7	30.9	751.5	666.8	84.7	11.3
2003	2,540.8	1,791.6	749.2	29.5	899.5	802.6	96.9	10.8
2004	2,636.3	1,746.3	890.0	33.8	1,169.3	994.9	174.4	14.9
2005	3,068.3	1,980.5	1,087.8	35.5	1,427.9	1,167.2	260.7	18.3

Source: Through 2003, "China Electric Power Generation and Environmental Issues" in *China Energy Resources*, Vol 27, No. 11, 2005. From 2004, prepared by Zhidong Li from China Statistics Yearbook.

Analysis of causes in accordance with the Coal-fired Desulfured Power Generation Cost and Desulfurization Facilities Operation Management Law (put into effect on May 29, 2007):

(1) Desulfurization equipment installation ratio is less than one-half; (2) Normal operations ratios are low; (3) Operations costs cannot be recovered; (4) Excessive low-price competition in the desulfurization equipment industry. → **Essential to strengthen regulations and management, and to internalize environmental costs.**

☆China's Mobile Pollution Sources Countermeasures

・Expansion of public transport ・Road maintenance and transportation management
・Fuel quality improvement ・Clean automobile strategy

☆China's Automobile Strategy (considering energy, the environment, and economic development)

Related documents: Socioeconomic Development Plan, Science and Technology Development Plan, Automobile Industry Plan, Energy Plan, Automobile Emissions Pollution Prevention Technology Policy (1999), Diesel Vehicles Emissions Pollution Prevention Policy (2003), Automobile Manufacturing Industry Policy (1994, 2004), State 863 Plan Electric Automobiles Project (including hybrid vehicles and fuel cell vehicles) (2001), etc.

<Points>

1) Petroleum vehicles to remain the mainstream over the short to middle term.
2) Petroleum substitute clean vehicles to be used when and where they are appropriate.
3) Use of fuel cell vehicles over middle to long term. All-electric and hybrid vehicles as appropriate.

<Perspectives>

Characteristics of automobiles, China's status, strategic objectives and strategic methods.

☆Can China achieve the kind of success realized for manned space flight? Can it leapfrog to the state of the art?

Fuel Cell Automobile "Excellence 1" (Aug. 2003)

Weight: 1.6-1.7t Fuel Cell: 40 kW Acceleration: 80 km/h in 14 sec.
Maximum speed: 110 km/hr Distance before refueling: 210 km

Fuel Cell Automobile "Excellence – Glory" (Dec. 13, 2006)

Acceleration: 100 km/h in 15 sec.
Maximum speed: 150 km/hr Distance before refueling: 300 km

☆Fuel cell unit price: 10,000 yuan (¥150,000) per kW; Total cost of a 50 KW capacity passenger car: 700,000-800,000 yuan (¥10 million).

→ Reduction of unit cost to 4,000 yuan (¥60,000) per kW by 2010

Effects on Japan

☆Understanding of Issues (1)

Three impacts on the international community that cause concerns as threats

1) Energy supply shortage ➡ Deceleration of China's domestic economy (including foreign affiliates) ➡ Effect on the global economy
   - **China is Japan's largest trading partner**
   - **China has integrated into the global economy as a "factory" and a "market", and has become a driving force**
2) Rising dependence on foreign energy supply, and decrease of coal exports
   ➡ a. Tightened supply-demand balance on the global energy market, and large price increases. b. Geopolitical redrawing of the world energy map.
3) Weakening of China's and the world's sustainable development base from the worsening of domestic environmental problems, transborder pollution, and global environmental problems primarily caused by energy consumption.

☆⇒ **The resolution of China's energy and environmental problems would contribute to Japan's energy security, stable development and other national interests.**

☆Understanding of Issues (2)

Japan, China and South Korea face common **issues** (although the extents and priorities differ among the three countries), and **unilateralism has its limits.**

1) The issue of energy and other resource security caused by limited mineral resources and mass consumption.
2) **The issues of air pollution, acid rain pollution,** and the processing of solid waste.
3) The issue of restricting emissions of CO2, which is the leading cause of global warming.
4) The inability to compete with the EU, NAFTA and other regional communities because there is no Asian economic bloc and thus comparative advantages within the region cannot be linked to international competitiveness.
5) **Under unilateralism, it is difficult to resolve the problems and the costs are high (energy security, CO2 reductions, etc.).**

3.2 Common Recognition of the Need for China-Japan Cooperation; **Difficulty with Implementation**

A. Security Cooperation: Stockpiling, domestic and foreign resource development, import negotiations, etc.

B. Technology Cooperation: Energy conservation, new energy, environmental protection, joint development of advanced technologies, etc.

- **Gratitude for the great benefits China has received from prior Japanese government green aid and present private sector basis aid.**
- **Ample leeway for further promotion.**
  - **Concerns of the Japanese side: If technologies are transferred they will be copied and Japan will lose its advantages.**
    → Strengthening China's intellectual property rights protections is an urgent issue.
  - **Understanding of the Chinese side: The quality is good, but the cost is high. The care and personnel training after introduction is weak.**
    → Survey the willingness to pay in China.
    → The Japanese side should consider the joint development, cost reductions, timing of local production, local procurement ratios, etc., based on the local needs.

Vague feeling that technology transfer benefits the Chinese side and disadvantages the Japanese sides. → Benefits for both sides

<<Consider the Demerits>>

- ☆ The competitors are Europe and the U.S. → Unwillingness to sell means losing the market
- ☆ The technology gap between China and Japan is shrinking. → Japan should not belittle China's technological progress
- ☆ Preventing the decline of industries and maintaining technological superiority (which is a resource for Japan) assumes that there is a market and that goods can be sold

C. Technological cooperation in the so-called "soft" aspects, including the management system, know-how, and personnel training.

- **Japan has the world's top energy conservation efficiency; Japan's domestic environment rapidly improved**
  Why? – Why and how does each body, legal system, market mechanism and type of measure function? Is this unique to Japan, or universal?
  → Systems research (finding the theoretical basis for Japan's experience) is necessary. This is an urgent research issue!
  → Bilateral government discussions: Premier Wen Jiabao's April visit to Japan, ministerial dialog, etc.
- Reconfirm "win-win" as the common understanding (remove the suspicions of both sides), agree on cooperation

Proposals:
1) An air pollution alliance centered on Japan and China is one possibility.
2) Another idea is to establish an Asia Energy Agency which would include the prevention of air pollution as a touchstone toward the formation of a community.