

ONE LIFEBOAT

CHINA AND THE WORLD'S ENVIRONMENT AND DEVELOPMENT



Arthur J. Hanson and Claude Martin



China Council for International Cooperation on Environment and Development



International Institute for Sustainable Development

Institut international du développement durable

ONE LIFEBOAT

CHINA AND THE WORLD'S ENVIRONMENT AND DEVELOPMENT

By

Arthur J. Hanson and Claude Martin

In association with

Earl Drake and Jeremy Warford

With contributions from

**Leo Horn, John MacKinnon, David Norse, David Runnalls,
Bernie Sonntag and Wanhua Yang**

December 2006



**China Council for International Cooperation
on Environment and Development**

iisd

International
Institute for
Sustainable
Development

Institut
international du
développement
durable

© 2006, International Institute for Sustainable Development

The International Institute for Sustainable Development contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, measurement and assessment, and sustainable natural resources management. Through the Internet, we report on international negotiations and share knowledge gained through collaborative projects with global partners, resulting in more rigorous research, capacity building in developing countries and better dialogue between North and South.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC) and Environment Canada; and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations and the private sector.

International Institute for Sustainable Development
161 Portage Avenue East, 6th Floor
Winnipeg, Manitoba
Canada R3B 0Y4
Tel.: +1 (204) 958-7700
Fax: +1 (204) 958-7710
Web site: <http://www.iisd.org>

One Lifeboat: China and the World's Environment and Development

By Arthur J. Hanson and Claude Martin

ISBN 1-895536-96-0

This paper was authored by Arthur J. Hanson and Claude Martin, in association with Earl Drake and Jeremy Warford, incorporating contributions from Leo Horn, John MacKinnon, David Norse, David Runnalls, Bernie Sonntag and Wanhua Yang. It is based on a background report prepared for the China Council for International Cooperation on Environment and Development (CCICED) Task Force on Review and Prospects. This Task Force worked throughout 2006 examining China's environment and development accomplishments over the past 15 years, and tasks ahead to 2020, when China hopes to achieve an environmentally-friendly society. The Task Force was co-chaired by Dr. Song Jian and Dr. Huguette Labelle, and included five senior Chinese and five international members. The work of the Task Force was supported by the CCICED Secretariat and by a Lead Expert Group headed by Prof. Shen Guofeng and Dr. Arthur Hanson. We acknowledge the valuable inputs provided by those involved with the Task Force and CCICED Council members, and by several past co-chairs of CCICED activities. CCICED is a high-level international advisory body with the purpose "to further strengthen cooperation and exchange between China and the international community in the field of environment and development." It was established in 1992 by China, with financial support from China, the Canadian International Development Agency (CIDA) and several other international sources. The views presented in this paper are those of the authors, not necessarily of CCICED, or any of the other organizations with which contributors are affiliated. Visit the CCICED Web site at <<http://eng.cciced.org>>.

Cover image of Beijing at night by Bill Glanville, IISD's Vice-President and Chief Operating Officer. Centre image of PEMSEA conference attendees courtesy of IISD Linkages. All other images are from iStock.



Printed on 100% post-consumer recycled paper.

Table of Contents

1. RISING INTERDEPENDENCY	1
2. CHINA'S GROWTH AND CONSEQUENCES	5
Comparative Situation	5
Ecological Footprint	6
Trade, Investment and Expenditures Abroad	9
International Cooperation Roles	12
Environment and Security Matters	14
3. CASE STUDIES	16
Case Study 1 – International Market Supply Chains	16
Case Study 2 – Trade in Illegally Produced, Harvested or Transported Materials	28
Case Study 3 – Biosecurity and Biodiversity Protection	31
Case Study 4 – Regional Environmental Impacts – River and Marine Water Issues	34
Case Study 5 – Learning From and Sharing Environmental Experience	41
4. TEN ISSUES	52
Issue 1 – Enhancing Domestic Performance on Environmental Regulation and Enforcement, Pricing, and Environmental Planning and Management within China	52
Issue 2 – Reducing the Impact of China's Activities on Global Resource and Environmental Conditions	52
Issue 3 – Avoiding Pathways Taken by High-consuming Nations	53
Issue 4 – Improving Market Access and Promoting Sustainable Trade	53
Issue 5 – Aligning Production and Manufacturing with International Environment, Health and Safety Approaches, Standards and Performance	54
Issue 6 – Alignment with International SHE Standards	55
Issue 7 – Dealing with New Types of Environmental Problems	55
Issue 8 – Fast-track of Innovations for Sustainable Development	58
Issue 9 – Information Quality	58
Issue 10 – Capacity to Share China's Environment and Development Solutions Globally	59
5. CONCLUSIONS	60

1. RISING INTERDEPENDENCY

Global-level interdependency among nations has steadily increased, especially in the past 25 years. It is unlikely that this tendency will diminish. We all share one planet, and by the calculations of the World Wide Fund for Nature (WWF) and others, we are well past a level of sustainable environment and resource use, which is causing severe environmental impacts—some irreversible.¹ Today's emerging economic powerhouses among nations, and burgeoning populations in poorer nations, lay just claim to a greater share of nature's wealth and the fruits of human knowledge. But this is likely to be a sustainable claim only if there are major adjustments in the well-entrenched economic ways of richer nations, and a better track record of environment and development performance on the part of all nations. China is rewriting the book on environment and development, affecting perspectives held by the entire world. No other nation has risen so fast in terms of global economic sway, and none among large developing nations has ever had to cope with poverty reduction, job creation, and building of urban and rural infrastructure on the scale of, and over such a short time, as China.

China influences the world's economy *and* ecology. In turn, China's domestic environmental situation is, of course, affected by changes taking place elsewhere. There can be little doubt that China is responsibly engaged in seeking a better relationship between environment and development within the country, regionally and globally. Since the 1992 Rio Earth Summit, there has been an increasing national effort² and, especially since the turn of the century, a considerably greater commitment of funding for environmental protection and management. In fact, such expenditures are projected

to total US\$243 billion between 2006 and 2010. But the actual results to date have fallen short in terms of environmental performance. Important environmental goals have not been met within China,³ a matter that occupies the most senior levels of government, but is often of less concern at local levels where GDP growth is a pre-occupation. For example, the targets for reduction of key pollutants such as sulphur dioxide were not met during the 10th Five-Year Plan (2001–2005), while economic goals were well surpassed. This trend continued into 2006 as stringent targets for energy efficiency and pollution reduction were not met.

Until recently, there was limited interest in the international implications of China's environment and resource use. In the early 1990s, when double digit Chinese economic growth rates were common, the international implications were limited because development was starting at such a modest level, domestic consumption was very low and exports were still limited. Perhaps few people ever believed that China could maintain very high growth rates over decades, or that a country that traditionally had quite low (albeit very inefficient) energy use could quickly start influencing the world price of natural resources including oil, cement, forest products, minerals and agricultural commodities. This influence accelerated dramatically once China became a member of the World Trade Organization (WTO), with a rapid increase in exports, but also with more affordable automobiles for Chinese citizens, leading to higher demands for oil.

Today, China is on everyone's radar screen⁴ for a variety of reasons: balance of payments issues with the U.S. and some others; market opportunities for

-
- 1 WWF International, *Living Planet Report* (Gland: 2006), <http://www.panda.org/news_facts/publications/living_planet_report/index.cfm>.
 - 2 Kristen Day (ed.), *China's Environment and the Challenge of Sustainable Development* (M.E. Sharpe, 2005), 320 pp.; G. Murray and I.G. Cook, *The Greening of China* (Beijing: China Intercontinental Press, 2004), 193 pp.
 - 3 Elizabeth Economy, *The River Runs Black: The Environmental Challenge to China's Future* (Ithaca: Cornell University Press, 2005), 368 pp.
 - 4 Jianguo Liu and Jared Diamond, *China's Environment in a Globalizing World: How China and the Rest of the World Affect Each Other*, *Nature*, 30 June 2005; *Feeding a Dragon*, *Latin Finance*, September 2006; OECD, *Environment and Governance in China*, Ch. 17 in *Governance in China* (Paris: OECD, 2005), 236 pp., <http://www.oecd.org/document/32/0,2340,en_2649_33735_35340704_1_1_1_1,00.html>.

export-oriented countries; high stock values of international resource companies; fear of lost jobs as industrial production, and now some service sector jobs, move to China; fear of hard-won environmental and social performance of the last 30 years being threatened; and worry that pollution and other environmental impacts from China's rise will directly affect human health and ecosystems elsewhere. As noted in a recent Canadian newspaper commentary, in addition to outsourcing manufacturing to China, the developed world is "outdumping our pollution there as well."⁵

These perspectives, of course, represent only one side of the picture. China also has specific concerns about its international environment and development relationship. It will face the full impact of climate change despite many decades of contributing only minimally to the problem. Like other countries, China pays the high price of resource commodities purchased on the international market. Undesirable byproducts from export-driven industry remain in China, including pollutants and their health costs. Some of the industry launched in recent decades is based on obsolete production techniques with limited environmental protection potential. Countries have readily given over to China some of the worst polluting industries—coke production, for example (China supplied 56 per cent of the world's coke in 2004). And China is concerned over the potential of non-tariff trade barriers that may be imposed in the name of environmental protection.

At a global level, environmental governance is weak. While environmental progress has occurred as a consequence of the many global environment and development initiatives, this progress pales in comparison with the growing levels of damage to human and ecosystem health and to the global commons, including oceans and the atmosphere. China is vulnerable to this weakly developed environmental governance system, with repercussions domestically and for its international cooperation efforts.

This report examines environment and development implications of China's rapid growth on the rest of the world. Environmental effects of the rest of the world on China also are examined. China serves as a workshop for the world, and bears the brunt of environmental impacts associated with tourism, climate change and other activities that are directly the result of economic activities initiated elsewhere. The subject matter is broad and complex.

China's economic growth and global environmental influence will likely continue to grow towards 2020, a date by which China hopes to have quadrupled GDP relative to 2000 and to have achieved an "environmentally friendly, resource-efficient society," a phrase now repeated in major speeches by senior leaders as an expression of their vision. With this growing prosperity will come additional levels of responsibility for China. Such responsibilities could open new economic and environmental opportunities and strengthen international perceptions about China's role in the world.

Chinese leaders have made numerous statements implying that China as a responsible country must do well in addressing all three aspects of sustainable development: the economic, social and environmental components. A recent *White Paper on Environmental Protection in China (1996–2005)*, produced by the State Council, documents many of the major steps taken and also future needs. Concerning international cooperation, the White Paper⁶ notes the many steps taken for bilateral and multilateral cooperation regionally and globally to improve environment. For example, the paper notes that, under the Montreal Protocol, China has adopted more than 100 policies and measures to reduce ozone-depleting substances (ODS), accounting for half the total amount of ODS eliminated by developing nations.⁷ The White Paper affirms that China will meet signed and ratified international obligations. And in December 2005, the State Council set out the basic guidelines for domestic implementation of environmental protection.⁸ This has been

5 David Reevely, *Can't You Hear the Dolphins Weeping?*, Ottawa Citizen, 18 December 2006.

6 *White Paper on Environmental Protection Published*, China.org.cn, <<http://www.china.org.cn/english/2006/jun/170355.htm>>.

7 See also Jimin Zhao and Leonard Ortolano, *The Chinese Government's Role in Implementing Multilateral Environmental Agreements: The Case of the Montreal Protocol*, *The China Quarterly*, 175, 2003, 708–725.

8 *Decision of the State Council on Implementing the Concept on Scientific Development and Enhancing Environmental Protection*, 3 December 2005.

followed by the 11th Five-Year Plan (2006–2010), the nation's first to focus on a comprehensive range of sustainable development priorities.

Particularly striking is Premier Wen Jiabao's statement at the 6th National Environmental Protection Congress held in Beijing in April 2006. Premier Wen noted that: "We must fully understand the [environmental] situation is grim and complicated..." He proposed "Three Transformations": (1) environment and economic growth should be given equal status; (2) environmental problems should be considered concurrently, not after economic growth is achieved; and (3) instead of the current focus on administrative initiatives, environmental action should be broadened to include legal, economic, institutional and other measures. This robust complement of concepts is only slowly making its way into the minds and actions of decision-makers, but provides an important touchstone for the future.

This overview paper is based on a submission prepared as part of a year-long examination of China's progress and prospects on environment and development for the period 1990 to 2020. This examination was carried out by the China Council for International Cooperation on Environment and Development (CCICED).⁹ The paper contains the views of several international contributors associated with the Council's past or present work, plus extensive review of Chinese and international perspectives on China's current and future environment and development situations, and views based on interviews and a literature review.

The analysis acknowledges that China: (1) is a developing nation with hundreds of millions of relatively poor people, and a growing gap between richer people in cities, and the poorly educated rural majority; (2) is a "saving" nation which still has a very low per capita consumption level; (3) has limited per capita resources, with some, especially water, well below world averages; (4) has many unique habitats and a high level of biodiversity of global as well as of national concern; (5) faces some impacts such as those associated with climate change which are not primarily of China's own making; and (6) absorbs major environmental costs resulting from the pass-through of materials and energy used for traded goods.

These factors call for a great deal of understanding on the part of the international community with respect to judgments on China's environment and development efforts. They also demand recognition that economic growth is fundamental to China's future. Many development experts within China believe that economic growth levels below eight per cent per year are likely to lead to unacceptable levels of prosperity and to social unrest.

The analysis starts with a look at resource and environmental matters related to China's recent growth. We consider five key factors influencing China's contribution to global prosperity and the growing dependence of other nations on China's stability and economic growth:

- China's comparative situation with other nations;
- ecological footprints;
- Chinese trade, investments and expenditures abroad;
- international cooperation roles; and
- emerging environment and security matters.

These factors place China's environment and development specifics in a broader geopolitical context that cannot be ignored.

This material is followed by five case studies that examine how China is dealing with problems where effects are global or regional as well as domestic, including actions that could be enhanced in the future:

- international market supply chains;
- trade in illegally produced, harvested or transported materials;
- biosecurity and biodiversity protection;
- regional environmental quality and cooperation—river and marine water issues; and
- international environment and development cooperation, including development cooperation between China and Africa.

⁹ CCICED Task Force on Review and Prospects, *General Report*, presented to CCICED 5th Annual General Meeting of the Third Phase (Beijing: November 2006).

These cases draw on the insights of several former CCICED task force international co-chairs and others.

Not all the bases have been covered. In particular, more attention might have been given to the following topics:

- China's implementation strategies for several multilateral environmental agreements (MEAs), especially on climate change.
- Selected sub-global and regional environmental problems such as long-range transport of air pollutants (LRTAPs), a matter of growing concern, especially on the part of the U.S. and Japan.

- Accelerated processes for sustainable development such as technology transfer and partnerships for addressing energy efficiency and environmental protection. This is a broad field in which China has built an astonishing number of productive working relationships, including business, government-to-government, research and development, and municipal and academic linkages.

Each of these three topics deserves in-depth analysis which was not possible to include here.¹⁰

Based on the analytical information, 10 important issues have been identified, with conclusions drawn about each.

¹⁰ An example of such in-depth analysis is a recent report prepared by UNDP in China reviewing efforts on capacity building for implementation of multilateral environmental agreements (MEAs).

2. CHINA'S GROWTH AND CONSEQUENCES

The rapid growth of the Chinese economy since the 1970s, but particularly in the past 10 years, has caused reverberations in global markets. This tendency has been further reinforced following China's WTO accession. The quest for resources to support China's growth; increasing emissions; surging commodity prices; China's overseas investments; and rapidly increasing exports of manufactured goods have become topics regularly covered by the world's media, and tracked by many organizations. With this newfound prosperity, many more Chinese are travelling abroad, bolstering tourism and schools in many countries. Investment by China's government and enterprises in other countries is accelerating, and is being given intense scrutiny internationally.

Comparative Situation

China's contribution to the growth of the global GDP since 2000 has been almost double that of Brazil, India and Russia combined—the three largest emerging economies after China. Since 1990, China's economy has grown over nine per cent on average annually and it is likely that this growth will continue to grow by eight per cent or more a year. At this rate, by 2015, China will be the third largest economy of the world with about 6.5 per cent of world GDP, using a 2000 real dollar exchange rate. By comparison, Japan during its phase of rapid growth, between 1971 and 1991, on average grew only by 3.85 per cent annually.

According to *The Economist*,¹¹ China manufactures 30 per cent of all of the world's television sets; 50 per cent of the world's cameras; and 70 per cent of the world's photocopiers. It also accounts for 30 per cent of the world's furniture trade. China also has become a major player in world markets for oil, metals and raw materials, and commodities such as grain soybeans, fruits, vegetables and seafood.¹²

No doubt the sudden increase of production capacity initially came as a result of Deng Xiaoping's call for rapid growth in 1992. What makes its current level so remarkable is its sustained nature, even as other nations in Asia faced serious downturns in the late 1990s. Various authors have been pondering over the reasons for China's rapid and sustained growth. The reasons most often cited include: high productivity due to important structural changes; foreign, as well as domestic investment; and the opening of the Chinese economy to international trade.

China continues to be a leading exporter of manufactured goods including electronics, clothing and furniture, and the world's largest consumer and importer of many raw materials. Its total trade in goods grew at an annual rate of 24.5 per cent during the 10th Five-Year Plan period (2000–2005), and the target set for the 11th Five-Year Plan period (2006–2010) is to increase its trade in goods from US\$142.2 billion in 2005 to US\$230 billion in 2010.¹³

When China was the 25th largest exporter in the world, a decade ago, this routine doubling was hardly noticeable in the world. Now that it is either number three or four, it is truly astounding. And the environmental implications will be considerable in the years ahead, for environmental effects tend to unveil themselves more gradually than the economic successes with which they are associated.

In the next 15 years, China will build its fundamental transportation, urban, water control, energy and other infrastructure that will serve the nation for decades to come. Half the concrete and steel used in the world is in China. And up to 2015, half of the world's new buildings will be constructed in China. These demands cause Chinese suppliers to scour their own country and the world for the raw materials and manufactured products to meet

11 *The Economist*, 30 July 2005.

12 M. Shane and F. Gale, *China: A Study of Dynamic Growth* (Washington: Economic Research Service, USDA, 2004).

13 *The 11th Five-Year Plan Outline for National Economic and Social Development of the People's Republic of China*, adopted by the National People's Congress in March 2006.

these immense, very immediate needs. They also stimulate a rapid industrial development response within China that sometimes creates overbuilding and surplus, for example in the steel industry. Chinese manufacturers then become exporters. The U.S. steel industry, feeling the pressure of Chinese steel exporters, calls this “The China Syndrome.” A further consequence of this rapid development is the creation of some infrastructure that simply meets a relatively low standard of energy efficiency, and with limited potential for contributing to environmental protection. Some, but not all, Chinese building construction falls in this category, and so do many of China’s coal-fired power plants.

Information on China’s environmental performance during the past years of rapid growth, compared to selected nation groups, has been compiled in a separate report for CCICED prepared by Dr. Stephen Lonergan.¹⁴ His report draws upon best available international sources, but these sources provide only a very approximate picture. In some instances, the results reveal that China has made dramatic progress over a 10-to-20-year time period, for example, on energy efficiency. And overall per capita production of pollutants, and use of resources are relatively low. Yet in aggregate, China has moved into the major leagues. For example, the rise in carbon dioxide emissions is dramatically increasing so that China is now behind only the U.S., and will soon become number one in the world. These dynamics have caught everyone by surprise, with the International Energy Agency (IEA) repeatedly having to update its forecasts of China’s situation.¹⁵

Ecological Footprint

Ecological footprint calculations (see Box 1) allow comparing and tracking of natural resource consumption and efficiency at the per capita level. The advantage is that the actual net consumption per person of resources, taking imports and exports into account, can be compared, irrespective of the size of a country. As an example, China’s ecological

Box 1. Ecological footprint analysis.

Countries use ecological footprint analysis to compare their impact on the world’s resources and as a tool to help shape national policies. The ecological footprint of a country is the total area required to produce the food, fibre and timber that it consumes; absorb its waste; and provide space for its infrastructure. A nation consumes resources and ecological services from all over the world and its footprint is the sum of these areas, wherever they are located on the planet. In 2003, the ecological footprint corresponded to 2.2 global hectares per person (a global hectare is a hectare whose biological productivity equals the global average). In 2003, the Earth’s biocapacity was 11.2 billion global hectares, or 1.8 global hectares per person. Thus, humanity’s ecological footprint exceeded global biocapacity by almost 25 per cent. This global overshoot began in the 1980s and has been growing ever since. This means that natural capital is being spent faster than it is being regenerated. If continued, overshoot may permanently reduce ecological capacity.¹⁶

14 S. Lonergan, *Global Environmental Trends and China*, background paper produced for CCICED Review and Prospects Task Force, 2006, 39 pp.

15 See J. Logan, *Surging Chinese Carbon Dioxide Emissions*, EarthTrends, (World Resources Institute, November, 2006), <<http://earthtrends.wri.org/updates/node/110>>.

16 WWF International, 2006.

footprint in 2001 amounted to 1.5 global ha/person, considerably below the world average (2.2 global ha/person); lower than other Asian countries such as Japan (4.3 global ha/person) and Malaysia (3.0 global ha/person); and well below the U.S. (9.5 global ha/person) and Western Europe (5.1 global ha/person). But China's ecological footprint in 2001 was higher than some other Asian countries, e.g., India (0.8 global ha/person) or Indonesia (1.2 global ha/person), and has likely been growing in the past five years.

China's "Export of Biocapacity"

The 2005 Asia-Pacific report on ecological footprints¹⁷ compares the export of biocapacity (biological capacity)¹⁸ from Asian countries (see Figure 1), which provides a clear notion of the fact that, contrary to common perceptions in the West, China as yet is not a high-consuming country for natural resources *per se*, but an increasingly important manufacturer of goods consumed elsewhere in the world.

Import of Natural Resource Commodities

Nevertheless, China's rapid economic growth, industrialization and urbanization face major resource constraints (see Box 2). Its large population will make domestic resource constraints even more significant in the future. China is now the largest consumer and producer in the world of many different commodities. It is the second largest consumer of primary energy after the U.S., and the top global producer of coal, steel, cement and 10 different kinds of non-ferrous metals. Its increasing appetite for commodities is driving global demand for everything from oil and steel to copper and aluminum. In recent years, due to its robust growth, China has replaced the United States as the dominant market and price setter for copper, iron ore, aluminum, platinum, etc.

China's total forest imports in volume went up from 40 million cubic metres in 1997 to 134 million cubic metres in 2005. China's agricultural imports also are expanding. It increased imports of cotton from the United States by 700 per cent.

Box 2. Securing stable sources of imported natural resources.

China has now sought raw materials from regions as diverse as the Middle East, Africa, Latin America, Asia and the Pacific, and East Europe through either overseas investment or by strengthening its political relationship and promoting bilateral free trade agreements with the commodity-producing countries. China's big three energy multinationals—China National Petroleum Corporation, Sinopec and the China National Offshore Oil Corporation—have been "buying up oil and gas concessions" around the world. China and ASEAN signed the Framework Agreement on China-ASEAN Comprehensive Economic Cooperation in 2002; and ASEAN + 3 are now negotiating a complete free trade agreement (FTA) package aimed to be established by 2010. China is also holding talks with Australia about a potential FTA. It has also started talks with South Africa on the creation of a new FTA. Negotiations have taken place between China and the six-nation Gulf Cooperation Council about a possible FTA. Brazil is also developing a "strategic partnership" with China.

17 WWF International, *Asia-Pacific 2005: The Ecological Footprint and International Wealth* (Gland: 2005).

18 The relationship of biocapacity and ecological footprint is explained by Wackernagel in <<http://www.footprintnetwork.org>>.

Figure 1. Export of biocapacity from China, Japan and Thailand in 2001.

Source: WWF International. 2005. *Asia-Pacific 2005: The Ecological Footprint and Natural Wealth*. WWF, Gland.

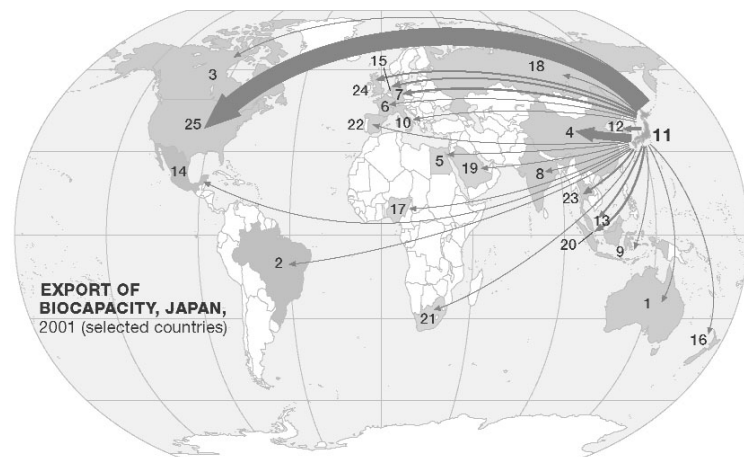
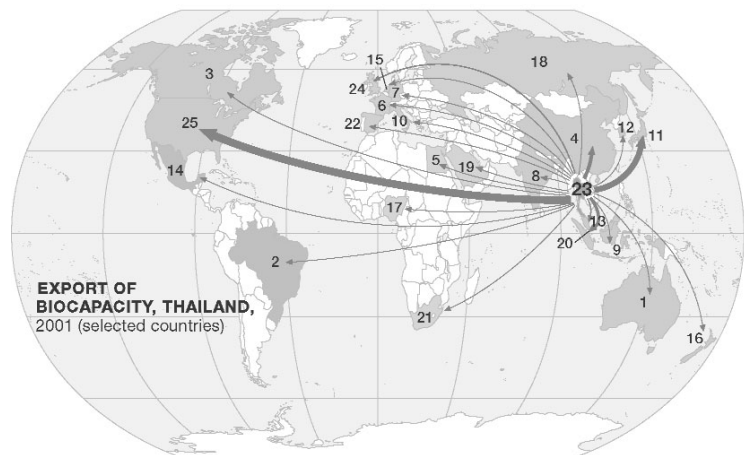
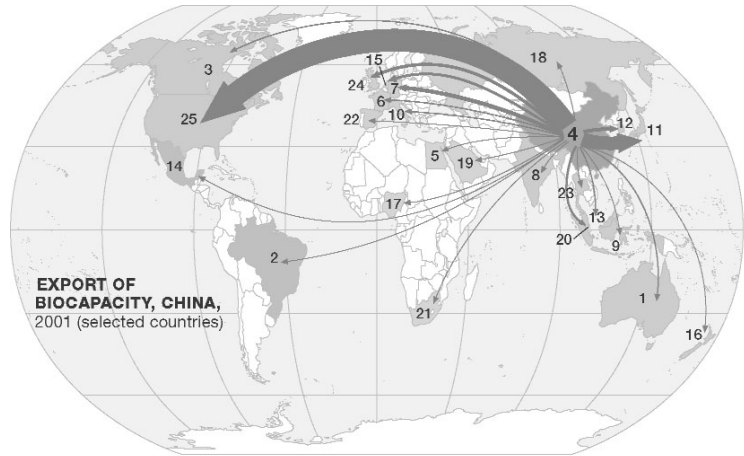
Table 1: Export of biocapacity from three Asia-Pacific countries, 2001, million gha.

The maps show flows in biocapacity particularly to the high income countries of Europe, Japan and North America. While some of this biocapacity comes directly from the exporting country, significant amounts originate in other countries, many in the developing world.

Export

From	China	Japan	Thailand
To			
1 Australia	2.5	2.1	1.4
2 Brazil	0.9	0.7	0.2
3 Canada	2.8	1.8	0.8
4 China	–	6.5	6.5
5 Egypt	0.5	0.2	0.2
6 France	3.0	1.7	0.9
7 Germany	7.3	4.3	1.7
8 India	1.4	0.5	0.5
9 Indonesia	1.6	1.8	1.5
10 Italy	2.7	1.3	0.7
11 Japan	25.1	–	10.6
12 Korea, Rep.	7.1	6.9	1.3
13 Malaysia	2.2	3.0	2.9
14 Mexico	1.3	1.1	0.5
15 Netherlands	4.7	3.2	2.2
16 New Zealand	0.3	0.3	0.2
17 Nigeria	0.5	0.1	0.4
18 Russian Fed.	1.3	0.2	0.1
19 Saudi Arabia	0.8	1.0	0.4
20 Singapore	4.3	4.0	5.6
21 South Africa	0.9	0.4	0.3
22 Spain	1.7	0.8	0.6
23 Thailand	1.9	3.3	–
24 U.K.	6.2	3.3	2.5
25 USA	43.2	33.6	14.1

Numbers refer to map locations only.



China's grain production has declined in the past few years. According to World Bank's forecasting, China's net grain imports will rise to 19 million tonnes in 2010 and 32 million tonnes in 2020.

The growth in China's oil consumption has been dramatic. Twenty years ago, China was East Asia's largest oil exporter, but it became a net importer in 1994. In 2003, it became the world's number three oil importer after the U.S. and Japan, and in 2005 it accounted for 31 per cent of global growth in oil demand.¹⁹

China's quest for natural resources (including timber, oil, base metals as well as agricultural products) and overseas investment in support of meeting these needs have become frequent topics in the global media. China has often been portrayed as responsible for negative global developments beyond its borders. However, in some cases (e.g., timber/furniture and cotton/textiles), it is not only China's own consumption that drives the resource demand. For example, over half the value of China's exports is derived from imported components and raw materials. A Stanford University study pointed out that the import value of Chinese exports to the U.S. is as high as 80 per cent (i.e., the products include a high level of materials imported to China, reprocessed into manufactured items).²⁰ This would imply that responsibility for sustainability and environmental concerns lies with consumers in the importing countries as well as with China, since the raw materials are taken from their own as well as other nations, and the final products are consumed outside of China.

Trade, Investment and Expenditures Abroad

Recently, for the first time ever, China's State Council in its *Decision on Implementing the Scientific Concept of Development and Strengthening Environmental Protection*,²¹ called for more comprehensive attention to trade and environment issues, including Doha negotiations on trade and environment, refining environmental standards for exporting products, illegal waste imports and invasive alien species.

Many Trade-related Resource and Environmental Concerns

Expanded trade activities have contributed to China's serious environmental problems including widespread air and water pollution, and serious ecological environmental damage. The level of damage is such that some international observers worry that China has become a very significant pollution haven. However, the evidence for this is mixed.²² There are a number of specific studies covering environmental assessment of China's accession to the WTO.²³

Increasingly, there is a focus on market supply chains, and the conditions under which resources are obtained by Chinese enterprises. A Global Witness report found that 90 per cent of timber crossing into China's Yunnan from Myanmar's Kachin State was illegal. China responded by signing an agreement with Myanmar to shut down this long-term trade.²⁴ Similarly, China and Indonesia signed an agreement to address problems of timber trade, but according to senior environmental

19 UNCTAD, *Trade and Development Report 2005* (Geneva: 2005).

20 Lawrence J. Lau, *Is China Playing By the Rules? Free Trade, Fair Trade, and WTO Compliance*, Congressional-Executive Commission on China Hearing, Washington, 24 September 2003.

21 *Decision of the State Council*, 24 November 2005, as noted in Major Domestic Economic Events in the Fourth Quarter of 2005, NDRC News, 11 January 2006.

22 Evidence about FDI seeking lax environmental standards in China is mixed, with countries from Europe and North America attracted to areas of good standards, while some investment sources from overseas Chinese sources are put off by high standards. See Judith M. Dean, Mary E. Lovely and Hua Wang, *Are foreign investors attracted to weak environmental regulations? Evaluating the evidence from China* (World Bank: 2005), <<http://www.eldis.org/cache/DOC17666.pdf>> and U.S. International Trade Commission, *Foreign Direct Investment and Pollution Havens: Evaluating the Evidence from China*, Working Paper No. 2004-01-B (U.S. International Trade Commission Offices of Economics: 2004), <<http://hotdocs.usitc.gov>>.

23 IISD, *An Environmental Impact Assessment of China's WTO Accession: An Analysis of Six Sectors* (Winnipeg: IISD, 2004), <http://www.iisd.org/pdf/2004/cciced_env_impact_assessment.pdf>.

24 Global Witness, <http://www.globalwitness.org/press_releases/display2.php?id=358>.

officials in Indonesia, there has been limited follow-up. In fact, the “world’s biggest timber smuggling” was found between Indonesia and China.²⁵ A 2006 report by the Environmental Investigation Agency located in the U.K. indicated that China plays the leading role in the worldwide illegal trade in ozone-destroying CFCs (chlorofluorocarbons).²⁶ These are only a few examples of trade and environment issues that China faces.

China worries about non-tariff trade barriers related to environment. In fact, this may be the most significant concern on the subject of trade and environment. The latest of these “green barriers” has raised concerns within China about its ability to export chemicals and products containing various chemicals. The EU has implemented a program intended to address some 30,000 chemicals which may have detrimental environmental and health affects. By June 2007, the REACH (Registration, Evaluation, and Authorization of Chemicals) Program will require registration of products with these chemicals. Apparently some five million Chinese products, including textiles, cosmetics and many other products, could be affected. At present there is no national system of chemical registration in China, and some 10 standards prevail. Billions of dollars of exports could be affected.²⁷ China also worries that the REACH Program will become a worldwide standard, therefore affecting its exports to many more countries.

Bird flu is costing China and other countries billions of dollars. Some of the costs are directly related to movements of people and exported products. Increasingly these public health issues are linked to wildlife, and to disease epicentres in countries such as China. Invasive species directly affect China and other countries, causing significant economic and ecological damage. And trade involving rare or endangered species is a well-established concern. There are environmental matters pertaining to novel life forms associated with biotechnology. All of these

biodiversity-related aspects of trade are of growing significance globally and are of concern to China.

Beyond these specific cases, there are many huge and detailed tasks that need to be performed in order to introduce environmental considerations into trade policies and enforcement practices for China and other countries, and within the trade agreements themselves. Most importantly, there is the need to build a better understanding and approach to trade and sustainable development—focused more broadly than on trade and environment considerations.

Integrated Trade and Sustainable Development Strategy

CCICED’s influential Trade and Environment Working Group and Task Forces²⁸ advocated for years that an overall national strategy for sustainable foreign trade, a green trade action plan and an integrated investment policy should be developed and implemented by the Chinese government in order to better promote trade and sustainable development. Although some progress has been made in some sectors and on specific issues, there is no coherent action. The lack of such a coherent policy, higher priorities paid to GDP and trade growth, and the absence of the necessary institutional coordination are hindering the development of a sustainable trade strategy.

The State Council’s major 2005 Decision for strengthening environmental protection and follow-up, such as the “Three Transformations” described earlier, calls for the coordination of socio-economic growth with environmental protection; putting environment at a more important strategic position; and reinforcing leadership on environmental protection work. The emphasis is on accountability, with principal officials of relevant departments and local governments held responsible for environmental protection work in

25 Environmental Investigation Agency, *World’s Biggest Timber Smuggling Racket Exposed Between Indonesia and China*, press release, 17 February 2005.

26 Environmental Investigation Agency, *China Exposed as Lead Player in Global CFC Smuggling Racket as Ozone Damage Worsens*, press release, 13 December 2005.

27 *Firms Prepare for EU Rules on Chemical Goods Imports*, China Daily, 16–17 December 2006; also see <http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm>.

28 *CCICED Compilation of Recommendations from 1992-2005* (Beijing: CCICED Secretariat, 2006). See CCICED and IISD Web sites for further information on publications related to CCICED work related to Trade and Environment.

their jurisdictions. This represents an unprecedented opportunity for developing integrated trade and sustainable development strategies, with accountability on the part of both trade and environment departmental officials.

Investment at Home and Abroad

Investment is important for sustainable development. High-quality and well-managed foreign investment at national and international levels can help promote the move from unsustainable to sustainable practices in various sectors. During the 11th Five-Year Plan period, China's goals are to continue to attract foreign direct investment (FDI) vigorously; to improve its investment law and policy; and to guide the FDI flow—to high-tech, to the high-end of production, to environmentally-friendly processes and production methods, and to China's inland and western regions. As China moves to becoming one of the world's leading investors in scientific R&D (likely second only to the U.S., or perhaps third), a significant portion of the investment will be devoted to environmental protection. This may help to overcome a significant problem in creating "Made in China" solutions well-suited to local environmental, social and economic circumstances, and also a means of overcoming the intellectual property rights (IPR) issues that make it difficult for China to engage in technology leapfrogging, and to gain access to leading-edge environmental solutions.

Recently, Chinese companies have actively engaged in overseas acquisition activities all over the world in an effort to acquire a wide range of natural resources to meet the short supply at home. In 2005, direct investment abroad by Chinese firms increased by 27 per cent to US\$3.2 billion, and contracted overseas investment jumped by 78 per cent to US\$3.71 billion. More than half of 2005's overseas direct investment by China was in the mining sector.²⁹ While this level of Chinese international investment pales in comparison to the US\$60 billion invested in China by foreign firms in 2005, it represents the beginning of a new trend where Chinese state-owned and private enterprises will be more active in establishing a global presence supported by the Chinese government. This

trend will include partial or complete purchase of banks and perhaps other financial firms abroad.

In 2002, the Chinese leadership announced at the 16th National Party Congress a broad "going out" strategy for both state-owned and private companies. In 2003, the government focused on commodities and adopted a policy to promote and protect investments in mineral resources prospecting and exploitation outside China. The 11th Five-Year Plan calls for further implementations of the "going out" strategy, and will provide support to enterprises that have the ability to engage in overseas operation and overseas acquisition, particularly resource exploitation and development cooperation to meet government policy objectives of securing commodities.

It is important that Chinese companies with an interest in overseas investment are aware of private and public opposition to the so-called "race to the bottom" on environmental measures and of corporate responsibility in their overseas acquisition efforts. Recent events in North America and elsewhere suggest that Chinese businesses may well benefit from stronger and sounder investment treaties. Private and government opposition in the United States ultimately prevented the proposed acquisition of Unocal by China's National Petroleum Corporation. China's Minmetals's potential interest in acquiring Noranda, a major Canadian resource company, also provoked some vocal opposition in Canada raising issues such as poor management, lower global standards of transparency, environmental standards and corporate responsibility of Chinese state-owned enterprises.

China has concluded bilateral investment treaties with some 71 countries over the past 25 years. Most of these agreements are modelled on the current international investment model developed a half century ago. Chinese interest in investments in the national resources sector outside of China may well benefit from a comprehensive and robust international investment regulatory regime that promotes sustainable development at national and international levels. However, there is no strong push in this direction from China.

International investment agreements (IIAs) have now become an important part of the legal and

29 Andy Rothman, *China Eats the World*, CLSA, Spring 2005, <<http://www.cctr.ust.hk/articles/pdf/China%20Eats%20the%20World%20Spring%202005.pdf>> (accessed 20 May 2006).

policy mechanisms that govern the economic processes of globalization. To put it more simply, international investment agreements are all about the governance of globalization.³⁰ The current international investment regime developed 50 years ago is inherently flawed and can no longer meet the needs of the global economy in the 21st century. It only focuses on the protection of foreign capital and investments; and the arbitration process developed to address disputes primarily focusing on investor-state arbitrations has major flaws. Also, international investment agreements grew on a bilateral basis between home and host states; there is no international institutional home for IIAs. This is clearly a topic that should be of interest to China and to its main trading partners. It is an example of the fundamental weaknesses of the international legal structure in matters affecting environment and other significant impacts.

International Cooperation Roles

China's has clearly signalled its intention to take an active part in many types of international cooperation related to environment and development. The following areas represent some of the more important possibilities:

- Active participation in the negotiation, funding and action internationally of multilateral environmental agreements (MEAs) and environmental aspects of other international agreements for health, trade, etc.
- Building domestic implementation capacity for MEAs signed and ratified by China, including new or revised laws and regulations, strengthened policies and enforcement.
- Increasing the level of Chinese participation concerning environment and development in international organizations.
- Ensuring effective implementation of bilateral and multilateral agreements for

managing shared resources (e.g., "Top of the world" mountain regions in western China; water resources in border regions such as Mekong and Songhua Rivers; and the South China and Bohai Seas).

- Promoting a good level of corporate governance capacity, and corporate social responsibility of Chinese businesses operating in China and/or internationally.
- Creating transparent processes for information sharing on resource and environmental problems, infectious diseases, etc., with consumers, organizations and governments internationally and within China. An example is China's willingness to undergo examination of its environmental protection mechanisms and organization by the OECD.³¹
- Sharing of Chinese experience in environmental technology and protection with other nations, including via Chinese development assistance.
- Expansion of joint efforts with foreign governments, universities and research organizations to address issues of mutual concern within China and internationally.

This list undoubtedly will be expanded in the future, as new problems emerge globally and as Chinese presence becomes greater in international environmental initiatives.

China has ratified dozens of international environmental agreements, amendments and protocols.

The national environmental protection law has taken the position that when domestic law is not in accordance with an international environmental accord ratified or acceded to by China, then the provisions of the international convention should be implemented, except in those cases where China had specified its reservations.³²

30 Howard Mann, Konrad von Moltke, Luke Eric Peterson and Aaron Cosbey, *IISD Model International Agreement on Investment for Sustainable Development – Negotiators' Handbook* (Winnipeg: IISD, 2005), <http://www.iisd.org/pdf/2005/investment_model_int_handbook.pdf>.

31 OECD, *Environmental Performance Review of China. Conclusions and Recommendations (Final)* (OECD: 2006), <<http://www.oecd.org/dataoecd/58/23/37657409.pdf>>.

32 *Article 46 of China's Environmental Protection Act* as noted on p. 42 in PEMSEA, *The Development of National Coastal and Marine Policies in the People's Republic of China: A Case Study* (Manila: PEMSEA, 2003), 63 pp.

One persistent concern internationally is how China can contribute to a strengthening of global environmental governance, and why it might be in China's best interest to do so (see Box 3).

What might China do to ensure that its interests are better served through a strengthened global environmental governance system? First, actions speak louder than words. China can meet its own rigorous domestic targets for energy efficiency and pollution control; restrict activities such as the import of illegally-cut timber; and ensure that its companies investing or operating abroad also observe good environmental standards. In these ways, China will contribute to improved global environmental quality, and build a reputation for itself as a respected and responsible world citizen in regard to environment and development. China can implement internationally recognized best practices, including investment in newer technologies domestically, and seek cooperation with others to ensure these practices operate smoothly. This is particularly needed in coal technology, where China's practices significantly affect global environmental quality.

China cannot delay taking a larger role in world environmental affairs. It is now a major economic power, a key player in energy, greenhouse gas emissions and climate change. And it is reshaping the world's market supply chains. Thus China should have a strong vested interest in creating predictable international environmental rules under which its businesses operate, and under which its own goods and services are traded. At the moment these are only weakly developed. There are many ways to enhance its role, ranging from pressing for enhanced action on existing agreements where these are compatible with Chinese needs, to scientific and other cooperation to produce better monitoring and environmental knowledge, and through expanding Chinese participation within international bodies, including financial support.

China also might build on the success it has had in domestic implementation of some global voluntary efforts for environment such as the widespread adoption of ISO 9000 and ISO 14000 management standards. Fully embracing other approaches such as the Responsible Care Programs used in chemical and other sectors internationally

Box 3. Global environmental governance and China.

As a rapidly developing and trading nation, China faces the dilemma of needing fast-paced environment and development decision-making at a time when global environmental governance is still slow-paced, inefficient and incomplete. The world's environmental governance lags behind the World Trade Organization.

Global environmental governance could be an important stumbling block for China's future environment and development relationship for a number of reasons: lack of clear and enforceable rules regarding transboundary pollutants; unclear international demands for rules on sustainable production of goods and for natural resource imports; limited monitoring and scientific proof concerning causes of environmental damage, leaving China vulnerable to assertions made by other nations or vested interests; unilateral environmental conditionality imposed by other nations on Chinese exports; unfavourable terms for access to advanced sustainable development technologies for key problems such as removing pollutants from new coal-fired power plants in China; poor global environmental information systems, making it difficult to benchmark Chinese experience against efforts elsewhere; and no systematic approach to build environmental protocols into trade and investment within the World Trade Organization.

China has been a major beneficiary by participating in the past 35 years of international environmental decision-making, from the 1972 Stockholm Environment Conference, to the Earth Summits in 1992 and 2002. China is signatory to the major conventions arising from these and other global meetings, and was one of the first nations to produce a national Agenda 21. Thus China has had the opportunity to apply domestically the knowledge and experience gained from global environmental governance efforts—over the same time period that China began its own period of very rapid economic growth.

would help to meet China's own "circular economy" objectives.³³

Over the longer term, China and other fast-growing major nations such as India and Brazil may have considerable influence in shaping the organization and effectiveness of the still relatively young global environmental governance structure into a more functional system. Certainly other nations already recognize the major influence these and other large countries are having on the world's environment and development. Needed are very clear signals of innovation and success in addressing the problems. This will create a level of credibility with both richer and poorer nations that such problems can be tackled while continuing ambitious economic and social development efforts.

Environment and Security Matters

The notion of considering environment and development as a security concern is relatively new but of growing interest internationally and nationally.³⁴ It is derived from an expanded definition of security that focuses attention on both human development and ecological conditions, and on security of resource supply and ecological services. Thus factors such as climate change, environmental incidents, such as large oil spills or prolonged periods of drought, floods and other natural disasters, can be considered as threats to human security, and to both natural and highly managed ecosystems. A general matter of concern for many countries, including China, is security of food, energy and raw materials for manufacturing. These might be considered as factors of economic security. Poverty, environment and security is another

approach of considerable concern, especially in regions of scarce land and water resources, where roots of conflict arise from access to resources and from environmental degradation. And, of course, there are those who would place environment and resource considerations into the framework of traditional military security, for example, refugees from civil strife over matters such as water and land use conflicts, and, internationally, military interventions to safeguard market supply chains for oil or other natural resources.

Another way of thinking about environment and security is that it brings out the potential of examining problems from an adaptive, sustainable development approach rather than from an ordered response approach. The latter employs solutions based on either use of military power or blunt instruments such as economic structural adjustment to address serious problems. Environment and security are only beginning to be linked in the case of China's environment and development.³⁵

In China's global relationships, as analyzed by some Western academics and those interested in new aspects of foreign affairs, the following topics are examples concerning environment and security. It should be noted that while some of these topics can be related directly to matters beyond China's borders, in other cases, there is concern for insecurity within China including political, economic and social implications.

- Domestic destabilizing influences of conflict over pollution incidents and improper land appropriation.

33 "Circular economy" is the way China describes its system of recycling, eco-efficient industry and other measures taken to reduce energy use and for introducing sustainable consumption and "cradle-to-cradle" approaches to cut material flow, especially in manufacturing.

34 See Woodrow Wilson Center Environmental Change and Security Program, <<http://www.wilsoncenter.org>>; R.A. Matthews, *Environmental Security: Demystifying the Concept, Clarifying the Stakes*, Environmental Change and Security, Report 1 (Spring 1995): 14–23; Institute for Environmental Security, <<http://www.envirosecurity.org>>; European Commission, *Global Monitoring for Environment and Security (GMES): From Concept to Reality*, COM (2005): 565, <<http://www.gmes.info/library/files/Reference%20Documents/COM-2005-565-final.pdf#search=%22environment%20and%20security%20china%22>>.

35 Vaclav Smil, *China's Environment and Security: Simple Myths and Complex Realities*, SAIS Review, 1997, 17(1): 107–126; Elizabeth Economy, *Environmental Scarcities, State Capacity, and Civil Violence: The Case of China*, 1997; Nathan Nankivell, *China's Threatening Environment*, Japan Focus, 2006; Nautilus Institute, Asian Energy Security Workshop, Beijing, 2005, <<http://www.nautilus.org/energy/2005/beijingworkshop/papers.html>>; UNEP, *The Fall of Water: Emerging Threats to the Water Resources and Biodiversity at the Roof of the World* (ICIMOD, 2005), <<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=452&ArticleID=4916&l=en>>.

- Impacts on China's ecosystems, water and food production arising from climate change.
- Impacts on fisheries and ecosystems arising from uncontrolled/unregulated exploitation in disputed areas of the South China Sea.
- Impacts of air pollutants from Asia (including China) such as persistent organic pollutants (POPs) and heavy metals on food chains for people and wildlife in Arctic areas.
- Purchase of natural resources such as oil or timber from countries with governments considered likely to be repressive or with a poor record of environmental sustainability.
- Purchase of natural resources such as agricultural commodities, timber, oil or minerals where the result may be incursion into globally significant ecosystems, or onto lands from where indigenous people may be displaced (e.g., the Amazon, parts of Africa).
- Human, plant and animal diseases and invasive species that are transformative in their economic, social or environmental impact. Trade, travel of people and other mixing factors constitute threats to environmental security, although providing essential benefits.

The subject of environment and security related to China will grow in significance over coming years, although these relationships require more analysis and statements need to be carefully considered, not blindly accepted.

3. CASE STUDIES

Case Study 1 – International Market Supply Chains

Agricultural Products

One of the most relevant issues in terms of global impacts of the Chinese economy is the question of whether China will continue its former policy of self sufficiency in grain supplies. Two aspects are of particular interest in this regard:

- China's grain harvests declined between 1998 and 2005 by nine per cent, or 34 million tons. Falling water tables, the conversion of agricultural land to non-farm uses, such as urbanization, and the loss of farm labour in rapidly industrializing provinces are at the source of this loss. Rice productivity, in particular, has been attributed to water shortages.³⁶ A study by a joint U.K./Chinese team released by U.K.'s Environment Minister Elliott Morley in 2004 has shown that Chinese staple crops—rice, wheat and maize—may fall by as much as 37 per cent by the end of the century, under current climate change projections.³⁷
- Food consumption levels have been increasing with China's growth and will undoubtedly continue growing with the increasing wealth of the average citizen. As a consequence, the demand for meat, fish, vegetable oils and dairy products will rise as well, which in turn requires additional quantities of grain for feed. China produces nearly half of the world's pork, is the world's second largest poultry and the third largest beef producer.³⁸

China already imports bulk commodities for its labour-intensive food industry. China is a major exporter of manufactured foods, animal products, fish, vegetables and fruit, mainly aimed at Asian markets. Although China's demand for protein may be supplied largely by domestic producers of livestock, those farms increasingly will rely on imported corn, soybeans and soy meal for feed.

Soybean and oil palm production in the tropics is of particular environmental concern because of the massive land conversion of tropical forests that this often entails. Plantations of these two crops already cover an area of the size of France and more forest is being cleared for this purpose every year. From 1993 to 2002, the global harvest of soybeans increased from 115 million tons to 180 million tons. Although productivity per area was also improved through new varieties, the cultivated area in Argentina and Brazil increased dramatically, at the expense of the natural savannah (Cerrado) and Amazonian forest. The recent increase of the rate of deforestation in the Amazon is mainly related to cattle ranching and soy plantations. By far the largest importers of soybeans from South America in 2001 were Europe (45 per cent) and China (35 per cent).

The area under oil palm plantations has increased between 1990 and 2002 by 43 per cent to 10.7 million ha. A vast new oil palm development project in the highlands of Borneo, straddling the border between Malaysia and Indonesia has drawn negative reactions the world over.³⁹ The area is still largely covered with primary forest and inhabited by indigenous peoples. Forest clearing for oil palm a major loss of some of the most diverse natural habitat in Borneo. A recent study⁴⁰ has identified

36 L.R. Brown, *Plan B 2.0. Rescuing a Planet under Stress and a Civilization in Trouble* (New York, London: Earth Policy Institute, W.W. Norton & Company, 2006).

37 DEFRA and Ministry of Science and Technology (China), *Impacts of Climate Change on Chinese Agriculture* (London: DFID, 2004).

38 F. Gale, *China's Food and Agriculture: Issues for the 21st Century*, U.S. Department of Agriculture, Agriculture Information Bulletin No. 775, 2002.

39 E. Wakker, *The Kalimantan Border Oil Palm Mega-project* (Amsterdam: AIDEnvironment, 2006).

40 J.W. van Gelder, *Financial Institutions Involved in the Heart of Borneo*, Research paper prepared for WWF Indonesia, 2005.

investors possibly involved in this completely unsustainable development would, because of the rugged up-land terrain, lead to massive erosion and low yields, besides undertaking, including the China Development Bank and the CITIC Group of China. At the Conference of the Parties to the Convention on Biodiversity (CBD) in March 2006, the three governments sharing Borneo—Indonesia, Malaysia and Brunei—made declarations in support of conservation efforts in the “Heart of Borneo.”

A new threat to the remaining natural forests of Southeast Asia, are various plans for biodiesel from palm oil. Indonesia has announced the conversion of six million ha of lands for this purpose. The lands are supposed to be from land not in primary forest, but the track record in Indonesia has been illicit burning of natural forest for this purpose. While much of the biodiesel will be for domestic use, it would be very surprising if there were not willing importers, including China, which is promoting demand for biofuels, including ethanol and biodiesel, but will have a difficult time meeting this demand if it relies solely on its own sources.

Agricultural Products Synthesis

Clearly, China cannot be held accountable for unsustainable agricultural practices abroad. The fact that rising Chinese demand for agricultural produce has led to a price surge for certain commodities, thus creating incentives for uncontrolled agricultural expansion, is primarily related to weak land use governance in producer countries. It is in accordance with its WTO membership that China lowers tariffs, weakens state monopolies and increases the openness of import allocations, thus weakening the policy instruments the government has been using to restrain agricultural imports. However, as some authors⁴¹ have stressed, if China turns increasingly to the world markets for massive imports of grain and other agricultural products, this has the potential to change the

geopolitical situation, increasing the insecurity for sustainable supplies, and exposing China to worldwide attention and criticism simply because of the dimensions of China's demand.

Already today, large scars of deforested areas in the Amazonian states of Mato Grosso and Rondonia in Brazil that can be attributed to soybean plantations and are clearly visible by satellite. It will therefore be necessary that China articulates its agricultural and investment policies, ensures reliable statistical information to accurately assess its development and participates in international fora to assess the impacts of markets on biodiversity and the natural resource base.

Forest Products

A considerable number of studies have been undertaken as a consequence of the rapidly increasing Chinese demand for forest products, particularly after the introduction of the National Forest Protection Program in 1998, which banned logging in ecologically-sensitive areas of China. These have been initiated by Forest Trends, the Center for Chinese Agricultural Policy (CCAP) the Center for International Forestry Research (CIFOR), WWF International and their numerous partners in China. Although there remain uncertainties with regard to unreported logging as well as import and export statistics, the level of understanding of China's forest products' market is more complete than for other resources.

The per capita use of wood products in China currently is modest. The average person in the U.S. uses 17 times and an average Japanese six times as much wood as a person in China! In 2003, China consumed about 173 million cubic metres of wood for its domestic use and for export. Of this volume, only about 79 million cubic metres log volume was produced by China's own forests and plantations. This figure includes the industrial timber as well as fuel wood according to national statistics, plus an estimate of undeclared industrial production. The State Forest Administration has

41 See, for example, Brown 2006.

recently estimated the amount of unreported logging to be as high as 75 million cubic metres per year.⁴² Domestic need for wood required 138 million cubic metres, and 35 million cubic metres were used to manufacture wood products for export to other countries.⁴³ In some instances, Chinese firms are able to take what is waste wood and re-process it into first grade material. This is apparently the case for some low-grade yellow cedar obtained from British Columbia, reprocessed, and then sold to Japan as high quality product—China's low labour cost advantage.

Rapid Growth of Timber Imports

In terms of size China's wood market—including industrial timber, pulp and paper—is now the second largest in the world, after the massive U.S. market. To cover its demand, China has imported a rapidly increasing amount of wood. From 1997 to 2005 China's total forest imports in volume (round wood equivalents – RWE) more than tripled from 40 million cubic metres to 134 million cubic metres.⁴⁴ The increasing demand for timber imports can, at least partly, be traced back to the logging ban introduced in 1998 under the National Forest Protection Program (NFPP). However, the decline in China's own production began already prior to the introduction of the logging ban and is a consequence of the depletion of natural forests over past decades.⁴⁵ In response to the reduced production capacity of natural forests and the increasing demand for wood, China doubled its timber plantations from 14 per cent of the total forest area to 28 per cent in the 1990s. China has now the largest area devoted to timber plantations of any country in the world.⁴⁶ The Chinese

plywood industry increased its capacity dramatically in the past 10 years (plywood production increased from 2.6 million cubic metres to 21.0 million cubic metres), which partly explains why China imports much larger quantities of raw logs today.

Origin of Imports

China's three largest suppliers of timber in 2003 were Russia, Indonesia and Malaysia, followed by New Zealand, Thailand, the U.S., Papua New Guinea and Myanmar. These trade statistics show that most of China's timber imports originate from countries where the forest estate is in decline and/or where forest governance is weak.

Russian Federation: In terms of volume, the most important timber supplier is the Russian Federation, with 21 million cubic metres of logs and wood-based products exported to China in 2003.⁴⁷ The aggregate demands for wood products from Japan, South Korea and China have led to serious over-logging in the southern part of the Russian Far East and Eastern Siberia with irreparable damage in logged permafrost areas, and forest fires.⁴⁸

Indonesia: China's imports from Indonesia increased gradually to reach about three million cubic metres RWE in 2003. China also imports a more rapidly increasing amount of pulp and paper from Indonesia, which reached eight million cubic metres RWE in 2002. The Indonesian pulp and paper industry has a significant overcapacity that outpaces the supply of sustainably harvested timber. The demand of the Indonesian pulp and paper industry, which consumes about 20 million cubic metres of round wood, is a major cause for illegal harvesting practices from natural forests.⁴⁹ The

42 State Forest Administration of China, Communication by Vice Minister as cited in AFP, 18 January 2006.

43 Zhu Chunquan, Rodney Taylor and Feng Guoqiang, *China's Wood Market, Trade and the Environment* (Science Press USA Inc. and WWF International, 2004).

44 Andy White, Xiufang Sun, Kerstin Canby, Jintao Xu, Christopher Barr, Eugenia Katsigris, Gary Bull, Christian Cossalter and Sten Nilsson, *China and the Global Market for Forest Products. Transforming Trade to Benefit Forests and Livelihoods*, Forest Trends, 2006, 34 pp., <<http://www.forest-trends.org/documents/publications/China%20and%20the%20Global%20Forest%20Market-Forest%20Trends.pdf>>.

45 Zhu *et al.*, 2004.

46 FAO, *State of the World's Forests* (Rome: FAO, 2003).

47 Zhu *et al.*, 2004.

48 Lebedev, A., *The Wild East – The Timber Trade between Siberia, Russian Far East and China*, Bureau for Regional Outreach Campaigns. Forest Monitor (Vladivostok: 2001); A. Kotlobay and A. Ptichnikov, *Illegal Logging in the Southern Part of the Russian Far East* (Moscow: WWF Russia, 2002).

49 C. Barr, *Profits on Paper: The Political Economy of Fibre, Finance and Debt in Indonesia's Pulp and Paper Industries* (CIFOR and WWF, 2000).

official Indonesian export statistics record a significantly lower volume of timber exported to China (20 per cent less in 2002), than recorded in China's import statistics.⁵⁰ However, the extent to which Chinese timber imports from Indonesia are from illegal sources is open to debate and requires further analysis and evaluation of current data.⁵¹ In recent years, significant amounts of wood have moved illegally from West Papua.⁵²

Malaysia: The official export statistics show only half the volume of timber imported by China from Malaysia. Some of the difference may be due to Malaysia's free ports. On the other hand there is substantial evidence that large amounts of illegally cut timber are smuggled into Malaysia from Indonesia and re-exported to China.⁵³

Increasing Timber Exports

In response to a rapidly growing demand for furniture, plywood, wood moldings and floorings, particularly in the U.S., Europe and Japan, China has in recent years become the world's largest wood workshop. Between 1997 and 2005, the U.S. increased its imports of manufactured wood products from China by almost 1,000 per cent and reached 35 per cent of China's total export value of timber products. Europe's imports from China during this period also increased dramatically, by almost 800 per cent.⁵⁴ Indeed, a very large part of the timber imported by China is used to manufacture timber products for export. The exported volume corresponds to over 70 per cent of the timber imported by China. Much of the wood is made into furniture, and some interest on the part of furniture producers is developing for certification processes, via the Forest Stewardship Council, now active in China.

Future Trends

According to White *et al.* (2006), forest product imports by China are likely to double in the next 10 years, based on an assumed six to eight per cent growth of GDP.⁵⁵ One of their key findings sug-

gests that the domestic as well as the export demand for manufactured wood products will continue to grow dramatically, at least over the medium term. The same authors emphasize that China, given its large export potential, may become increasingly vulnerable to consumer preferences, with growing environmental awareness. European countries are already drafting policies and implementing procurement procedures that require verification of legal or even independently certified origin of wood products.

Wood Product Synthesis

A number of policy recommendations have been made in the past to reduce the impact of China's increasing demand for wood products, domestically and for export. These focus on the following aspects:

- Improving the productivity of the Chinese forestry sector to reduce its reliance on imports.
- Strengthening of China's environmental protection initiatives, including through government incentives for farmers and local governments to protect and restore forests.
- Encouraging environmentally sound wood and fibre production and processing in China.
- Improving the efficiency of wood harvesting, distribution and use in China.
- Encouraging imports or purchases of wood produced legally and from well-managed forests.

In light of the growing demand for timber products globally, including China's massive manufacturing and export capacity, a number of policy recommendations are also addressed to a broader range of importing

50 Zhu *et al.*, 2004.

51 D. Brown, *Regulation, Law and Illegal Logging in Indonesia* (Jakarta: WWF-World Bank Alliance for Forest Conservation and Sustainable Use, 2002).

52 Environmental Investigation Agency (EIA), <<http://www.eia-international.org/campaigns/forests/reports/>>.

53 Zhu *et al.*, 2004.

54 White *et al.*, 2006.

55 *Ibid.*

and exporting countries.⁵⁶ Those include recommendations on procurement policies; education programs for retailers and consumers; supply chain management and certification; bilateral cooperation on illegal logging and trade; updating forest legislation and enforcement; and the promotion of small-scale forest-related livelihood.

It is quite possible that a sustainable pathway could be created by a range of Chinese and other national actions. However, it is perhaps equally possible that action will be far too slow to deal with issues such as rising international demands for cheap wood and furniture products, by the difficulties of various key timber exporting countries to control their own situation, and for Chinese domestic demand to rise dramatically, making it very difficult to put in place suitable sustainability strategies. As EU countries and others start implementing sustainable procurement policies, China likely will have to have systems in place to maintain access to such markets. Being ahead of the game may be essential if China wishes to secure a growing market presence.

Fisheries and Aquaculture

China accounted for about a third of the reported fish landings and production over the last decade, thus making it the world's largest fish producing nation in the world. Its international trade in seafood soared from about US\$1 billion to almost US\$8 billion in a decade. China is the world's largest seafood exporter, with more than two million tonnes exported at a value of US\$5.5 billion in 2003.

It should be noted, however, that China's aquaculture makes up a very sizable proportion of this

production. The surge in seafood exports is related to the increased production of farmed seafood such as shrimp, scallops, eel, tilapia and crawfish.⁵⁷ Moreover, aquaculture benefits from the huge amounts of by-catch taken by Chinese fishing fleets, and used as feed. Due to its impressive processing capacity, which increased by 50 per cent between 1996 and 2000, China takes in for processing and re-export a large part of the globally landed value of fish. This has included species of considerable conservation concern such as Patagonian toothfish (also sold as Chilean Sea Bass) from Antarctic waters. The re-exported, semi-processed fish are sent to countries such as Canada for further processing and then sold in these countries, or exported again to the U.S. or other markets under the Western country brand name. This process works particularly well for white-fleshed fish that lose their species identity, ocean of capture, and place of processing. In such a situation it is very difficult to create a good chain of custody concerning any kind of reliable sustainability assertion or certification (e.g., by the Marine Stewardship Council).

Since the late 1980s, China's own marine fishery resources have been overfished. This has been an issue the Chinese government has taken seriously. Very considerable resources have been devoted to research and the rational utilization of its marine resources. A significant number of Chinese fisheries scientists have assessed these stocks, e.g., Jin (1996); Yuan (1999); and Cheng *et al.* (2004).⁵⁸ The "Fishery Act" of 1986 was subsequently amended by an "allowable catch quota" in 2000. A moratorium on summer fishing was already previously introduced in the Bohai and Yellow Seas and extended to all of the Chinese waters in 1998. A mandatory fishing vessel buy-back program was also introduced, albeit with modest success. With the widely used trawl nets and purse seiners by-catch is very substantial and it can be expected that

⁵⁶ *Ibid.*

⁵⁷ P. Redmayne, *China: The Country That is Changing Everything*, Industry Report, IntraFish Media, 2004.

⁵⁸ Xian-shi Jin, *Ecology and Population Dynamics of Small Yellow Croaker in the Yellow Sea*, Journal of Fishery Sciences of China, 1996, 3(1):32-46; Wei-wen Yuan, *Fish Stock Assessment in South China Sea*, in Jia Xiao-ping (ed.), Symposium on Marine Fishery Research (Guangzhou: Guangdong Science and Technology Press, 1999), 82-87; Jia-hua Cheng, Lin Long-shan and Ling Jian-zhong, *Effects of Summer Close Season and Rational Utilization of Redlip Croaker Resource in the East China Sea Region*, Journal of Fishery Sciences of China, 2004, 1(6): 554-560.

fishing effort, dictated by the decreasing resource, will be greatly reduced in the coming decade.⁵⁹

A number of fisheries scientists have reported problems with Chinese fisheries data, with implications at the level of global catch statistics. Watson and Pauly (2001) demonstrated that over-reporting of catch by China (presumably to demonstrate production increases, which is important to local officials) led to substantial over-reporting of marine fish catches, creating a false perception of good health in world fisheries.⁶⁰ An additional difficulty has been reported with the privatization of the previously state-owned marine fishing enterprises and the consequences of WTO accession: the fisheries statistics system has fallen apart. Current statistics on catch are incomplete and inaccurate, which does not allow China to monitor the sustainability of its fishery resources, and therefore with consequences for the world statistics.

China's fisheries fleet did not venture much beyond its own EEZ until about 1985. Thereafter its activities began to expand, particularly around the turn of the century, and now span the world's oceans. In some cases, China cooperates with other countries in patrols to monitor these offshore fisheries, for example with the U.S. and Russia concerning drift net fisheries in the North Pacific, and with Japan and Korea in waters closer to China.

Illegal, unreported and unregulated fishing (IUU) has become a serious global problem and is a major obstacle to the achievement of sustainable world fisheries. IUU accounts for US\$4 to 9 billion in value per year, or up to 30 per cent of the global marine catch. This loss is primarily borne by developing countries that provide over 50 per cent of all internationally traded fish products.⁶¹ An important element in IUU is the open registries or "Flags of Convenience (FOCs)" for large-scale fishing vessels. Countries that operate an FOC registry cannot guarantee "a genuine link" required under the UN

Convention on the Law of the Sea (UNCLOS) between states and those authorized to fly their flags. Consequently they cannot or will not take action against fishing boats damaging the marine environment or living marine resources. Effective flag state control is equally necessary to ensure safety of life at sea, shipping standards and securing the welfare of seafarers.

Over 1,200 large-scale fishing vessels were registered to FOC countries in 2005 and the large-scale fishing vessels on the Lloyd's Register with flags listed as "unknown" has increased to 1,600 in 2004. This means that about 15 per cent of the world's fleet of large-scale fishing vessels is flying FOCs or listed as "flag unknown." A recent study⁶² analyzed information available from the Lloyd's Registry of Ships between 1999 and 2005 on fishing vessels registered to the top countries that operate FOCs. Belize, Honduras, Panama, St. Vincent and the Grenadines have topped the list of FOC countries, with the largest numbers of vessels registered to fly their flag.

Despite the fact that China is the most important fishing nation in the world, the use of FOCs by mainland Chinese companies does not seem to be common. In fact, China undertakes some fisheries patrols in international waters to police its own fleets. Among the countries where companies that own fishing vessels flagged to one of the FOC countries are based, one finds Taiwan with the largest number of vessels (142), as well as Hong Kong with 27 vessels. Members of the European Union are also frequent users of this dubious instrument which is commonly used to conceal illegal fishing.

Fisheries Synthesis

China is the country to reckon with now in world fisheries and aquaculture. It has achieved remarkable progress in terms of the

59 FAO, *Code of Conduct: Rapid Appraisal of Compliance with Article 7 – Fisheries Management* (Rome: FAO, 2005).

60 R. Watson and D. Pauly, *Systematic Distortions in World Fisheries Catch Trends*, *Nature*, 2001, 414: 534–536.

61 High Seas Task Force, *Closing the Net: Stopping Illegal Fishing on the High Seas*, Ministers of Australia, Canada, Chile, Namibia, New Zealand and the U.K., and leaders from WWF, IUCN and the Earth Institute of Columbia University, 2006.

62 M. Gianni, and W. Simpson, *The Changing Nature of High Seas Fishing: How Flags of Convenience Provide Cover for IUU*, Australian Department of Agriculture, Fisheries and Forestry; International Transport Workers' Federation; and WWF International, 2005.

range of products produced from the sea, much of which is consumed domestically. It has indicated serious intent to regulate its own fleets where they are operating within national and international waters. And it takes seriously the need for good knowledge to manage fisheries. However, the statistical information provided has sometimes been of limited value, or even counter to the real situation. Furthermore, China, by actively taking over a huge processing role for re-exported fish products, has probably further lowered the accountability of fisheries processors in other countries concerning the sustainability of their raw and semi-processed materials. Traceability appears to be difficult, at least for some common forms of seafoods such as white-fleshed fillets.

The High Seas Task Force (HSTF) on Illegal, Unreported and Unregulated (IUU) Fishing⁶³ presents a comprehensive menu of proposals to improve prospects for monitoring and action to improve the situation in world fisheries. China has not been a member of this Task Force, and is not at the present time committed to implementing the proposals. Indeed, China, along with Japan and Korea, are not among the 52 members of the UN Fish Stocks Agreement (UNFSA) that is the main guiding global governance beacon for sustainable fisheries. In light of China's vital interest in a sustainable use of the marine resources of the world, for its own long-term supply security either based on marine catch or in support of the increasingly important aquaculture, the proposals of the HSTF as well as other forms of international cooperation on these issues should be given serious consideration by China.

Energy Resources

China is now the second largest energy consumer after the U.S. Already the largest producer and

consumer of coal in the world, but now with rising demand for oil and gas, China is a key player in the world's energy markets. In 2003, China overtook Japan as the second largest oil consumer in the world.

Oil Demand

China's oil demand in 2004 stood at 6.5 million barrels per day and is projected to reach 14.2 million barrels per day by 2025. This would mean that imports would have to cover a net quantity of about 10.9 million barrels per day according to the EIA (2005).⁶⁴ A lot of attention has been given to recent investments in foreign oil assets by Chinese companies. The China National Petroleum Corporation (CNPC) acquired oil concessions in Azerbaijan, Canada, Indonesia, Iraq, Iran, Kazakhstan, Sudan and Venezuela. The China Petrochemical Corporation (Sinopec) also bought oil assets in Iran (Yadavaran) and in Canada's oil sands. The China National Offshore Corporation (CNOOC) purchased a stake in the Malacca Strait oilfield in Indonesia. However, these participations will only be able to cover a small fraction of China's projected oil demand. The country will thus remain largely dependant on imports.

Natural Gas

With the increasing concerns of the Chinese leadership about its energy supplies and the environmental advantage of using natural gas, China has in the past years invested heavily in gas infrastructure. In 2004, only about three per cent of China's energy demand could be covered by natural gas, which is projected to double by 2010. China has considerable reserves of natural gas, mainly in the western and northern provinces, estimated at 1.5 trillion cubic metres in 2005.⁶⁵ The development of these fields however requires the construction of pipelines over large distances to aliment the urban centres of the east. Imported liquefied natural gas (LNG) will primarily be used to convert existing oil-fired power plants in the southern part of the country. In Guangdong Province, six gas-

63 High Seas Task Force, 2006.

64 Energy Information Administration (EIA), *Country Analysis Brief on China*, August 2005, <<http://www.eia.doe.gov>>.

65 *Ibid.*

fired power plants of 320 MW are currently being built and an import terminal near the city of Guangdong is being built by BP.

Coal

China as the largest consumer of coal in the world has recently stepped up its coal production. In 2003 it consumed 1.53 billion tons, corresponding to 28 per cent of the world consumption. Over the long run, the proportion of coal in the energy mix of China is expected to fall; however, in absolute terms, coal consumption is still projected to continue rising. Very large numbers of coal-fired power plants are under development. With the opening of China's coal sector to foreign investment, the prospects for investment in new, and environmentally more friendly technologies has been rising. Of particular interest to Chinese authorities is the potential of coal liquefaction technology, with recent U.S. cooperation established.⁶⁶

Electricity

The early part of the new millennium saw a shortage of electricity supplies (estimated at 30 GW in 2004). As a consequence of the shortage, the Chinese government has approved a large number of new power projects (including coal-fired power plants, see above). Nuclear power generation increased from two GW to 15 GW between 2002 and 2005. An April 2006 deal with Australia to supply 20,000 tons of uranium per year should allow China to develop its nuclear capacity by adding 27 GW by 2020, and thereby quadruple the nuclear part in the energy mix (currently 2.2 per cent). China is committing US\$1 billion and the efforts of 1,000 Chinese scientists to the International Thermonuclear Experimental Reactor (ITER) located in France in the interest of building advanced science and technology capabilities for environmental protection and securing new energy sources.⁶⁷ Wind power and solar

power also are being added. China's electricity consumption is expected to grow by an average 4.3 per cent annually for the next 20 years.⁶⁸

Biofuels

China is number three in the world after Brazil and the U.S. in terms of ethanol for fuel production. Plans are for vast increases in ethanol-gasoline mixes. The four state-owned grain-based ethanol makers—China Resources Alcohol, Henan Tianguan Group, Jilin Fuel Ethanol and Anhui Fengyuan Group—together produced 720,000 tons of fuel a year in 2004 and planned to increase production to more than one million tons by the end of 2005.⁶⁹ China Resources Alcohol may build a 600 million yuan plant in Guangxi Province to distill alcohol from cassava and molasses. The biofuel capacity increase comes in response to a government direction in 2004 addressed to five provinces to include 10 per cent ethanol in their car fuel. Now such fuel mixes are available in nine provinces. The longer-term goal is for biofuel to become 10 per cent of all fuels by 2010 and 16 per cent by 2020.⁷⁰ This would mean increasing China's ethanol production by about 15 times by 2020, to a level equal to the U.S. or Brazil's current production.

China already has experienced shortages in ethanol, which raises a longer-term issue of whether ethanol might be imported, for example from Brazil. Ethanol will become a commodity on world markets, with important implications for sustainable land use in countries like Brazil. Similarly, palm oil plantations in Southeast Asia may become sources of biodiesel, possibly at the expense of the remaining rainforests in countries like Indonesia and Malaysia. It is also possible that China and EU countries will compete for any available tropical country-produced biodiesel, perhaps including sources from Africa. The EU is now discussing sustainability certification of biofuel imports, an approach that China could also consider.

66 U.S. Department of Energy, <http://www.fossil.energy.gov/international/International_Partners/China.html>.

67 *China a Major Contributor to Global Nuclear-Fusion Reactor*, China Daily, 30 November 2006.

68 Energy Information Administration (EIA), 2005.

69 Koh Chin Ling, *China Seeks Boost from Biofuels*, International Herald Tribune, 29 September 2005, <<http://www.ihf.com/articles/2005/09/29/bloomberg/sxfuel.php>>.

70 A goal indicated by the National Development and Reform Commission (source: China Daily, 6 December 2006).

There are various points of view about the use of food crops—such as corn—for fuel, including environmental and net energy gain considerations. What is clear for countries such as China, the U.S. and Brazil, is that there are two prime values—fuel security, and local rural benefits. Already, the strong stimulus of this new sector is on the price of several commodities, including wheat, corn and soy, which China purchases on international markets.⁷¹

Energy Resources Synthesis

Among various concerns about the impact of China's growth on the world's market and the global environment, its rapidly increasing energy needs probably rank highest. There exist many legitimate reasons to take these concerns seriously: China's energy needs are not only of geopolitical relevance in terms of the increasing competition over access to these resources, but also for the inflationary prices, and the security aspects that are related to it. They are equally relevant in relation to the rapidly increasing concerns over the climate change impacts of China's massive fossil fuel consumption. Moreover, it is in China's own best interest to reduce its dependence on foreign energy resources in order to guarantee a predictable development path, as envisaged by the Chinese leadership.

The conversion of energy generating systems to new environmentally beneficial technologies; the aggressive promotion of renewable energy; and much higher energy efficiency standards in all sectors of energy consumption, including building standards and low-energy transport systems, are probably the areas that could be of greatest benefit to China. Unlike other markets with global impact, such as the import of commodities from countries with insufficient natural resource management, the energy future of the country is largely in China's own hands. Energy production and consumption can be

influenced to benefit the future of its own society in parallel with a reduction of the countries dependence from foreign resources as well as a reduction of negative impacts on the global ecology. Incentives; investment; pricing; regulation and enforcement; training and education for energy conservation, and for building advanced scientific capabilities for environment and energy conservation will contribute to a sustainable energy future for China. Clearly, however, the problems of China's energy security also involve a great deal of cooperation from abroad to ensure that new technologies are made accessible in a timely way, and on reasonable terms, and to ensure that energy demands of other nations do not make it impossible for China to meet its legitimate and growing needs.

Metals

Although China currently accounts only for about four per cent of global GDP, its metal consumption is disproportionately larger, with 16 per cent of the world's consumption. China is the largest consumer of copper, iron ore, steel, tin and zinc; the second largest consumer of aluminum and lead; the third largest consumer of nickel; and the fourth largest consumer of gold. China's iron ore imports between 1990 and 2003 increased by a factor of 10. The country now consumes 35 per cent of the world's iron ore. It produces more steel than the U.S. and Japan combined.

China depends on minerals imports which reached US\$140 billion in 2004. However, China has large reserves of some minerals: 54 per cent of the world's manganese reserves; 23 per cent of the lead reserves; 22 per cent of silver reserves; 12 per cent of coal reserves; 11 per cent of vanadium reserves; and six per cent of copper reserves.⁷²

Nevertheless, commodity prices have risen to historical peaks, as global mining efforts cannot keep up with the demand of Chinese mills, building

71 *Ethanol Output has Corn Prices Popping*, China Daily, 6 December 2006.

72 Minerals Council of Australia, *Fact Sheet – The Australia China Minerals Trade*, April 2005, <http://www.minerals.org.au/___data/assets/pdf_file/8829/MCA_au-china_fact_sheet_april1.pdf#search=%22Minerals%20Council%20of%20Australia%2C%202005%20china%20mineral%20reserves%22>.

sites and car factories. According to Lin Hai, a manager at Guotai Asset Management, Chinese investment abroad has become a necessary step to ensure preemptive rights on raw materials and to keep costs low. The competition for Australian mineral resources is particularly fierce between Chinese companies, the South Korean steel maker Posco, and the Japanese companies Nippon Steel and Mitsubishi. Henry Wang from the Australian government agency Invest Australia has been cited to state that from all Chinese iron ore imports, China currently has some kind of involvement in 25 per cent of the suppliers, and it intends to increase this to 50 per cent.⁷³

The massive demand for steel caused a temporary doubling of prices which peaked in 2004 at US\$700 a ton, but prices have come down again since then. This has been seen as a consequence of stepped up steel production from Chinese producers and government efforts to slow down the real estate and construction industries. Construction accounts for 67 per cent of steel consumption according to Baosteel, the biggest Chinese steel producer.⁷⁴ With the increasing steel production in China (forecasted to reach 348 million tons in 2006), the country may soon become a net exporter of steel which would mark a drastic turnaround from the situation in 2004 when China was the biggest steel importer!

This transformation is deeply troubling to the U.S. steel industry. In July 2006, the American Iron and Steel Institute released a report called *The China Syndrome: How Subsidies and Government Intervention Created The World's Largest Steel Industry*.⁷⁵ It marked the start of a campaign to place tariffs on Chinese steel entering the U.S. on the grounds of subsidized production, worker conditions and poor environmental controls. In effect, the charge is that the U.S. industry is imperiled and 30 years of investment in environmental quality improvement will be lost in favour of low cost, unsustainably-produced steel imports.

Metals Synthesis

China's consumption of metals is more directly related to construction of infrastructure than is the case with natural resources and even fossil resources. The surge of imports and the massive increase of China's own production are largely driven by the country's rapid urbanization. As urbanization is projected to continue over the next 15 years or more, and may reach a level where 55 or even 60 per cent of the Chinese population will live in cities, a sustained high level of metals consumption will exist. China will undoubtedly try to cover this demand increasingly from its own production and participation in overseas operations.

Unlike natural resources (particularly timber or fisheries products) the origin and conditions of exploitation of mineral resources are more easily verifiable, and are thus less prone to illegal exploitation practices. Although China's huge consumption of metals may cause price reverberations on the world market, its impact on the global environment, biodiversity conservation and regional development prospects in other parts of the world is less severe than is the case with natural and fossil resources. It is also less evident, how efficiency gains could contribute to lower consumption levels by comparison to the case with fossil resources.

Recycled Materials

China is driving the waste trade in the world.⁷⁶ China's imports of paper, scrap metals, plastics, electronics and other materials are leading to significant increases in the proportion of materials re-used in the world, and are relieving the burden of local jurisdictions and industries facing demands for increased recycling. Even some of the

73 *China Hastens Quest for Metals*, International Herald Tribune, 22 September 2005.

74 *China's Demand for Steel Slows, but Mills Keep Churning*, International Herald Tribune, 20 July 2005.

75 Alan H. Price, Christopher B. Weld, D. Scott Nance and Paul Zucker, *The China Syndrome: How Subsidies and Government Intervention Created the World's Largest Steel Industry* (Wiley Rein & Fielding LLP, 2006), <<http://www.steel.org/AM/Template.cfm?Section=2006&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=15993>>.

76 *The UK's New Rubbish Dump: China*, The Guardian, 20 September 2004, <<http://www.guardian.co.uk/print/0,,5019767-110826,00.html>>.

steel from the ill-fated New York World Trade Center was sent to China for recycling. This willingness by Chinese industry to purchase recycled material is a benefit for the world, and a means for China both to generate employment and to meet shortfalls in raw material for manufacturing. But it comes with a cost.

Some of the trade is illegal under China's own laws, and some of the exported material to China, for example, electronic waste from the U.S., would not be allowed from countries that have ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. The problems of computer disassembly are considerable, with a limited number of small towns in China being converted into hazardous waste sites.⁷⁷ It has been suggested that most of the world's "high-tech trash" ends up in China, despite official bans. A recent case involved some 27 companies in eastern Canada that sent computer components in some 50 shipping containers destined to China. The amount of plastic and metal waste totalled more than 500,000 kg. These were seized at the Port of Vancouver. The companies were fined only a nominal amount by Canadian authorities and their names were not made public.⁷⁸

There are questions raised about the sanitation of some materials such as plastic bottles sent to China. And there are problems in China and elsewhere with ship-breaking, which involves many hazardous materials such as asbestos and heavy metals in electronics.⁷⁹ China has been cautious about some forms of recycled materials, for example textiles. This is a topic of active discussion on the part of the Bureau of International Recycling (BIR) which in May 2006 held its World Recycling Convention in China for the first time.⁸⁰

Recycled Materials Synthesis

China is experiencing the same double digit growth in a great variety of recycled materi-

als that it has seen for other resources. There are benefits to poor people by providing employment in China, and also to the very rich. It is said that the richest woman in China made her fortune by importing and reprocessing waste paper, developing new supply lines, and taking advantage of low-cost shipping provided by empty container ships on their return voyages. Recycling has been a means to expand sources of supply for vital commodities, meaning less pressure on forests and landscapes, and perhaps lower energy costs. It is a means for China to extend its concept of circular economy to a global level.

It is quite likely that China can lay claim to being the world leader in the import of recycled material. In addition, given its growing resource demands and focus on a circular economy, China should have a clear and direct interest in ensuring the "recyclability" of the products it produces. Environmentally smart product design and production also could help ensure Chinese access to increasingly sensitive international markets defined increasingly by "responsible producer" laws as well as by the European Union WEEE and ROHS regulations now coming into effect for e-waste products. Five or 10 years from now will China have the advanced environmental technologies to ensure that it carries out recycling in the safest, most efficient and effective ways? If so, the world, as well as China, will have benefited immensely.

Some General Conclusions about China's Market Supply Chains

Market supply chains have various junctions where important interventions could take place in order to promote sustainable consumption, production and trade. Certainly China, in its remarkably varied and very dynamic international

77 See references in Yingling Liu, *China's E-Waste Problem: Facing Up to the Challenge*, 2006, <<http://www.worldwatch.org/node/3921/print>>.

78 *27 Firms Caught Exporting Toxic Waste to China*, Victoria Times Colonist, 22 December 2006.

79 Greenpeace, <<http://www.greenpeaceweb.org/shipbreak/documents.asp>>.

80 Bureau of International Recycling, <<http://www.bir.org>>.

relationships, is already starting to re-shape conventional thinking about market economics. It could do so in relation to sustainability concerns as well, and indeed, is doing so in relation to at least some forms of recycled material imports. Much more work needs to be done in order to understand the opportunities and sustainable development needs concerning China's market supply chains. This is a relatively unexplored topic at the leading edge of environment, trade and investment. Below, a number of conclusions, organized around five main points, are offered on this subject:

- (1) China is a major commodity transformer.
 - China has rapidly become the world's largest consumer and producer of many different commodities.
 - For a number of commodities, China has made a rapid transition from being a leading net importer to becoming a net exporter, often via value-added finished products.
 - China's own consumption often does not entirely explain the increased resource demand. In the case of certain commodities (timber, some fish) China could more appropriately be seen as the "world's workshop" as opposed to the nation that uses up the world's resources.
 - Although China has an unmatched growth in terms of speed and duration, resource use is surging in many other parts of the world. Therefore its comparative advantage is a dynamic matter, and so are issues such as source and substitution potentials of raw materials.
 - A very large part of the biocapacity of China, domestic or imported, is consumed by end-users in Europe and the U.S.
- (2) China's domestic consumption is growing relatively slowly, although that may well change.
 - The per capita footprint of the Chinese population is still relatively modest, even compared to some other Asian nations. It is the speed of development and the size of its population that create the concerns.
- (3) Rapid growth in natural resource demand makes regulation of supply chains difficult.
 - China's rapid urbanization and changing lifestyles of the urban population drive most of the domestic consumption issues.
 - Concerns over China's natural and fossil fuel resources use are much more prominent than concerns over the consumption of metals or other geological resources.
 - High demand for natural resources is increasing illegal activities in countries of origin with weak governance systems, or in the global commons.
 - Supply chain analysis, declaration of origin, certification and labelling can mitigate this difficulty and will become important aspects for consumers in China's client countries.
 - The responsibility of countries exporting to China and to consumer nations importing from China to take environmentally-appropriate action cannot be overstated.
- (4) China has undertaken some very responsible sustainable development actions in dealing with international supply chains.
 - Efforts of the Chinese leadership to show responsibility for global resource use and the environment (e.g., fuel efficiency standards) are always noted and well perceived in other countries.
 - Self-sufficiency in terms of resource use, when justified on an economic and environmental basis, should remain a principle, but needs thorough, ongoing analysis.
 - Resource and energy efficiency gains and a recycling economy are not only in the best interests of China itself, but also are the most effective measures to reduce global impacts.
 - Perhaps the single most promising focus for alleviating China's global environmental impact is through the adoption and promotion of new, resource-efficient energy technologies that also reduce China's CO₂ emissions.

- Close involvement in and cooperation with international conventions (e.g., UNFCCC, CBD, CITES, UNCLOS, Fish Stocks and other marine agreements) as well as with international NGOs can increase transparency and confidence, and lead to policy change.
 - International cooperation (whether in the form of international commodity agreements, multilateral environmental or trade agreements, or “public-private supply chain initiatives”) offer key opportunities for improving the transparency and predictability of trade impacts.
- (5) International cooperation and improved Chinese research on environment and sustainable development implications of market supply chains are needed.
- Many authors regret the decreasing quality of statistical information from China, following privatization in many sectors. The general lack of high quality data does not help to support China's case of improved efforts towards a satisfactory sustainable consumption, production and trade relationships.
 - Similarly, there is a great need for improved scientific and impact information regarding the extent and severity of China's external impacts arising from market supply chains and related problems such as long distance transport of pollutants generated in China to other countries and continents, and from other impacts such as inadvertent export of invasive species through trade.

In summary, China does have a responsibility, by virtue of its importance and growing power over international supply chains, for ensuring that production is done sustainably. A sustainable view of China in the world needs to be built on more than measures adopted within its own jurisdiction. There is a special opportunity and obligation for China, in cooperation with others, to play a special role in guiding international supply chains towards sustainable practices. Indeed, it would be surprising if, in the future, the world was not looking to China for guidance on governance for international supply chains.

Case Study 2 – Trade in Illegally Produced, Harvested or Transported Materials

This subject has been introduced in sections dealing with forest products, fisheries and recycling of e-wastes, but it merits additional attention, since some of China's impacts are very substantial, and have been of concern for many years, and especially with increasing purchasing power within China. It also is important to recognize that progress has been made through concerted efforts on the part of both China and the international community on certain concerns, for example in ivory trade and on CFCs. Also, it is important to recognize the substantial number of international agreements that cover various illegally traded materials.

These international agreements include: the Convention on International Trade in Endangered Species (CITES); The Framework Convention on Biological Diversity (CBD) and the Cartagena Protocol on Biosafety; the Montreal Protocol covering CFCs; the Basel Convention, which covers movement of toxic materials; various WTO agreements; FAO Responsible Fisheries and other regional or global fisheries agreements; and phytosanitary and sanitary measures, including those designed to reduce risks associated with spreading of infectious diseases. Bioterrorism issues are also part of the picture, although this subject is not covered.

China as a Consumer of Illegally Caught Wildlife and Products

China is the largest market for illegal trade in wildlife from Southeast Asia, and also a major market from other countries such as Russia, Mongolia and India. Animals traded include snakes, pangolins, lizards, birds and turtles as well as endangered animals such as tigers, leopards, bears and wild ox. According to a study by Chinese scholars, the increased trading activity between China and Vietnam has led to the development of a trading network involving some Chinese provinces, Vietnam, some other Southeast Asian nations, Hong Kong and Macau. Wildlife from Laos, Thailand, Cambodia, Myanmar and Vietnam is first transported to border cities in Vietnam. The wildlife is then taken to the purchase stations in

the Chinese border areas and then redirected throughout the country. The insatiable demand for wildlife and products in China has caused detrimental effects in those supplying countries.

China's consumption of global wildlife has literally pushed the conservation efforts of many supplier countries into total crisis. The trade in tiger and leopard skins, bones and parts from the Indian sub-continent into Tibet and thence down to Sichuan and other markets in China, is decimating tiger populations in those countries. The increased demand for antelope meat and horns (e.g., sable antelope) from Mongolia and Russia has caused a huge upsurge of poaching in those countries. The demand for reptiles and other wildlife products from the Indochina region has wiped out much of the wildlife.

The absence of an agreement regarding the sovereignty of the Spratly Islands, which are claimed by several ASEAN countries, leads to overexploitation of resources, and a complete lack of protection of those important marine environments. Entire coral reefs are dredged up and taken to Hainan for lime, while collectors of shells, pearls and rare grouper fish have decimated other reefs. The import of live tropical fish for ornamental fish trade or exotic foods is growing fast in Hong Kong and southern China, putting pressure on reefs throughout Indonesia and Philippines and leading to some terribly destructive collecting methods such as coral blasting and cyanide fishing.

There are mechanisms being designed internationally and domestically to handle these types of marine use problems. For example, there is a marine aquarium fish certification process. Hainan has struggled to develop as an eco-province dedicated to principles of sustainable development. And China indicates that where marine boundaries are still in dispute, resources will be used but in a sustainable way. China has been a prominent and active partner in the Global Environment Facility (GEF) sponsored program called PEMSEA (Partnerships in Environmental Management for the Seas of East Asia).⁸¹ For some activities, such as marine use zoning, and shipping port clean-up,

there have been major successes within China through PEMSEA. But dealing with regional marine biodiversity protection is very difficult.

More could be done to improve transborder management of Protected Areas (PAs) and control of illegal wildlife trade routes especially on the borders China shares with Mongolia, Russia, Vietnam, Myanmar, Pakistan and North Korea.

Ozone-depleting Substances (ODS)

In 1999, the State Environmental Protection Administration (SEPA), the Ministry of Foreign Trade and Economic Cooperation (MOFTEC) and the General Administration of Customs (GAC), jointly issued a circular on the Licensing of Ozone-depleting Substances (ODS). The circular stipulates that SEPA and MOFTEC are responsible for registering companies engaging in ODS trade, and responsible for annual export and import quotas for all of China as well as individual companies. MOFTEC is also responsible for issuing ODS trade licences, while GAC is responsible for giving clearance to ODS by licences issued by MOFTEC. Also, China's Country Program on ODS Phaseout has now considered the control of production and consumption of ODS through foreign direct investment.

In some ways, China's efforts under the Montreal Protocol have been a model effort of international environmental cooperation. China has been permitted to produce and to import CFCs to 2010 as a developing country. It has been proactive in domestic efforts to produce CFC-free refrigerators, and to take other steps to eliminate use of ODS. Licensing rules were established in 1999 by three Chinese government agencies concerning ODS trade, and controls exist for production and consumption of these substances in foreign direct investment activities within China. China has taken an earlier than required commitment date of 2007 for a halt in domestic production.

But the problem of illegal trade in ozone-depleting substances involving Chinese firms has been very difficult to solve. China set out a plan to control the "Three Illegals" (production, consumption and trade) in 2004. Still, operating apparently from

81 Chua Thia-Eng, *The Dynamics of Integrated Coastal Management. Practical Applications in the Sustainable Coastal Development in East Asia* (Manila: PEMSEA, 2006), 431 pp.

only two ports, Shanghai and Ningbo, traders falsify documentation and send ODS shipments to more than a dozen countries. China is considered the main source of illegal CFCs in the world according to the Environmental Investigation Agency,⁸² a position it has held since 1998. China has been the world's largest producer and consumer of these substances. With the ending of ODS production, stockpiles in China should diminish rapidly. Yet there may well be contraband sources that could fuel continuation of this trade. Following the release of the recent EIA report, China at the 17th Montreal Protocol Meeting of the Parties "made a commitment to change their domestic export policy, take action against the smugglers and implement measures to put a stop to the black market operations."

This example illustrates the difficulties faced in eliminating a global environmental scourge, even where there is strong national and international will backed up by considerable financial expenditures from both China and international sources. Part of the problem lies with the nature of the international agreement itself, related to both licensing and tracking arrangements. For example, large discrepancies exist between export numbers from China and ODS import numbers from Indonesia.

Conclusions on Eliminating Illegal Activities

Even where mature international agreements, such as CITES, are in place, it has proved to be very difficult to eliminate all the important abuses. On some problems, such as the import of elephant ivory, there has been great progress. But many of the world's wildlife species and plants remain at high risk and with the expanding wealth in China and some other countries, the situation could get worse. Clearly there needs to be even more international cooperation, including stepped-up surveillance and enforcement for this form of trade to be stopped. But it is also a matter of public education and behavioural change that is needed within China. As long as there is a high level of demand, smuggling and other illegal acts will take place.

In the case of economic resource activities such as fisheries and timber trade, there are many opportunities for China to take more effective action under existing cooperative agreements signed with various nations such as the U.S. and Indonesia, and in the case of marine protection, through regional partnerships such as PEMSEA. It is also important that in establishing new arrangements, for example, with Latin American and African nations, and in the conduct of Chinese businesses abroad, that best practices and corporate social responsibility be exercised.

Porous borders, especially in western China, and the massive volume of trade make regulation difficult. China has tried to crack down on trade in endangered species, and on various other trade flows. The struggle to reduce and eventually eliminate ozone-depleting substances illustrates just how difficult it can be to stop a lucrative illegal activity—one that has ranked at the level of some illegal narcotics trade during the past decade. But China's role has been quite exemplary, and this is one topic where there is some cause for applause. While victory is not complete, China deserves all the recognition that it has received for a massive effort of value to all countries. It would appear from this particular effort and from some others, that action to address a serious illegal problem will take at least 10 to 15 years for substantial progress to be made. In the case of CITES, it is an ongoing problem even after three decades of implementation. There is a need to reduce this time and to seek breakthroughs.

It is hard to avoid the reality that many of the activities branded illegal are in fact not well covered under existing international legally binding agreements, or occur in countries with weak governance and enforcement regimes. Thus self-regulation by Chinese authorities, accompanied by capacity development abroad may be the most sensible route. This can involve a range of measures from well-enforced bans on some materials and sources, to environmental and sustainability certification such as the Forest Stewardship Council (FSC) certification.

82 Environmental Investigation Agency, *China Exposed as Lead Player in Global CFC Smuggling Racket as Ozone Damage Worsens*, Press Release, 13 December 2005.

Case Study 3 – Biosecurity and Biodiversity Protection

Over the past decade the world has grown smaller in many ways. One aspect is the ease with which biological problems seem to move from being local to becoming regional or even global concerns. These have many economic, health and food safety repercussions, and also affect natural ecosystems and biological diversity. The most recent example is avian influenza, which moves with ease from tropics to sub-Arctic regions and across great latitudinal distances, at least partly due to migratory waterfowl. The elaborate precautions necessary for food safety are becoming codified in drastic revisions to trade rules. Problems of alien invasive species are important for all importing and exporting nations, including China. Biodiversity protection is a matter closely aligned with climate change, and with tourism potential of nations. This case study surveys each of these topics, although not in great detail.

Animal to Human Disease Transmission and Epidemics

Zoonoses worldwide (“mad cow disease,” foot and mouth disease, swine fever, several tropical African fevers, schistosomiasis, etc.) demonstrate that disease routes between wildlife and man are of increasing significance. There is a need in China to better understand the potential pathways for infection. In addition to accurate mapping of routes and dates used by migrating birds and marine organisms, there should be a careful study of major trade routes of other wildlife products and foods and also maps of the major domestic animal trade patterns. Such basic data will prove valuable in accessing risk and also in planning controls in the event of further outbreaks of animal/human diseases.

Serious epidemics of two wildlife-related diseases, SARS and avian flu, in recent years—both accompanied by loss of human life as well as enormous financial losses due to restrictions on travel (SARS) and destruction of poultry—bring to prominence the ever-present dangers associated with movement of animals. Whether by natural migration or domestic trade, or through the dangers posed by close association between human beings and animals in conditions of less than satisfactory sanitation, the dangers are likely to be of increased concern within China

and internationally. The continued, increasing demand for wildlife foods, the breeding of wildlife for foods or medicinal use, and the close association of domestic and wild animals all pose dangers to human health. The continuing losses of adequate natural forests, wetlands and grasslands increase the degree of interaction between domestic and wild animals and add to these risks.

The idea of culling wild waterfowl has been voiced in several countries including China. The idea has many drawbacks, including: wasteful and unnecessary destruction of valuable wildlife; culling leads to atypical and accelerating dispersal patterns by surviving birds which may hasten the spread of the disease; culling may also cause a local vacuum which accelerates the immigration of new wild populations into the culling area and may also increase rather than decrease the rate of spread of the disease. Most evidence of timing of spread and direction of spread indicates that, to date, wild bird migration has played only a small part in the distribution of the disease so it is better to concentrate on the major cause, which is human trade in poultry and rearing conditions that promote fast disease spread through domestic poultry populations.

The number of humans affected by avian flu remains low, transmission rates between humans seem zero to low, maybe because the disease tucks in deep in the lungs rather than in the nose and throat from where sneezes and coughs transmit most other flu viruses. The danger is seen that further mutation of the avian flu could render it a potential pandemic disease. Thus governments, including China, are spending considerable sums of money to prepare for the possibility of this particular problem going global. China and other Asian nations will face considerable pressure in the years ahead to address weak points in the relationship of people and livestock, and possible action to address expensive, regionally and globally significant infectious disease issues. China has taken the matter seriously, closing public access to some major nature reserves on bird migratory routes (e.g., at Qinghai Lake).

Safety, Quality and Competitiveness of Food Supply Chains

If China is to maximize the potential benefits from its food chain (domestic and export markets), it

will have to generate crops, animals and foods that are of equal safety/quality to comparable goods offered in trade by its competitors. Specifically, it will have to:

- Reduce residues in animal products. Fifty per cent of China's food chain exports are aquaculture products. The limiting factor causing problems in first tier markets (U.S., Japan, EU) is chemical residues.
- Create a "Disease Free Zone (DFZ)" for foot and mouth Disease and hog cholera and use it to ship pork to first-tier markets (U.S., Japan, EU). The current idea is to use Hainan Island as a DFZ to get exports up and running from this island to create credibility in the international market, before trying to export to the first-tier markets from DFZs that China is trying to create in Sichuan, Shandong and Jilin. These latter DFZs have little credibility for international trade as they have porous borders that allow disease to spread. No meat can be exported to first-tier markets while China has diseases like those listed above. Pork is probably the next animal product that China should try to export as it has half the world's hogs and can produce at lower costs than developed country competitors.
- Improve quality in its crops (e.g., meet Japanese specifications for vegetable quality); animals (e.g., produce lean pork for Malaysia—a predominantly Muslim country with a 30 per cent Chinese minority who want pork); and food (e.g., introduce a grading system like the U.S. and Canada for all animal species, thus providing graded pork, beef, etc.).
- Safety and quality are important deterrents to China maximizing its opportunities in these post-WTO accession times. China is now the world's third largest importer of food and agriculture products and the fifth largest exporter. It is on track to becoming the third largest importer and exporter in a few years. While it only

imports and exports a small proportion of national production, national production is so large that this small proportion is still a large quantity. China now sends some aquaculture products and vegetables to first-tier markets (with ongoing residue and other quality problems!). However, less well known are its exports to second-tier markets along its borders (e.g., Mongolia and Russia), which are less demanding regarding safety and quality, but who pay second-tier prices.

- Adherence to international standards will be important for exports of food products, but also for protecting the domestic market against import competition. As the affluence of urban Chinese consumers grows, so will their demand for safety and quality assurance of food products. If this assurance comes with imported food rather than from domestic supplies, food imports will grow at the expense of domestic producers.
- The 11th Five-Year Plan commitment in this regard is stated as: "We will pool our resources to launch special campaigns to promote food safety, strictly control market access for food products, and strengthen oversight and management of the entire production and distribution process to assure the people of the safety of the food supply."

Alien Invasive Species

China may be the recipient of invasive species problems or be a contributor to their occurrence elsewhere. While the number of documented invasions coming out of China and adversely affecting other countries remains rather small, the reverse list is growing every day.

The problems faced by invasive species in China are potentially enormous and increasing. A special Web site remains dedicated to this subject as a legacy of the work of the CCICED Biodiversity Task Force,⁸³ which lists details and maps for 123 of the most serious invasive alien species in China. A book on invasive species has been published

83 China Species Information Service, <<http://www.chinabiodiversity.com/search/species/english/ealist.shtml>>.

based on this work and several international workshops have subsequently taken a deep interest in this topic.

Invasive alien species are most aggressive in colonizing degraded and dynamic ecosystems of which China is one great example. China is particularly susceptible to invasion because its range of habitats and conditions are so great that any species gaining entry into the country will probably find a suitable living habitat. The fast pace with which China is being exposed to new potential invasive species is a result of China's phenomenal growth in world trade. China is now importing raw materials from all corners of the world and many containers remain sealed until they reach destinations deep within China's territories.

A continuing lack of awareness or interest in the threat leads to complacency by local government agencies. Even botanical gardens that should know better continue to bring into China as many new species as they can out of scientific curiosity and competitive pride, but without concern as to the risks involved in such introductions.

New agricultural or forestry pests, and new fish and other aquatic species get noticed because they affect economic sectors directly but species able to invade open spaces, forest ecosystems and other wild lands pass completely unnoticed.

China is poorly equipped to tackle such problems having few taxonomists to recognize or deal with invasive species. Newly recruited and poorly trained guards stationed in the very extensive Protected Areas system are unable to spot or react to the arrival of new species. There is a need to put in place appropriate and sound sanitary and phytosanitary measures for import control at China's borders.

Existence Value of Protected Areas and Species in China

The numbers of international visitors to China grow at a spectacular pace. The publicity of the 2008 Beijing Olympics will carry over for years after the games, drawing visitors to China. China also increasingly markets its biological diversity and unique natural areas as reasons to become a tourist in remote areas of the country.

But the lure of visiting China's natural areas and growing system of protected areas is a large part of

China's attraction and the rare and famous species for which China is justly renowned all add their weight to the equation—giant panda, red panda, takin, golden monkeys, elusive tigers, alligators, dolphins and rare pheasants all have their devotees. Specialists set off in search of equally spectacular butterflies, birds, rhododendrons and other ornamental plants.

These are economic magnets that can theoretically serve China for many decades with value growing as the world offers ever fewer safe wild places to explore. But despite a huge increase in the area and number of protected areas for wildlife, and now more than 5,000 scenic sites that cover about 15 per cent of the land surface of the country, management standards and law enforcement remain so weak that wild populations continue to dwindle and the lure of the wild may not endure unless a renewed effort is placed on saving them.

Climate Change, Human Activity and Biodiversity

There can be little doubt that China and other countries with vast land and water areas will face many ecological impacts of climate change. These impacts will be costly to address, whether through adaptation or mitigation. China on its own cannot prevent climate change, nor has it been the major contributor to greenhouse gases that have accumulated since the industrial revolution. It is the impact of the rest of the world plus China that counts. However, climate change will not act in isolation. Local activities and various national development and other policies will be important, affecting ecological services and biological diversity. An example of how these factors might interact is shown in Box 4 concerning the Qinghai Plateau.

The worldwide concern for China's biodiversity and ecologically sensitive areas is part of the rationale for the Global Environment Facility's (GEF) substantial investments for protection of China's biodiversity. Also, for programs in China funded by aid organizations of the EU, and by countries such as Norway. International concern for nature conservation and sustainable use of biodiversity has drawn other organizations into China, including WWF, The World Conservation Union (IUCN) and Conservation International.

Box 4. Drying up of the Qinghai Plateau: biodiversity concerns.

Temperature has risen two degrees Celsius while rainfall has decreased by 10 per cent over recent years in this ecologically unique area of China. This has disastrous significance. The single most limiting factor on an otherwise rosy future of development is water supply. The water draining off the plateau is falling very fast. Water levels in Qinghai Lake are dropping several metres and water supply to the Upper Yellow River is severely reduced. Several explanations can be made for this. The local agencies mostly blame global warming. In fact, global warming should raise rainfall levels on the plateau so why is this not occurring? Some interesting studies and analyses are warranted. Overgrazing stems from government policies about sedentarizing; enclosing and draining various parts of ancestral rangelands; and conversion to planted grasslands using exotic seeds. The results of these factors of change are reduction of the ground vegetation; raised ground temperatures; reduced cloud, frost, dew and snow retention; increased levels of evaporation and salinization; and erosion of surface turf, leading to direct wind erosion into the sandy subsoil. Poisoning of voles and pikas leads to the spread of toxic plants, loss of turf health, loss of aeration, and water drainage that allow a higher proportion of rain/snow to penetrate into the ground and loss of secondary biodiversity—animals that use pika holes for shelter and breeding.

(Observations from Dr. John MacKinnon)

Conclusions about Biosecurity and Biodiversity Conservation

Although China is investing considerable effort in dealing with these topics, it is difficult to be highly optimistic about outcomes over the short run. China's situation is of interest to the world for reasons of both public health and conservation. The two interests are intersecting to a greater extent than ever before, but they are also coming up against entrenched economic interests as well as the problems of dealing with rural poverty. While it is possible to take steps such as setting areas off limit, carrying out culls and prohibiting the sale of wildlife for food or for other uses, it is quite another matter to create an effective enforcement approach.

A large part of China's problems with biodiversity protection can be linked to trade. It has been difficult to make CITES work well, and the rapid rise in imports and exports has created problems of invasive species. In the future, domestic and international tourism to China may create additional problems (although also certain opportunities) for biodiversity protection.

The international conservation community, and now the international public health authorities, play an important role in international perceptions about China concerning its efforts for conservation and disease control. There is a need to backstop these external communications efforts with additional research and cooperative work with Chinese experts. Almost certainly major efforts will be needed to understand more clearly the impacts of climate change on biodiversity, plant, animal and human disease vectors, and other difficult topics about which there is limited knowledge today.

Case Study 4 – Regional Environmental Impacts – River and Marine Water Issues

In November 2006, the Songhua River in northern China was contaminated by a serious spill of benzene, aniline and nitrobenzene from the Jilin Petrochemical Corporation, in Jilin Province. The contamination plume flowed past the city of Harbin, and eventually affected the large Heilongjiang River, a natural boundary with

Russia (the Amur River within Russia), eventually discharging into Russian coastal waters of the Sea of Okhotsk.⁸⁴ This event led to a temporary shut-down of the drinking water supply for several million people, and raised public and diplomatic concerns on both sides of the Sino-Russian border.

The event has now passed into environmental history, but it has become a significant turning point for Chinese authorities and perhaps for the Chinese people, in terms of domestic and international disclosure and in developing emergency responses to environmental incidents. In the Songhua incident, full details did not emerge until days after the event, and there was clearly a lack of preparedness. However action, once initiated was swift, punitive to officials involved and conciliatory towards its important neighbour, Russia. Fortunately, the health impacts appear to have been minimized in both countries, and ecological effects are being carefully monitored in the incident. But the event highlighted what is clearly a significant problem for China—cross-border impacts in waterways arising from river use, including marine and coastal effects.

China does not have robust regional agreements on environment and development like those that exist between some European nations, for example, concerning the Rhine; or institutional arrangements like the International Joint Commission (IJC) between Canada and the U.S., which addresses various air pollution and water issues. The Mekong River, with headwaters in western China, is a natural starting point. Lower basin cooperation is long-standing among countries such as Cambodia, Vietnam and Thailand, and there has been some level of overall cooperation since 1992 via the Greater Mekong Subregion (GMS) agreement. However it is only since 2005 that GMS officials, including China, have been meeting on environment and development matters.⁸⁵

On ocean and coastal management, China is an active member of PEMSEA (Partnerships in Environmental Management for the Seas of East Asia), a successful regional initiative to improve integrated coastal management. A prime example of China's commitment is its work with others on the Bohai Sea Environmental Project. The objective of the project is to develop effective collaborative actions among adjacent provinces and municipalities to reduce waste discharges and to address environmental problems across the administrative boundaries.⁸⁶

This case explores the problems of water use in China at their source, and some of the regional implications. The key current water quality issue above all others is the massive non-point source pollution created by heavy use of agricultural chemicals. However, this problem is interactive with others such as untreated industrial and household sewage. Also of growing significance is the interaction between airborne pollutants and water quality. Emissions of nitrous and nitric oxides from coal burning, automobiles and other sources are deposited as acid rain or by dry deposition to the China Sea, forming about a third of marine pollution. The case study, prepared by Prof. David Norse of the University of London, and drawing upon work by CCICED and others, considers potential outcomes to 2020.⁸⁷

Land-based Sources of Marine Pollution

The Global International Waters Assessment (GIWA) project identified agricultural development and economic growth as the most significant cause of transboundary pollution (TBP).⁸⁸ China is not an exception to this conclusion. The dominant pathway for waterborne TBP is river runoff into the East and South China Seas (about 60 per cent of China's annual runoff). It is China's largest

84 UNEP, *The Songhua River Spill, December 2005. Field Mission Report* (Nairobi: UNEP, 2005), 26 pp., <http://www.uneptie.org/PC/apell/disasters/china_harbin/unepmr.pdf>.

85 Greater Mekong Subregion Economic Cooperation Program, *GMS Environment Ministers Meeting, Senior Officials Meeting, Highlights of Discussions*, 24 May 2005, <<http://www.asiandevbank.org/Documents/Events/2005/GMS-Environment-Ministers-Meeting/sommeeting-minutes.pdf>>; *ADB to Hold Environment Ministerial Meeting of Greater Mekong Subregion in Shanghai*, Peoples Daily Online, 17 May 2005.

86 PEMSEA, <http://www.pemsea.org/abt%20pemsea/sites/demo_hotstpt_bohai.htm>.

87 The full case study is available from CCICED, David Norse, *Direct Physical Transboundary Effects of Economic Growth – Downstream Effects on Water Quality and Flow*, 2006, 24 pp.

88 UNEP, *Challenges in International Waters – Regional Assessments in a Global Context. Final Report of the Global International Waters Assessment (GIWA)*, (Nairobi: UNEP, 2006), 150 pp.

contribution to TBP of international waters and has become a major issue during the past 10 to 15 years. Lesser pathways of such pollution are to India (17 per cent), the Russian Federation (six per cent) and Myanmar (four per cent). The main pollutants are fertilizer and pesticide residues from crop production; nitrogen and phosphate from livestock and domestic wastes; and heavy metals and persistent organic pollutants (POPs) in industrial effluents.

Looking ahead to 2020, it seems likely that TBP from agriculture in China will increase, that from the domestic sector it will stabilize and industry's contribution will decline. Nitrogen and phosphate from crop and livestock production will continue to be the major concern, primarily through their impact on eutrophication and the incidence of red tides in the China Sea. On the other hand, structural change in the economy will lead to a further decline in the heavy industries of the primary sector, greater technical sophistication in the secondary sector, and growth of the tertiary sector. These structural changes will be associated with or paralleled by greater investment in pollution control and stricter enforcement of environmental standards.

It can be questioned whether much of the TBP is a direct effect of economic growth. There is no doubt that economic growth is the driver for many of the activities whose residues and discharges are the cause of the pollution that is carried out of China in river runoff. However, where there are cost-effective mechanisms for pollution control, which is commonly the case, one could argue that the causes of TBP are policy and institutional weaknesses rather than economic growth *per se*. Similar arguments can be made regarding TBP arising from industrial accidents (e.g., the Songhua incident) that are the result of institutional weaknesses.

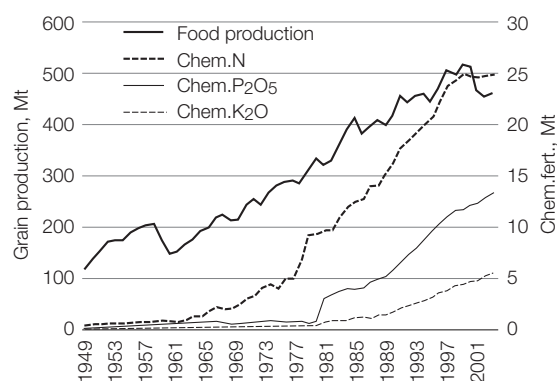
Initially, the main pathway was the outflow from the Yangtze (Changjiang), Yellow (Huanghe) Pearl (Zhujiang) and Red Rivers that drain the main crop production areas, but rapid urbanization and industrialization have led to coastal areas becoming an important source of TBP. In the 1970s and 1980s, the main pollutant was dissolved inorganic

nitrogen (DIN) from agriculture, and this remains important. POPs and heavy metals from agriculture and industry are of growing concern. Also of concern now is the expansion of coastal aquaculture, another large DIN source. The chief consequences of this TBP are eutrophication of coastal waters, which is the cause of the rapidly rising frequency of algal blooms (red tides), and the accumulation of POPs and heavy metals in marine ecosystems and commercially exploited fish.

River Outflow

The Changjiang, Huanghe and Zhujiang Rivers account for about 55 per cent of China's annual runoff and at least 25 per cent of the world's anthropogenic inputs of DIN into marine ecosystems. Prior to the 1980s, the DIN concentrations were relatively low but doubled during the 1980s.⁸⁹ This increase is related to the rapid rise in nitrogen fertilizer for grain production from about 1978 onwards (Figure 2). A positive correlation was established between nitrogen fertilizer use in the Changjiang River basin and the DIN levels in the river for the period 1980–1989.⁹⁰

Figure 2. Grain production and chemical fertilizer use in China from 1949 to 2002.



A similar, but less clear, correlation was observed for the Huanghe and Zhujiang Rivers. Increased nitrogen fertilizer was not the only driver for the higher DIN concentrations. During the same

89 J. Zhang *et al.*, *Chemical Trend of National Rivers in China: Huanghe and Changjiang*, *Ambio*, 2005, 24: 274–278.

90 D. Shuiwang, Z. Shen and H. Hongyu, *Transport of Dissolved Nitrogen from the Major Rivers to Estuaries in China*, *Nutrient Cycling in Agroecosystems*, 2000, 57: 13–22.

Table 2. Nitrogen inputs and exports to major rivers and coastal waters and the percentages of N coming from agriculture.

River (Country)	N inputs to rivers		N exports to coastal waters	
	Annual input kg N km ⁻²	From agriculture %	Annual export kg N km ⁻²	From agriculture %
Mississippi (USA)	7,489	89	597	63
Amazon (Brazil)	3,034	17	692	6
Nile (Egypt)	3,601	67	268	37
Zaire (Zaire)	3,427	18	632	9
Zambezi (Zambia, Zimbabwe and Mozambique)	3,175	47	330	25
Rhine (Germany)	13,941	77	2,795	49
Po (Italy)	9,060	81	1,841	56
Ganges (India)	9,366	81	1,269	55
Changjiang (China)	11,823	92	2,237	83
Huanghe (China)	5,159	88	214	24

Source: adapted from G. van Drecht, A.F. Bouwmann, J.M. Knoop, and C.R. Meinardi. 2001. Global Pollution of Surface Waters from Point and Nonpoint Sources of Nitrogen. *The Scientific World*. 1(S2): 632-641.

period there was a significant increase in industrial and domestic wastewater discharges in the Changjiang river basin—they increased by over 10 per cent during this period.

These trends have continued. There are no readily available analyses specifically for China but a global study using data from the mid-1990s confirms the seriousness of the situation.⁹¹ The Changjiang River is estimated to be the largest source of transboundary anthropogenic nitrogen in the developing world (Table 2) with some 83 per cent of the nitrogen exports to coastal waters coming from agriculture, and only eight per cent from domestic sewage. However, for the heavily urbanized Huanghe River basin, the dominant source of nitrogen is estimated to be domestic sewage (59 per cent).

Industrial fertilizers and domestic sewage are not the only source of DIN. Income growth over the past 10–20 years has led to greatly increased demand for livestock products, fish and shellfish, which, in turn, has driven the development of intensive livestock and aquaculture operations. The output of these operations has doubled over

the past 10 years or so and they generate wastes with high DIN concentrations. The waste discharges from intensive livestock operations are seldom controlled and those from aquaculture are virtually impossible to control.

The issue is that these estuarine inputs do not stay within territorial waters. The plumes of DIN and sediments carrying heavy metals and other pollutants can stretch out several hundred kilometres from the coastline. The Yangtze River effluent plume, for example, may travel some 300–400 km from the river mouth and spread over some 80,000–90,000 square kilometres of ocean.⁹²

Coastal Inputs

Much of China's economic growth has been centred on the Pearl and Yangtze River deltas and the coast of the Bohai Sea. The Pearl River delta contains several large cities, including Dongguan, Foshan, Guangzhou, Huizhou, Jiangmen, Shenzhen and Zhongshan with substantial discharges of untreated domestic and industrial wastes.⁹³ DDT concentrations in sediments in the Pearl River delta are high although its use was

91 G. van Drecht, A.F. Bouwmann, J.M. Knoop, and C.R. Meinardi, *Global Pollution of Surface Waters from Point and Nonpoint Sources of Nitrogen*, *The Scientific World*, 2001, 1(S2): 632–641.

92 J. Qu, Z. Xu, Q. Long, L. Wang, X. Shen, J. Zhang and Y. Cai, *Global International Waters Assessment East China Seas: GIWA Regional Assessment 36*, University of Kalmar on behalf of UNEP, 2005.

93 K.W. Chau, *Characterization of Transboundary POP Contamination in Aquatic Ecosystems of Pearl River Delta*, *Marine Pollution Bulletin*, 2005, 51: 960–965.

banned in 1983. The concentrations of most other POPs, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) are less serious but still may be transported into international waters where they may bioaccumulate. The situation appears somewhat better in the Yangtze River delta with higher levels of investment in wastewater treatment in and around Shanghai.

The problems on these coastal zones include: microbial pollution adjacent to heavily populated coastal areas, and particularly where the growth of urbanization outpaces investment in sewage treatment facilities; development of pollution hotspots close to point sources like major industrial or urban wastewater outfalls; and pollution and other problems arising from excessive density of China's, burgeoning aquaculture operations.

Marine Impacts of River and Coastal Inputs of Pollutants

The most serious and geographically extensive impacts arise when the increased nitrogen and phosphate levels in seawater stemming from the river and coastal inputs cause eutrophication. The latter arises when the increased nutrient inputs stimulate excessive plant growth, disrupt the ecosystem and create oxygen-depleted zones. This happens not only in semi-enclosed seas like the Bohai Sea but also in the open waters of the China Sea that are important international fishing grounds for North and South Korea, and Japan. This TBP-induced eutrophication is most evident in the major increase in the incidence of red tides (algal blooms). These occurred about 10 times per year in the 1960s and affected relatively small areas. Their frequency and extent have grown appreciably since then. They now occur about 100 times per year and affect around 15,000 sq. km of ocean, with the East China Sea being the most badly hit.⁹⁴ Some of the algae (dinoflagellate plankton) release toxins that can kill fish and contaminate shellfish such that they become poisonous to humans. The economic losses from red

tides in 2001 were estimated to be about one billion RMB⁹⁵ but can be as much as three million RMB in a single incident.

Another important impact is on fisheries productivity and particularly on the health of spawning grounds that are vital to the maintenance of fish stocks. This damage to spawning grounds is the result of POPs and polycyclic aromatic hydrocarbons (PAHs). According to SEPA, about half of China's offshore seawater is polluted to the point where the marine environment is damaged.

These TBP impacts are globally significant. The South China Sea, for example, accounts for about 10 per cent of the world's catch from capture fisheries, and more than 50 per cent of shrimp and other aquaculture products.

Prospects to 2020

TBP from agriculture is strongly related to the overuse of nitrogen fertilizer and the expansion of the livestock sector. The problem is well-studied.⁹⁶ Given current policies and technologies, nitrogen and phosphate fertilizer use will continue to grow, as will the flow of nitrogen and phosphorous into the China Sea, thereby intensifying the red tide problem. By 2020, all of the major river basins will be have a serious nitrogen surplus.

The fertilizer problem will be compounded by the growth in livestock wastes. In 2002, the total amount of organic waste from livestock was already four times greater than that from industry. Income growth will continue to drive the demand for livestock products, such that livestock populations will grow two to four-fold by 2020. A significant proportion of this increased livestock production will be based on imported feed grains (mainly soybean and maize) which will favour expanded production in the coastal zone that

94 State Oceanic Administration, *Marine Environmental Quality Bulletin*, 2005, as quoted in *China Daily*, 13 March 2006, <<http://www.china.org.cn/english/environment/161297.htm>>; see also, China Institute for Marine Affairs, *Report of the Legislative Framework of Environmental Management of Bohai Sea Area*, State Oceanic Administration and PEMSEA, 2005.

95 State Oceanic Administration, *Marine Environmental Quality* (Beijing: SOA, 2002).

96 See, for example, the *2006 Special Issue on Aquatic Ecosystems of China: Concerns, Technologies and Management*, *Aquatic Ecosystem Health and Management*, 9(1).

close to ports along the China Sea. Given the coastal zone already has a serious nitrogen surplus because of the overuse of nitrogen fertilizer on crops, further expansion of livestock production in this zone will intensify the TBP problem. A number of factors may ameliorate this situation. For example, there are discussions about using planning laws to discourage or even relocate intensive livestock enterprises in peri-urban areas and the coastal zone. Large-scale units improve the economics of pollution control and make it easier to monitor compliance with environmental regulations. Nonetheless, the introduction of these possibilities face substantial financial, institutional and technological constraints and hence there may be little progress in the next 10 years or so.

The situation regarding domestic and industrial wastes and their contribution to TBP is more promising. It seems unlikely that there will be any slowdown in the rapid urbanization of the coastal zone, but in recent years there has been substantial investment in waste treatment facilities. For example, over 80 per cent of the industrial wastewater in the major cities of the Pearl River delta is now treated. Wastewater treatment rates will continue to improve and the quality standards will continue to be tightened.

Shared River Basins

Major rivers flow from China into Bhutan, India, Laos, Myanmar, the Russian Federation, Thailand and Vietnam (Table 3). Long-run transboundary

pollution carried by these rivers is generally less serious than the marine pollution stemming from land-based source, although short-term accidents, such as the Songhua incident in November 2005, can be of major concern.

China is the source of major rivers that are important to the water supply of its neighbouring countries (Table 2). As yet there have been no major transboundary impacts that can be related to economic growth. There are concerns that over the next 10–20 years, dam building in China on international rivers could have impacts in neighbouring countries by reducing dry season water flows. For example, there are plans (currently blocked by Premier Wen Jiabao) to erect 13 or more large hydropower dams on the Nujiang/Salween River that would restrict flows into Thailand and Myanmar. Similarly, there are plans for dam construction in Yunnan on the Lancang/Upper Mekong that would have similar impacts in Laos and Myanmar.

The water quality issues relate mainly to POPs, particularly pesticides, and industrial chemicals, PCBs and hexachlorobenzene, and PAHs formed by the combustion of organic compounds. The danger to the environment arises from their stability and the fact that many of them can accumulate up the food chain. However, although pollution from these organic chemicals and from the non-point pollution from nitrogen and phosphate fertilizer discussed above is a serious problem within China, it tends not to be a problem within the territories of the neighbouring countries. This is because (1) the rivers commonly originate in Chinese provinces or parts thereof which are not heavily developed, e.g., Tibet and Yunnan; and (2) any

Table 3. Major rivers flowing from China to neighbouring countries.

River	Destination	Mean annual flow into neighbour (km ³)	% of neighbour's total runoff
Suifen, Songhua and Amur	Russian Federation	119	n.a.
Yarlung Zangbo (Brahmaputra)	India & Bhutan	165–347	9–19
Miscellaneous rivers in south and west Tibet	India	182	n.a.
Nujiang (Salween)	Myanmar & Thailand	69	n.a.
Lancang/Upper Mekong	Laos & Myanmar	74	38 for Laos 3 for Myanmar
Yuanjiang (Red)	Vietnam	48	5
Rivers in west Yunnan	Myanmar	31	n.a.

pollutants from China are substantially diluted by river flows from within the neighbouring countries.

These two ameliorating factors also apply to TBP arising from industrial accidents, as with the incident at Jilin, Helongjiang Province in November 2005 when some 100 tonnes of benzene, nitrobenzene and other compounds were released into the Songhua River. At the time it was thought that the spill would cause serious TBP, but natural dilution and the construction of a diversion dam prevented appreciable flows of polluted water into Russia.

Prospects to 2020

There are three possible developments to consider. First, what is the likely impact of climate change on any of the rivers, but especially the rivers rising in the Tibetan-Qinghai Plateau? This is a major concern for China and downstream countries. It is a separate and complex topic from those discussed in this case study, but will be of potential significance. Second, will agricultural development in Tibet and Yunnan lead to greater flows of nitrogen, phosphorous and pesticides from crop and livestock production? The answer is probably no because these provinces have no appreciable comparative advantage. Third, is the discharge of industrial pollutants, or their loss through accidents, likely to increase on international rivers? Again the answer is probably no. The government of China is supporting the provinces of northeast China in their efforts to modernize their industrial base, and it is not unreasonable to expect progressive improvements in the application of pollution control legislation, particularly after the Jilin accident affecting the Songhua River.

Conclusions about China's Regional Transboundary Water Issues

The future of China's relations with its bordering neighbours will certainly be more focused on environmental matters than in the past. There are various mechanisms by which this may happen, but

the institutional framework for regional environmental protection is still very weak—lagging behind both the need, and also the level of sophistication that might be expected of such relationships today.

The mix of pollutants and the varied sources also present a major problem. Cleaning up industrial and urban sewage will help, but the prime problems are related to agriculture and, to some extent, aquaculture. In addition, the pollution-loading of rivers and coastal waters will be affected by air-borne sources, including cars and trucks. Given the continued rapid economic development within China, downstream and coastal impacts seem likely to worsen over the short term.

Specifically, most of the environmental actions taken under the 11th Five-Year Plan will not have a great deal of impact on the main cause of TBP, which is agriculture. Without additional actions to control water pollution from the overuse of chemical fertilizers for crop production and poor livestock management, the discharges of N and P into coastal waters will rise.

In the longer term, between 2010 and 2020, there is more hope, as the numerous initiatives being taken by China to improve water quality achieve success. However, even with effective management of today's problems, there still loom the uncertainties of water flow associated with climate change, and with the extensive water engineering underway or proposed by Chinese authorities.

Finally, it is worth noting that within China there is considerable debate about the best means for integrated river basin management, and also concerning ecological compensation—payments for environmental services safeguarded by upstream users. At present, these debates are within China, and certainly do not contemplate any extension to ocean impacts, or to downstream situations affecting other nations. The TBP of international waters is, of course, not unique to China within the region, and its significance is a problem for all the nations draining into the China Sea. Greater regional collaboration is therefore required to find satisfactory solutions. China's efforts will be a key to making such collaboration successful.

Case Study 5 – Learning From and Sharing Environmental Experience

It is difficult to summarize the range of international contacts and initiatives China has developed on environment and development. These extend back to the time of the 1972 Stockholm Environment Conference, which China attended. Two leading veterans of that time, Maurice Strong and Qu Geping, are still active participants in China's Environment and Development.⁹⁷ The most active period in China's efforts started in 1992 and continues today. It can be argued that China gained more than virtually any other nation at the Rio Earth Summit, since it almost immediately developed a comprehensive China Agenda 21, which has helped to make sustainable development become a well-embedded approach within central agencies of government. At the 2002 Johannesburg Summit, China was an active participant, with well-formulated views on many subjects.

Just as China gained from its international contact and cooperation, it might now be expected that China should be in a position to share its own rapidly developing experience on environment and development with others. And China will increasingly become an active and key participant in international environmental negotiations and processes.

China has indeed been increasing engagement with developing countries, including in Africa, offering a mixture of aid, trade and investment— incentives to build political alliances. This sharing with very poorer countries is not be entirely altruistic, since China, like many other nations, is interested in building trade and access to resources, and finding others who might share common positions in international decision-making circles. Most importantly, China now has the wealth to become influential as a development assistance donor (see Box 5) and as an active participant in business joint ventures abroad.

Box 5. China as a responsible stakeholder in the international system?

China is increasingly aware of its growing profile as a major development player and the increased scrutiny of international opinion, and is making efforts to be a responsible stakeholder in the global system. China's leaders have shown that they are keen to engage in development assistance.

For example, China is beginning to contribute to multilateral mechanisms and disaster relief. Particularly noteworthy were contributions of US\$50 million to the replenishment of the African Development Fund; US\$30 million to the Asian Development Fund plus US\$20 million to the Asian Development Bank to create the "China special fund for poverty reduction and regional cooperation"; and US\$25 million to the reconstruction of Iraq. China responded very quickly to the tsunami in the Indian Ocean, pledging US\$63 million in financial assistance and contributing medical and other personnel to the relief effort. China was one of the first countries to act after the Kashmir earthquake, pledging US\$5 million and sending a search and rescue team within the first 48 hours. China also has started to participate in Consultative Groups, such as the one for Vietnam, and it has joined donor coordination groups in Kenya and Tanzania.

⁹⁷ Qu Geping went on to become China's first environment administrator, and continues to be influential as a senior statesman on this subject within China, including serving as a Vice-Chair of the CCICED. Maurice Strong maintains a residence in China. In 2004 the two reviewed the long path and changing attitudes on environment during a gathering arranged by SEPA (see China Daily, 29 March 2004, <<http://china.org.cn/english/environment/91507.htm>>).

Advice and Assistance to China

China has received environmental advice and/or assistance from the World Bank and from the United Nations Development Programme (UNDP), as well as from various bilateral donor organizations and the European Union. There have also been joint activities with government environment organizations such as the U.S. Environmental Protection Agency (EPA) and Environment Canada; the United Nations Environment Programme (UNEP) and other UN bodies; as well as with international organizations such as the Ford Foundation; World Wide Fund for Nature (WWF); the Natural Resources Defense Council (NDRC); World Watch Institute; and research bodies such as the International Development Research Centre (IDRC); the World Business Council on Sustainable Development (WBCSD); the World Resources Institute (WRI); and the International Institute for Sustainable Development (IISD); plus many academic bodies, including Harvard University. There are long-standing international cooperation activities throughout China on watershed management, various urban environmental infrastructure initiatives, etc. As well, there are many scientific joint ventures and exchanges, often arranged through national academies. In recent years China has begun to actively engage with the OECD on environmental matters.

These international efforts can be classified into several categories, including those related to policy development; capacity building and human resource development; technical and operational improvement; scientific research and development; and various reviews aimed at performance assessment and improvement. As well, there are many important transfers of experience taking place through the private sector. It is beyond the scope of this paper to consider the wide range of technology transfers underway, and the accompanying difficulties associated with intellectual property rights, and other terms under which modern technology is developed or brought into China. The role of the international private sector is exceedingly important in virtually every major

field related to industrial production and to environmental technology applications in transportation, urbanization and some resource sectors. There is likely to be more international private sector involvement in some of China's environmental technology R&D, for example in most energy applications such as coal gasification and in carbon dioxide emissions reduction.

CCICED – A Unique Policy Advisory Body

In 1992, when China was beginning to implement the results of the Earth Summit, and to design its domestic environmental laws, it started an organization which is not like any in other countries. The State Council (China's cabinet) saw a need for an advisory body from which it could draw reliable advice reflecting a combination of international and national expertise—a body that would report annually and directly to the Premier of China, and be chaired by a senior member of government, currently Zeng Peiyan, the Vice-Premier of China who acts as a spokesperson on sustainable development. The China Council for International Cooperation on Environment and Development (CCICED) members (generally about 25 Chinese and 25 international members) are invited by China to serve five-year terms. Task forces are established on topics considered of high relevance to Chinese policy-making on environment and development. These report to the Council after a year or two of work, and recommendations are forwarded to the State Council for follow-up.

The CCICED⁹⁸ has played an important role in certain topics of environment and economy, including natural resource pricing; environment and trade; and law and policy for a circular economy. It has provided guidance on policy for biodiversity conservation, energy alternatives and advanced models for use of coal such as gasification. The CCICED also helped to develop environmental aspects of approaches to sustainable rural development and sustainable urbanization. In the recent past, it has introduced concepts for ecological compensation; improved policies for river

98 In 2006 a review of the work of CCICED during the past 15 years was conducted, along with a prospective examination of China's environment and development needs over the period to 2020. This special Task Force report is available on the CCICED Web site, <<http://eng.cciced.org/cn/company/create/page2102.htm?siteid=1&lmid=2102>>. Also see CCICED, *Policy Recommendations to the Government of China on Environment and Development (1992–2005)*, (Beijing: CCICED Secretariat, 2006), 481 pp.

basin management; inter-urban sustainable transportation policies; and policies that could be introduced to strengthen a national system of environmental governance.

While there are many national and international voices competing for attention on many of these same themes, CCICED has become established as a senior voice consulted, and listened to, by China's top administrators. This is a remarkable position of trust, and one that is quite unique in the world. No other country has such a mechanism. CCICED is now entering its fourth five-year phase. Support has been provided by China and by several donors, such as Germany, the U.K., Japan, Sweden, Norway and others, with the lead being provided by the Canadian International Development Agency (CIDA). International members have included heads of organizations such as UNEP, IUCN – The World Conservation Union, WWF, as well as recognized leaders in environment and development from a variety of countries including India, the U.S. and some OECD countries.

CCICED plays to Chinese pragmatism—a desire to receive solid information with a minimum of posturing and an expectation that it will be delivered without vested interests or biases. It has been judged by China to be a success. The obvious question is why it should continue to be funded in part from external sources, since China is now at a point where it is well able to fund whatever it really wants. The best answer is probably the most obvious. CCICED is actually a partnership, and one where the benefits flow in both directions. It is a means to understand the complex dynamics of policy change in China in this field, and also to see exactly where progress is and is not being made. The CCICED provides a bigger view than can be put together by any one of the international organizations individually. China explicitly considers it of importance to be better understood abroad in terms of Chinese actions for environment and sustainable development.

Improving China's Capacity for Environment and Development

China has sought inputs concerning many aspects of its environmental initiatives, and engages in

efforts to upgrade operational capacity at all levels from national to local, and a surprising range of institutions. For example, the Central Party School, which has a capacity to reach out to some 2,500 locations across the country from the national to county levels, is introducing environment and sustainable development into its leadership training for Communist Party cadres. In the process of doing so, the Central Party School is seeking to learn from various countries' experiences and teaching methods for these topics.

Environmental governance is a topic of particular interest to SEPA and others. This topic has been examined as part of an overall OECD review of China's governance.⁹⁹ China also requested that OECD review environmental governance using the approach followed every half decade for OECD nations. The result was some 51 recommendations that are now under consideration by China.¹⁰⁰ The point here is that China is under no international compulsion to undertake this type of assessment, but it desires to do so, not only for providing operational suggestions, but also to provide benchmarking consistent with international assessments conducted elsewhere.

China has made great strides in legislative and regulatory reform and innovation, drawing on international best practice. For example, China's Water Law—which was revised in 2002 with assistance from the U.K.—is widely considered to be among the most advanced of its kind. Many recently enacted or promulgated special laws—including the EIA Law; the Cleaner Production Law; the Renewable Energy Law; new legislation on the Management of Protected Areas; and the Circular Economy Law (which is being drafted)—have explicitly drawn on international expertise and experience. They clearly signal the importance of environmental protection, and have helped to close some important loopholes. As a result, a strong legal and regulatory framework is now in place to support achievement of environmental objectives.

Another effort that appears to be quite successful has been the introduction of UNEP's "cleaner production" approach into Chinese industry. This has

99 OECD, *China in the Global Economy: Governance in China* (Paris: OECD, 2005).

100 OECD, *Environmental Performance Review of China. Conclusions and Recommendations (Final)*, (Paris: OECD, 2006), 12 pp. The Main Report is due to be released in February 2007.

been accomplished with the assistance of various donors, and involved the establishment of both sectoral and regional initiatives.¹⁰¹ Since 2003 there has been a Cleaner Production Promotion Law in China. A number of sectors including chemicals, breweries, eco-industrial parks, pulp and paper, and textiles have participated. The presence of Cleaner Production Centres in a number of provinces provided beachheads during the mid- and late-1990s for introducing basic pollution control concepts. This has been followed up with other ideas derived from international experience, including ISO 14001 certification, and now a wide variety of other domestic and international efforts, including those associated with multinational firms involved through foreign direct investment in China's industrial base.

Chinese officials and experts have been active participants in international learning and lesson-sharing on the use of economic instruments for environmental management,¹⁰² and indeed China has made significant progress in this regard. The recently revised Pollution Levy System (PLS) is one of the most comprehensive in the world. The introduction of Total Emission Control, and the implementation of the Emission Permit System, provided the basis for experimentation with emissions trading schemes.¹⁰³ The Chinese government has fully embraced the concept of charging of tariffs for cost recovery and has formally adopted the polluter-pays principle.

A Task Force on Environmental Pricing and Taxation was set up under the CCICED in 2002 in response to growing recognition at the centre of government that environmental policy can make more use of fiscal instruments. Where resource scarcity is a growing problem (e.g., water), there has been a shift towards greater consideration of pricing as a powerful demand management tool (as opposed to traditional supply side solutions).

Recent trends show improved utility pricing policies in terms of purely financial performance—while not explicitly for environmental purposes, the resulting improvements in resource use efficiency are clearly consistent with environmental objectives. Ongoing discussions about an eventual fuel tax also provide a unique opportunity for addressing externality issues related to fuel use.

On the public expenditure side, there has also been significant progress. There has been a steady increase in environmentally-related public expenditures over the past decade. During the period 1998–2002, 38 per cent of total public long-term debt was invested in environmental protection and ecological construction projects.¹⁰⁴ The proportion of GDP spent on environmental protection has increased to 1.5 per cent for the 11th Five-Year Plan period. Most significantly, an Environmental Fiscal Expenditure Account will be set up in 2007 under the public budget. This could be a major step forward in terms of improving the efficiency of public spending on environmental protection at the national level. This focus on a comprehensive approach to environmental economics has come about, in large measure, through international inputs to the government, and from the adaptation to Chinese conditions of practices developed largely in OECD countries.

It should be clear from this brief overview of learning from overseas experience that China believes in learning from the best international experience and then adapting that experience to Chinese circumstances rather than directly adopting it. And there is no doubt that this is a wise approach. For example, rather than stopping at recycling, which is the mantra of countries such as Canada and the U.S., China has gone further, taking the broader concept of a circular economy, borrowed and adapted from Japan and Germany. Indeed it is difficult to suggest to China that there

101 Cleaner Production in China, <http://www.chinacp.com/eng/cpdonors/cp_unep.html>.

102 Chinese officials from the State Taxation Administration, the Ministry of Finance and SEPA have been engaged in a long-term dialogue with the OECD on Environmental Taxation since 1996. The CCICED Task Force on Environmental Pricing and Taxation (previously the Working Group on Environmental Economics) has been another important vehicle for lesson-learning in this area.

103 The year 2002 saw the official launch of emissions trading demonstration activities, covering seven provinces (municipalities) and one business conglomerate.

104 Including: urban environmental infrastructure, protecting the “three lakes, three rivers,” the Sloping Land Conversion Program, etc.

Box 6. Lessons from Japan's experience.

Japan embarked upon a massive industrialization and reconstruction program in the 1950s, and soon faced problems of the type confronting China today on how to reconcile economic growth with environmental protection. Following catastrophic human health impacts of industrial pollution in the 1960s and 1970s, Japan dramatically improved the environment while undergoing a sustained period of rapid economic growth. While problems remain, Japan's experience offers much guidance on actions that can be successful within a fairly short time.

The successful actions include the system of voluntary agreements; the role of the industrial pollution control managers who are nationally certified and legally mandated for major industrial sites; improved energy and water pricing policies; and various technical and policy support mechanisms for small business and local governments.

In terms of environmental legislation, regulations and institutions, or indeed standards, Japan is not particularly unique, and indeed its formal mechanisms are largely matched by China. The distinguishing characteristic of Japan's environmental performance is its *implementation* record on environmental regulations and standards—possibly the key issue in China. It is here that China has the most to learn from Japanese experience, but the implications are that the responsibility for change goes well beyond the mandate of environmental agencies such as the Japanese Environment Ministry, or the Chinese SEPA, and involves much more profound societal issues.

The main lesson is that explicitly environmental management policies and actions are only part of a much bigger picture. Japan's success is to be found, not so much in formal environmental legislation enacted at the national level, but rather in the effectiveness of local agreements and action, and in the existence of such basic conditions as public awareness of environmental problems and impacts; freedom of expression including local anti-pollution protests; community participation; high level of technical education; and decentralization of decision-making.

Government and industry responded quickly and efficiently to well-informed public pressure, mobilizing institutional and financial resources to address problems, and, of major importance, minimizing corruption in the inspection, monitoring and licensing process. There was also substantial effort for technology innovation, and to ensure that private sector firms employed pollution control managers whose advice is respected. Implementation of technical improvement, sophisticated environmental investment programs and policies would have been much less effective if these fundamental conditions were not in place.

There have been ongoing positive impacts from these earlier efforts. Japanese industry leads the world in terms of energy efficiency; auto companies are world leaders in producing hybrid cars; and there has been complementary action in transportation and for the circular economy.

But there are a number of areas where Japan's environmental policies do not constitute a model that should be followed by China, for example: Japan's early "grow now, clean up later" policy; its slowness in adopting economic instruments for pollution control and parallel subsidization of industrial environmental investment; and Japan's environmental record abroad of industrial, forestry and international fishery operations.

Source: J. Warford. *Environmental Management Experience in Japan – Relevance to China*. Background Paper available from CCICED.

is any single country that offers a perfect parallel situation or model. Perhaps the one that comes closest is Japan, in part because it was able to transition rapidly to a resource-efficient, circular economy at a time of rapid economic activity (see Box 6.) But even in this case, at least part of the learning is what to avoid, since a part of Japan's success was achieved at the expense of exporting dirty industries to countries outside of Japan, and by exploiting the forests of others while making Japan the country with the greatest proportion of its land under forest cover.

China's Development Cooperation with Africa

In November 2006, China drew 48 countries of Africa to Beijing, including many national leaders, in order to express its interest in Sino-African relationships, including development cooperation and trade. The point is repeatedly made by international media and analysts that China has strong vested interests in both finding new markets, and in securing reliable sources of energy and other resources, and therefore Africa is a highly attractive region. But there can be little doubt that China could radically revise development cooperation by its larger presence in Africa. It has pledged over US\$10 billion in low interest loans and debt relief over the coming two years to poor countries in Africa, Latin America and Asia.¹⁰⁵ The level of development assistance commitment in Africa by China is such that it will exceed that of the World Bank on that continent,

These observations need to be set in the context of a growing economic interdependency between China and African countries (see Box 7.) Chinese trade with Africa is projected to rise from a level of US\$40 billion in 2005 to US\$100 billion by 2010. A decade ago the level was only US\$5 billion. Other features of economic and technical cooperation include: providing some US\$3 billion of preferential loans and US\$2 billion in buyer's credits; setting up a US\$5 billion China-Africa development

fund to encourage and support Chinese companies to invest in Africa; opening Chinese markets to a range of African goods tariff-free; conducting training and cross-cultural exchanges and providing technical expertise in a number of fields.

Strong complementarities exist between the Chinese and African economies:

- China's continued economic growth depends on imported energy and raw materials. Africa supplies around 28 per cent of China's imported oil. African mineral imports are critical to support continued industrial expansion. China is the world's largest consumer of copper and imports most of it from Africa. Same is true for African ferrochrome, platinum, cobalt, iron, gold and silver.¹⁰⁶
- With the exception of South Africa (manufacturing) and Mauritius (manufacturing and tourism), most African countries participate in the world economy as exporters of raw materials and soft commodities. For 27 out of 49 African countries, fewer than five products (mostly commodities) account for more than 75 per cent of exports. Crude oil accounts for 35 per cent of the continent's total exports according to OECD figures.

Overall, this increase in economic relations between China and Africa appears to be beneficial to African countries:

- China is a major contributor to African growth through trade and investment. China accounted for one third of Africa's growth (i.e., two per cent) in 2005. The private sector has been a key actor in China's engagement with Africa contributing to employment and business linkage creation.

¹⁰⁵ *China Opens Debate on its Rising Status*, International Herald Tribune, 9–10 December 2006.

¹⁰⁶ It should be noted that often, trade deals for these commodities are associated with the provision of infrastructure (by Chinese companies) in the exporting countries.

Box 7. The recent growth in trade, aid and investment relations between China and Africa.

Trade – China's trade with Africa is expanding rapidly. Between 2001 and 2004, two-way trade quadrupled, reaching almost US\$40 billion in 2005. This is expected to rise to US\$100 billion by 2010 (NB: this expectation is based on the commitment made at the China-Africa Forum to double trade by 2010.) China is now Africa's third largest trading partner (after the United States and France). China scrapped tariffs on 190 kinds of imported goods from 28 African countries in 2005 and has signed a host of trade and double taxation agreements across the continent. It is currently also negotiating a free trade agreement with South Africa. China's traditional trade surplus with Africa turned into a deficit in 2005, reflecting rapidly growing imports from Africa (+50 per cent year-on-year on average since 2002). China will remain hungry for commodities over the coming 15 years.

Investment – Chinese investments in the two regions will also increase. Driven by economic, political and strategic considerations, Chinese firms have increased investment activity abroad. At the China-Africa Summit, 16 commercial contracts worth US\$1.9 billion were signed, covering natural resources, infrastructure, finance, technology and communications. Chinese investment at the end of 2005 was reported to be US\$6.3 billion.

A number of high-profile investments in the African oil sector have recently grabbed the headlines: US\$2.3 billion for a stake in a Nigerian oil field; US\$4 billion for drilling licenses in Nigeria; and a US\$6–10 billion loan to Angola in exchange for a long-term 10,000-barrel-a-day supply agreement. Africa is estimated to supply 28 per cent of China's oil supplies and 60 per cent of Sudan's oil exports go to China. China also invests heavily in related infrastructure such as refining and transportation. Seventy per cent of Chinese investment in Africa is in oil-producing countries. Nigeria, Angola and Mozambique are the biggest recipients of Chinese investment. China is the biggest foreign investor in a number of countries including Sudan and Kenya.

Aid – China offers significant development assistance, including a promise to double aid (with no strings attached) by 2009. In the margins of the China-Africa Summit earlier this month, the government pledged US\$5 billion in preferential loans and credits to African countries and a further US\$5 billion for a new investment fund to support Chinese companies in Africa (the Africa Development Fund). Geographically, Africa is the main receiver of China's aid and an area of strategic importance to China. The most important sub-region in terms of the number of technical assistance projects started is West Africa, with 44 per cent of all projects. Next is East and Southern Africa together (18 per cent), followed by the Pacific (14 per cent) and South East Asia (nine per cent).

(Sources: Kaplinsky *et al.*, 2006;¹⁰⁷ World Bank "Silk Road" report;¹⁰⁸ and DFID briefs.)

¹⁰⁷ See L. Wild and D. Mephram (eds.), *The New Sinosphere. China in Africa* (U.K.: Institute for Public Policy Research, 2006), <http://www.ippr.org.uk/ecomms/files/china_africa_intro_conclusions.pdf>; R. Kaplinsky, D. McCormick, M. Morris, *The Impact of China on Sub-Saharan Africa*, Report for DIFID, 2006.

¹⁰⁸ Harry G. Boardman, *Africa's Silk Road: China and India's New Economic Frontier* (Washington: World Bank, 2007).

- There is a strong correlation between Africa's total exports and its major commodity exports to China, although the latter have been growing at an even higher rate. The share of oil, iron ore, cotton, diamonds and logs in total exports to China grew from less than 50 per cent in 1995 to more than 80 per cent in 2005, with oil growing most rapidly. The importance of China as an export partner for a number of commodity-exporting fragile states such as Angola, Sudan and the DRC is particularly significant.¹⁰⁹
- China's support is delivering crucial investments in priority sectors, particularly infrastructure.
- At the China-Africa Summit in November 2006, African delegates were unanimous in welcoming China's assistance, investment and the opening of its markets to African commodities.

But China's growing presence in Africa has also given rise to some legitimate worries:

- There are concerns that Chinese companies are securing energy assets in a non-transparent and developmentally-adverse manner, thereby exacerbating poverty, conflict and corruption. The provision of "oil-backed loans" poses a special problem.
- Similar concerns apply to the massive and growing Chinese investments in infrastructure projects in Africa, where "responsible" companies are losing out to Chinese firms, with some being considered "less responsible."
- Increased commodity exports and rising investment inflows may lead to problems of "Dutch disease" (i.e., an overvaluation of the currencies making it more difficult for the manufacturing sectors to compete in export markets). Such difficulties might be exacerbated by China's tendency to keep the downstream and processing activities at home and only import the

basic raw materials. South African President Mbeki recently voiced concerns that cheap Chinese production of goods such as textiles and shoes could undermine Africa's weak industrial base.

- At a political level, China's principle of non-interference masks China's willingness to engage politically and economically in countries with poor governance and human rights track records without addressing these fundamental barriers to pro-poor change. In some cases (e.g., Angola, Sudan and Zimbabwe) this approach risks undermining the international community's reform efforts.
- Also China's growing presence poses a new challenge for aid effectiveness. One risk is that the commodity boom in some African (and Latin American) countries, driven by surging trade with China, might give rise to a sense of complacency, which might prevent governments from undertaking the necessary measures to make growth sustainable in the medium term (i.e., investment in human capital and infrastructure, institutional reform, etc.) Chinese investments could also exacerbate conflict and corruption (although the opposite might also be true). Some worry that the increasing importance of China as a donor and investor may interfere with efforts to improve donor harmonization.

Growing economic interdependence has been bolstered by strengthened political ties:

- China published its first White Paper on its Africa Policy in January 2006. This paper lays out the key framework for its growing engagement on the continent, highlighting the need for "win-win" economic cooperation, sharing development experiences and mutual support within the United Nations. Beijing's "One China" policy and the principle of non-interference in internal affairs underline all of this.

¹⁰⁹ Kaplinsky *et al.*, 2006.

- The Government of China dubbed 2006 “the year of Africa” with a stream of high-level visitors to Africa including President Hu Jintao and Prime Minister Wen Jiabao. In November, the fourth Summit of the Forum for China-Africa Cooperation (FOCAC) was held in Beijing. (FOCAC was launched in 2000, formalizing long-running informal relations between China and Africa on wide ranging political, economic and social cooperation. It has become a mechanism and important platform for enhancing China-Africa collective dialogue and cooperation.)
- The formal outputs of the Summit were the Beijing Declaration and Action Plan. The Declaration sets out a vision of China and Africa’s “new strategic partnership,” based on “political equality, mutual trust, economic win-win cooperation and cultural exchanges.” Both sides undertook to increase high level visits to promote political cooperation. They also called for the enhancement of South-South Cooperation and North-South Dialogue to promote “balanced, coordinated and sustainable development of the global economy.”

Where do environment and development fit into this potentially encouraging new extension of China’s international presence? The answer is not very clear at this time, but there are some signals. First, China-Africa environmental cooperation is not new. The China-Africa Environment Forum was set up in 2000 to strengthen cooperation with African countries on environmental protection. At the 2006 Summit, China said that it would give high priority to African concerns on environmental protection and sustainable development, and help African countries “turn their advantages in energy and resources into development strengths.”

Vice-Premier Zeng Peiyan has recommended reinforcing dialogue in fields such as biodiversity, policy-making and legislation on environmental protection. So far, however, cooperation on environment and development has focused mostly on issues such as development and application of appropriate technologies in agriculture, capacity

building (mainly personnel training), rural development, communications, etc.

Under agreements reached at the Summit and through other recent initiatives, the following activities that might broadly be construed as sustainable development initiatives will be undertaken.

- The Chinese government has funded the establishment of the UNEP China-Africa Environment Centre. China and Africa have agreed to multilateral cooperation in environmental protection under UNEP.
- China and Africa have agreed to dialogue and exchanges in environmental protection and cooperation in human resources development. Over the next three years, China will increase the number of environmental protection administrators and experts from Africa to receive training in China. The two sides will work with the UNEP for multilateral cooperation in environmental protection.
- China has established cooperation in capacity building, prevention and control of water pollution and desertification, maintenance of biodiversity and the development of environmental protection industry and demonstration projects.
- China has set up in Africa 10 demonstration centres of agricultural technology with special features.
- China has stepped up cooperation with Africa in extending applicable technologies and human resources training in agriculture. One niche for China is technical/engineering support. A second Chinese niche is in agriculture. For example, the Chinese have been trying to encourage Ghanaian use of new more productive strains of rice.
- President Hu announced that China would work with Africa to set up three to five special economic zones there, agreed to build more Confucius Institutes and approved a further nine African countries as tourist destinations for Chinese citizens.

- China has announced that it will expand the African Human Resources Development Fund (AHRDF) to train some 15,000 professionals between 2007 and 2009.
- At least 3,000 Chinese scientists will spend three years working in rural communities in developing countries to help improve their food security. The arrangement is part of a strategic partnership between China and the UN FAO that was agreed at the FAO's Regional Conference for Asia and the Pacific in Jakarta in May. China has already sent more than 700 experts and technicians to at least 20 countries mostly in Africa and Asia.

These activities represent a starting point, but by no means exhaust the potential of China to work cooperatively with African countries to improve environmental conditions, based on Chinese experience in sustainable rural and urban development, and in fostering sustainable natural resource and sustainable industrial development.

Conclusions about China's International Learning and Sharing

China has a 35-year record of exchange of views on environment and development with the international community. It has demonstrated an ability to take on board radical new ideas as part of its overall opening up to the world. The characteristics of this learning include the following features:

- a clear idea of what is wanted/needed, and from whom China can learn;
- adaptation to Chinese context and needs through experimentation;
- an experimental approach to policy: "feeling the stones in crossing the river";
- effectiveness in scaling up successful programs;
- careful sequencing; and
- openness to dialogue.

The task is made easier by the reality that China can pick and choose its sources. China has dealt with the huge supply of expertise available from governments; international organizations and NGOs; business consultancies and multinational firms; and others, in a very strategic and considered way, identifying which organizations they want to work with on which issues, based on comparative strengths and capacities but always keeping China's own needs and priorities front and centre.

Yet, while China has been very good at learning from, adapting and incorporating international best-practice, at the same time the Chinese have been somewhat weaker at learning from their own experience: they have not developed and systematically applied good methodologies for analysis and evaluation of their own policies. This is an area that needs to be strengthened. Perhaps most difficult has been the capacity to develop a comprehensive and effective approach to the use of economic incentives for matters such as industrial pollution control and for enhancing resource use and energy efficiency.

China also has found useful ways to draw on international expertise, for example via the CCICED. And only weeks after the release of the report to the British Government by Sir Nicholas Stern on economic aspects of climate change,¹¹⁰ he travelled to China to meet with senior policy-makers. To say that China is broadly engaged with the international community as it plans and implements its domestic environment agenda is an understatement. What will become more apparent in the years ahead is a growing influence on the part of China within global fora.

The role of China in international cooperation will continue to be a complex matter, involving a number of motives on the part of other countries and on the part of China. China is aware of its increasing profile as a major player and that its behaviour is increasingly scrutinized by international media and observers, and it wants to be perceived as a responsible stakeholder in the international system.

110 HM Treasury, *Stern Review on the Economics of Climate Change*, 2006, <http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm>.

China is an emerging key player in “South-South” lesson learning, technical exchange and technological transfer. While Africa is one key partner and client, much of this will take place in Asia and perhaps Latin America. There likely is a role for China to learn from third parties such as bilateral and multilateral donors, and perhaps from bodies such as the Development Advisory Committee of OECD, and from international non-governmental organizations, and also UN agencies. But China’s expanded presence and efforts could provide fresh

approaches. Certainly it is likely that China will be welcomed in Africa and elsewhere as an additional source of assistance, but even more for the possibility of trade ties. It is only a beginning, however, in relation to environment and development potential, and, in Africa and other developing regions, there will be much need for monitoring of whether the new relationships will have net positive environmental benefits. This is a challenge that China could readily address in coming years.

4. TEN ISSUES

China is gradually assuming the responsibilities of a leading producing and consuming nation. A nation that will be playing an ever-more significant role in global environmental affairs. In this section we explore 10 issues important for China in developing an internationally-satisfactory, domestically-productive environment and development relationship.

Issue 1 – Enhancing Domestic Performance on Environmental Regulation and Enforcement, Pricing, and Environmental Planning and Management within China

The reality for all nations is that effective domestic action is essential as the basis for solving regional and global issues. China is no exception. Better enforcement of existing laws and regulations, further implementation of taxation and pricing measures, and improvements in environmental governance and institutional coordination, are areas that everyone realizes have to be improved. The years ahead will bring the additional challenge of integrating provisions from a number of MEAs into domestic environmental management. This will require significant new measures related to many sectors such as energy, transportation, agriculture, industry and water resources.

As the case of compliance under the Montreal Protocol reveals, basic implementation of any major agreement will take a decade or more. The agreements tend to become more stringent over time, so that full implementation may well take 20 to 30 years or more. CITES is still not meeting its goals even after such a long time span. The hard issues associated with the Climate Change Convention are still in the future. We can presume that the period after 2010 will be exceedingly important for China to address a complex, highly interactive set of domestic and international environment and development implementation needs.

Increasingly, the world will view China as a major economic force and innovative leading industrial nation rather than as part of the developing world.

There will be rising expectations concerning environmental stewardship in all of China's actions.

Issue 2 – Reducing the Impact of China's Activities on Global Resource and Environmental Conditions

The review of market supply chains in Case Study 1 reveals just how significant China is becoming in its draw upon natural resources from many parts of the world. There is little question that China will have a major impact on sustainable resource use. The impacts are not necessarily negative. If some lands can be turned into more productive use, there may be major benefits. But the pressure on tropical forests, coral reefs, ocean fisheries and some agricultural lands is likely to be severe, and biodiversity losses high. There are three key points:

- How China can continue to access the resources needed for its high rate of growth, while strengthening its own domestic capacity for efficient use of raw materials and improving environmental protection.
- How China can deal with individual supply sources to reduce supply chain environmental impacts created in meeting its domestic and export-oriented economic needs.
- How global and regional environment and sustainable development efforts can be furthered through Chinese commitments and involvement.

These are big points, all relating back to China's dual role of meeting the material needs of its own people and secondly, continuing to be "workshop to the world," but perhaps under more stringent environmental conditions. It is inescapable that China under these circumstances needs to pay particular attention to its ecological footprint—in considerably more detail than most other developing nations. Many of the issues described below relate back to particular aspects of the three points mentioned above.

Issue 3 – Avoiding Pathways Taken by High-consuming Nations

The unrestrained appetite for consumer goods in regions of North America, Europe and elsewhere is unsustainable. But applying the brakes at the present time on China's role in supplying cheap goods would damage China's economic engine, at least in the short run. It cannot be China's burden or responsibility to ensure sustainable consumption patterns on the part of all trading partners. Arguably, China's low production costs have abetted the continued growth of global consumerism by lowering the cost of goods. Certainly there is an accumulating environmental deficit growing inside China, regionally and even globally as a consequence of limited environmental management as export-oriented production escalated within China. Even if China were now to address these concerns satisfactorily, some other developing countries would take over and emulate the Chinese economic growth model of the last decades. Thus, while full-cost pricing and better trade and investment rules should help, if implemented fairly around the globe, these do not constitute a sufficient solution to unsustainable consumption. The responsibility should remain primarily with measures taken by the consuming nations.

And in this regard, China itself must find a virtuous path of sustainable domestic consumption that does not trace the unsustainable route taken by wealthier, high-consuming nations. This is likely to become more difficult over the coming decade, given the growing Chinese wealth and policy emphasis on expanding the size of domestic markets. However, China is well-placed to become an example for other countries, with its high savings rates, low per capita consumption patterns at present, and its considerable latitude to increase energy and material efficiency. The general notion of *Xiaokang*¹¹¹ promoted by current leaders is helpful, but this concept needs to be made as operational as possible with appropriate capacity to address situations where it is not working.

Issue 4 – Improving Market Access and Promoting Sustainable Trade

Improving market access will continue to be the concern of the Chinese government and businesses. In the past few years, Chinese exporters have sometimes been thwarted by higher environmental, health and safety standards in developed country markets. According to a 2003 MOFCOM (Ministry of Commerce) report on the Impacts of Foreign Technical Barriers to Trade on China's Exports, the Chinese exports most commonly facing difficulties are those of animal origin such as poultry and marine products, vegetables and other plant products including tea, peanut and tobacco products. The countries that most commonly raise difficulties are the European countries, Japan and the United States.¹¹² According to the same report, major difficulties faced by Chinese exporters include: lack of information and awareness of rapidly changing requirements; lack of financial resources to undertake renovation or to obtain international certification; lack of information on potential technological solutions for meeting the requirements of importing countries; and difficulties in meeting the supply chain requirements that involve compliance of many different manufacturers and actors of a product life cycle.

Despite the difficulties that foreign environmental measures present to Chinese exporters, these measures may represent trade and development opportunities as well. They can, for example, provide an incentive to accelerate the development of green products, the introduction of cleaner production technology or the expansion of environmental services. They can prompt domestic enterprises to strengthen their environment management, to adopt new technologies and processes and to lower energy and raw material consumption. This will ultimately increase the competitiveness of their products. It is not only conducive to overcoming green barriers to trade, but is also compatible with China's sustainable development strategy.

111 *Xiaokang* is an old Chinese concept of a modestly well-off situation for all in society. It introduces a concept of equity in current development directions, but also, perhaps, sustainable levels of consumption.

112 MOFCOM, Department of Science and Technology Development, *Investigative Report on the Impacts of Foreign Technical Barriers to Trade on Chinese Exports* (Beijing: MOFCOM, 2003).

There is a need in China to accelerate trade in green products, environmental technology and environmental services. Indeed, some enterprises in China have realized that there are green opportunities in overseas markets and have committed to cleaner production through foreign-funded projects. However, these enterprises suffer from lack of information relating to foreign environmental requirements and relevant WTO rules. They have identified the need for practical guidance on environmentally-related WTO requirements and on existing or planned national environmental requirements related to their export products.

There is also a need to assist China's own effort to improve market access in response to increasingly stringent health and environmental standards and increased demand for environmentally friendly products in developed countries' markets, and to address actual and perceived difficulties faced by Chinese exporters wishing to get greater access to developed country markets. This could be accomplished through creating the basis for sustainable trade, including supporting access to information on foreign environmental and health safety standards; establishing local networks to disseminate information and organizing training for promoting sustainable trade; and establishing an international network to facilitate international certification and standard conformity. It could also be accomplished through supporting Chinese export-oriented enterprises in acquiring technical information on technological solutions for meeting chain supply requirements and information on possible foreign financial assistance to promote sustainable trade, and to promote corporate social responsibility in China.

Issue 5 – Aligning Production and Manufacturing with International Environment, Health and Safety Approaches, Standards and Performance

There is a real need to improve access to information on environmental, health and safety standards

of countries that are the target of Chinese exports, and to provide technical assistance to address real and perceived difficulties of Chinese exporters. The examples provided below demonstrate that it is possible to make progress through a combination of government efforts and business initiative. While the initiatives described should have environmental benefits, they have been promoted for pragmatic reasons—market access, and in some cases, to avoid import competition.

Environmental Management Systems

In 1997, China adopted five ISO 14000 standards that were first published by the International Organization for Standardization. The State Council approved the establishment of the National Accreditation Committee for Environmental Management Systems to oversee China's authentication work of ISO 14000. As of late 2004, Chinese enterprises and organizations accounted for some 70 per cent of the world's 74,000 ISO 14001 registered facilities.¹¹³ This is quite a remarkable achievement, which demonstrates responsiveness on the part of both a national government to a useful tool for improving environmental performance. The ISO 14001 effort has laid groundwork for other types of environmental certification involving Chinese products and processes.

FSC and MSC Certification

Perhaps the most stringent of various environmental process and product certifications is the Forest Stewardship Council (FSC), which has been active since 1993 at the international level, and now is moving into domestic markets as well. Both aspects are relevant, since Chinese exporters source their raw wood materials from such a variety of sources. Both Chinese domestic purchasers of wood products and purchasers abroad have an interest in knowing that these products are derived from sustainably grown and harvested sources. Both chain of custody certification and forest management certifications are important. Since 2003 these two types of certifications have been introduced within China through the FSC China

113 Sangbum Shin, *The Role of the Government in Voluntary Environmental Protection Schemes: The Case of ISO 14001 in China*, Chinese Electronic Periodical Services (C.E.P.S.), Issues & Studies, December 2005.

National Initiative. Currently there are 150 enterprises holding chain of custody certification, including a number of furniture manufacturers, and four wood producers hold the forest management certificates for domestic natural and plantation forests totaling some 400,000 ha. The huge challenge is to convert these beginnings into more widespread efforts domestically, and to ensure that the majority of wood imported into China is internationally certified either through FSC or through equivalently-stringent certifications.

A similar certification process operates internationally for seafood via the Marine Stewardship Council (MSC). No Chinese fishery or processor has been certified by this Council. This would be a complex process for wild fisheries since seafood is sourced from many locations for processing in China and re-exported to many international markets, sometimes with final processing in third countries such as Canada before export to final destinations such as the U.S. It might be a somewhat easier effort for China's massive and diversified aquaculture industry.

Ecolabelled Products and "Green Food"

Up to June of 1996, there were only 12 categories of products that had been awarded the China Environment Label, and there were 43 products being certified with the environmental label. Now there are some 21,000 products produced by 1,300 enterprises that have obtained China's Environmental Label certificates. Since 1997, "green food" has been gradually popularized, industrialized, commercialized and exported widely. It has now become one of the major export products actively promoted by China Import and Export Company of Cereal and Edible Oil Products. In December 2006, the Ministry of Finance and SEPA announced plans to begin green government procurement, first at national and provincial levels, and, in 2008 by all levels of government. This will be a major incentive for shifting into "greener production" if implemented fully.¹¹⁴

Issue 6 – Alignment with International SHE Standards

As China's new industrial base matures, and as more domestic and international attention is focused on issues such as safer production and use of coal, the many issues related to safety, health and environment (SHE) in China will receive greater international scrutiny. Success with economic growth strategies focuses attention on China as a competitor, as the cause of lost jobs in Europe, North America and elsewhere, as well as the source of environmental problems such as mercury or other distantly-transported pollutants. Labour activists, environmental lobbies and industrial interests abroad will place considerably more pressures than at present for SHE improvements, while leaving China vulnerable to international claims that its economic growth leads to undercutting of hard-won social and environmental benefits elsewhere.

These concerns will not be addressed by simply adopting international standards, or better; the emphasis will be on verifiable performance and transparency in dealing with problems. And this issue is, of course not restricted to strictly domestic operations, but also to performance of Chinese multinational companies in their operations in other developing or industrial countries.

China is certainly engaged on SHE concerns at present, but not at a level of effort commensurate with the scale and range of problems. It is an area where the large body of experience in other countries can be of direct value, also of WBCSD and other international business organizations, international NGOs and international organizations such as the OECD, ILO and UNEP.

Issue 7 – Dealing with New Types of Environmental Problems

Each decade brings with it new environmental and sustainable development issues and surprises. We can presume that more will emerge (see Box 8 for

¹¹⁴ A certified product "will pose minimal or no harm to the environment and human health during its life cycle, from the design, production, packaging, transportation, and use stages to the item's ultimate recycling, reuse, or disposal." (See iNSnet <http://www.insnet.org/ins_headlines.xml?cust=&id=3759>).

Box 8. Emerging issues of environment and development.

Biosafety – The problems associated with invasive species, zoonoses (diseases passed from animals to humans such as avian influenza, BSE and SARS, but also malaria and other parasitic diseases) and deliberate infections, including bioterrorism acts, will be of increasing concern. These need to be assessed as environmental risks and dealt with in a way that minimizes harm to wildlife while protecting human health and economic activities such as animal husbandry and tourism. Biosafety will become even more significant in the future, and demands an integrated ecological, public health, safety and economic framework of analysis, policy and action.

Climate Change – This subject is very complex, with a number of key issues: China's effective participation in the Clean Development Mechanism (CDM); development of climate change adaptation and mitigation strategies; carbon taxes; domestic and international emissions trading; implementation of coal gasification and other sustainable development technologies that reduce greenhouse gas emissions and energy consumption; China's role and commitments in post-Kyoto climate change action; and gradual transformation from a fossil hydrocarbon to a bio-product economy.

Environmental Assessment of Innovation Technologies – Biotechnology and nanotechnology are potential drivers of future economies. They will therefore have a pervasive influence in industrial processes, consumer products and on environmental technologies. They require sector-wide environmental assessment and monitoring in addition to specific health, safety and environmental review of specific products. Massive investment in biofuels and other innovation technologies require careful monitoring to ensure cost-effective, environmental benefits.

Environmental Fiscal Reform – Consideration of pricing, environmental taxes, government expenditures and subsidies has, in most countries, been done in a rather ad hoc way. There is increasing interest in taking a more integrated approach involving all of these categories to develop a more strategic and comprehensive use of economic instruments for environmental protection and improvement. With such an approach, benefits should be more easily monitored since the various elements can be aligned to work together in support of key environment and sustainable development objectives.

Financial Sector and Environment – Environmental guidelines for domestic and foreign direct investment; bank loans and mortgages to business; and insurance that recognizes the liability associated with production of hazardous and toxic materials and pollutant impacts, are examples of how the financial sector can influence environmental protection outcomes. As well, in the stock market, there is now an international effort on the part of investment firms to examine environmental performance of companies. These measures have had limited impact within China, but major effects on multinational companies in Europe and North America in particular.

Gender and Environment – This topic is of increasing concern in both developing and industrial nations. There are a number of important considerations including: maternal health and pollutants in the body affecting the child; indoor air pollution impacts on women at home; female participation in decision-making; female access to education; environmental health and safety in the workplace, especially for migrant males working in cities or in occupations such as coal mining; gender-specific participation in natural resource management such as forestry; access to market-based environmental opportunities and credit; and gender, poverty and environment.

Mercury – China is considered to be the largest source of elemental mercury release into the environment today, with possibly even greater levels in the future as a consequence of coal burning, gold mining and other activities. There are concerns related to bioaccumulation in people and animals both within China and inter-continently, since mercury is transported via air currents and in rivers and the ocean. There is growing interest in international regulation of trade and reduction at source. Understanding the movement of mercury locally and to distant locations is complex and demands more environmental and health analysis than in the past, both in China and abroad. There will be major investment needs to address the problem.

Ground-level Ozone – This pollutant, found in the lower atmosphere as a consequence of automobile use and other ground-level emissions, is of increasing concern as a public health matter, and for its role in transforming other pollutants into biologically-reactive, forms. Ozone was at first thought to be mainly a local issue, especially around major cities. But it is now recognized to be a pollutant that can travel great distances, with Asian sources contributing to pollution on the west coast of North America, for example.

Indoor Pollution – Air quality in homes, offices and factories is now recognized as a major environmental health concern. Building design, release of toxic gases from building products, improper construction that affects ventilation and other factors can contribute to “sick building syndrome.” These can be problems even in major skyscrapers and apartment buildings. In homes, coal burning, poor ventilation and use of materials that may contain toxic materials are problems that influence health. Often, poorly constructed buildings will also be energy inefficient and unsafe in other aspects. There is growing interest in many countries for sustainable buildings meeting LEED (U.S. Green Building Council Leadership in Energy and Environmental Design) standards.

SCPT (Sustainable Consumption, Production and Trade) – How to govern these three aspects of environment and economy in an integrated way is a key challenge for the future. They are particularly important for China, as a country seeking to stimulate domestic consumption, dependent on maintaining a high level of exports, and on market supply chains for raw materials, and making major efforts towards having a circular economy and eco-efficient industrial production. SCPT depends on a mix of command and control; economic incentives; voluntary and consumer-driven approaches such as environmental certification; industry stewardship programs; and environmentally-sustainable procurement programs on the part of governments and large industry. SCPT as an integrated topic for environment and sustainable development is still in its infancy but can draw upon available experience of the main components.

SHE (Safety, Health and Environment) – Combining these three aspects into occupational, health and environmental inspections and in industrial management is now commonplace in some OECD countries. In China these are topics still treated separately and insufficiently by comparison to international standards. There will be growing pressures from international consumer, labour and environmental organizations, and in trade arrangements to ensure compliance to good standards, especially for production of internationally-traded products. There is also a strong move to ensure that SHE covers industrial impacts on nearby ecosystems and communities as well as the workplace.

examples that are highly relevant to China): some associated with new technology development such as biotechnology and nanotechnology; the push for novel forms of resource extraction such as oil sands, frozen ocean methane deposits, deep ocean drilling for oil and gas; various biosafety issues, including bioterrorism, zoonoses that may create epidemiological crises and alien invasive species; and, of course, the unknowns associated with climate change. In addition, with new knowledge, chemicals and industrial processes formerly thought to be safe may need new regulatory and phaseout measures. In all the cases cited, there are likely to be significant international considerations. As the case with ozone depleting substances demonstrates, managing the transition on any one issue is complex, likely played out over decades.

On most new issues, it may be presumed that China will be directly affected and involved in the solutions. Even for development issues such as oil sands located in North America, China will have a stake since it invests in these new energy sources. It is an important outcome of globalization that problems become shared. And certainly China will face some critical regional concerns such as the changing moisture conditions associated with the loss of glaciers and snow melt in the shared “rooftop of the world.”

Some of the strategies to deal with novel concerns and their implications within China and in China's international relationships are: proactive measures to anticipate and take early action on emerging problems; incorporation of environmental assessment into R&D efforts and commercialization of new technologies, both nationally and cooperatively with international organizations; alignment of Chinese and international regulatory efforts for new technologies and environmental monitoring; promotion of corporate social responsibility on the part of Chinese business and investors; and participation in major international assessments conducted by organizations such as UNEP and OECD.

Issue 8 – Fast-track of Innovations for Sustainable Development

China is building its future around innovation, with an investment in scientific development and R&D that already exceeds that of Japan, and many countries of Western Europe. But innovation does

not automatically lead to pathways of sustainable development. The time frame for innovations moving from concept to widespread practice has been on the order of 15 to 30 years. With needs such as coal gasification, alternative fuels for transportation, improved plants able to thrive under changed soil moisture conditions, etc., this time frame must be significantly shortened. China's call for technology leapfrogging, concessional arrangements for new technology and partnerships to address issues such as carbon sequestration, are being answered, but not yet at the level of activity required.

Innovation of many sorts is required, in addition to introduction of new technologies, for example, changes in governance, management, public engagement and financing. These are matters that can be addressed domestically and internationally. China's constructive engagement with innovation almost certainly can be enhanced during the 11th Five-Year Plan and beyond. It is a bright light both domestically and for the world.

Issue 9 – Information Quality

Knowledge needed for global environment and development decisions depends on the quality of national-level data and information. The quality of information from China suffers in a number of ways: declining quality of monitoring in recent years; misleading information “manufactured” at local levels to meet expectations; and inadequate analysis, a need for more timely reporting of problems and a lack of transparency. These problems are certainly not restricted to China, but no other nation faces such rapid development changes, where accurate information plays an exceedingly important role. At times, these national-level problems have created global-level issues, for example in relation to world fisheries statistics, SARS and other public health concerns, and specific environmental matters such as traffic in illegally harvested goods sent from other countries to China, including timber and wildlife. In addition, since China has not developed a reliable, internationally-compatible system of national environmental accounts, comparability of performance with other nations is limited.

It is very difficult to assess China's actual contribution to cleaning up global and regional pollution

concerns such as GHG production; mercury contamination; POPs in the Arctic and elsewhere; and various other long-range transboundary pollutants without accurate assessments of environmental loading, behaviour of pollutants in the environment and the effectiveness of control measures. Each of these aspects requires good data collection, proper analysis and sharing of information—all matters where international cooperation is important.

While there may well be justified concerns that data improvement will create problems for China, especially if it is discovered that China's contributions continue to rise, without such information China will be vulnerable to assertions by others around the world about its contributions to problems elsewhere. An example is the assertion that some 50 per cent of mercury contamination in U.S. lakes and rivers arises from Chinese sources.

At a grander scale still are the information quality and quantity needs required to refute concerns that China may turn into the world's largest pollution haven. Whether this hypothesis will take hold is a significant matter for China's trade relationships as well as domestic perceptions. It will not be persuasive enough to point out the major investments in pollution control and other environmental management initiatives. Credible and independently verifiable signs of actual progress will be needed.

Issue 10 – Capacity to Share China's Environment and Development Solutions Globally

China's expertise for solving many domestic environment and development problems, and for

addressing international-level resource and environment matters, including those associated with market supply chains and other trade matters, will be in high demand. The three most significant sources of this demand are likely to be:

- developing nations, especially those with significant natural resource and other trade ties to China;
- nations adjacent to China; and
- nations in partnership with China on specific environment and development problems or other alliances.

While arrangements will be dictated by specific circumstances, all will require financial, scientific and managerial support, perhaps at levels above and beyond China's current commitments and capabilities.

The benefits to China may be considerable, although longer-term. There should be benefits to China's rapidly developing environmental industry sector. Quite likely, China will be a net recipient of other benefits, including a number of intangibles such as international goodwill towards Chinese environmental problem-solving approaches; more rapid and cost-effective sharing of advanced technology and management between other parts of the world and China; and, perhaps, favourable terms for resource access or other benefits sought by China.

5. CONCLUSIONS

China does not have the time to learn by trial and error. It needs to identify and act on core responsibilities related to environment and development where results will be highly significant to China and to the world. A good example has been China's role in the Montreal Protocol restriction of CFCs.

Between now and 2010–2012, China will face some major issues in terms of its potential global environment and resource impacts—where it will be expected to be a high performer. Among these issues are:

- China's rapidly rising greenhouse gas emissions;
- prevention and control of human diseases originating in China (SARS, avian flu and others);
- corporate responsibility for Chinese business and state activities abroad, especially related to environment and social aspects of market supply chains;
- influence of China on global patrimony/heritage, including sites and structures, natural habitats and species of global interest located within China, and areas that China might be affecting through activities abroad; and
- influence of China in shaping, adequately supporting and implementing international environmental agreements.

China can take various steps towards strengthening its role as a responsible producing and consuming nation dedicated to resource and environmental stewardship. These steps could include:

- working towards prevention and elimination of major problems rather than seeking palliative measures;
- promoting upward movement of standards and performance;

- consistently making effective and innovative international interventions, including supportive and leading action;
- implementing domestic policies, regulations and enforcement activities harmonized with international environmental and other agreements; and
- working cooperatively to remove illegal, cross-boundary activities.

There are many opportunities for China to learn from the rest of the world's 30 to 40 years of environment and development experience. There are caveats to this experience. None parallels the rapid rate of economic development experienced by China, nor the size of population, and therefore meeting both demands and very complex governance considerations. Nevertheless there are important lessons, good and bad. China's neighbour, Japan, is an important source, albeit not the only relevant example. In fact, China has done quite a good job at learning from others so far, and in drawing on international efforts such as Agenda 21.

China also must be prepared to address emerging environmental concerns such as those shown in Box 8. This list is drawn up based on international experience including concerns not fully described in the text. It will make sense to cover these issues in an internationally cooperative way in the coming years inside and outside of China.

Over the past decades, China has maintained a relatively low international profile, not overtly taking on leadership positions internationally. This is consistent with Deng Xiaoping's admonition that China should "hide its ambitions and disguise its claws."¹¹⁵ It has been the Chinese way in relation to international environment relations as well as in many of its economic development ways. Yet the results of the economy are such that this approach is becoming increasingly untenable. It can now be

¹¹⁵ This point of not taking an overt leadership role is repeatedly stressed during meetings with Chinese officials, but it does not mean inaction. The International Herald Tribune notes that this approach may be emphasized less in the future (*China Opens Debate on its Rising Status*, IHT, 9–10 December 2006).

argued that the same is true for environment and development.

The emphasis from China in the future will likely be that it wishes to be seen as a responsible, wealth-creating country, willing to shoulder its share of international burdens, but wanting for the world to recognize that it is also still a developing nation. This duality needs to be respected, certainly in relation to environment and development.

China's environment and development relationships within its region, with poorer countries in other regions such as Africa and with richer OECD nations will each take on their own complexion. At a global level, it is proper to expect that China will

move towards considerably more action to reduce carbon emissions, control pollution and intensify efforts to be a good steward of resources at home and abroad. It should be in China's best interests to insist that other nations do their share as well.

It was popular in the 1970s to describe all countries as passengers in a single lifeboat called Planet Earth. There is no escaping the impacts of any one passenger on the others. It will be one of this century's greatest challenges to keep a steady trim on our lifeboat. China, by its size and increasing global role, can play a huge role in safeguarding the journey for all nations and for all people.

ONE LIFEBOAT

CHINA AND THE WORLD'S ENVIRONMENT AND DEVELOPMENT

The climate is changing; biodiversity is being reduced; quality of land, water and air is compromised. Indeed, our global environment is a stormy sea of effects known, unknown, unpredictable and perhaps unimaginable—a stormy sea we navigate together in one lifeboat. And like a real lifeboat, when one passenger moves, everyone feels the effects.

With a massive population, substantial resource base and unprecedented economic growth, China occupies a prominent position in the lifeboat. The country's environment and development impacts can be felt around the world. By 2020, China expects to quadruple its GDP over the year 2000, while becoming an “environmentally friendly, resource-efficient society.” These goals present an enormous challenge, with outcomes of growing significance for all nations.

China's role as the “world's workshop” complicates relationships of its ecological footprint and market supply chains. There are pressures that are moving the Chinese people away from their traditionally low consumption patterns. But China's new wealth presents major opportunities for rapid improvement not only within China, but for tackling global environment and development issues.

China has demonstrated its commitment to environmental stewardship by participating in major international agreements and by investing in improved environmental performance domestically. It's projected that between 2006 and 2010 alone, China will spend US\$243 billion on environmental protection and management. Yet economic growth outpaces environmental efforts, and a weak international environmental governance system hinders progress.

This report looks at the international environmental implications of China's growth, and the role played by China in international environmental cooperation, including its regional and global efforts and its growing role in development assistance.

As with a real lifeboat, we learn that there is little room or time for trial and error. There is only room and time for cooperation and effective action. Only then might the lifeboat sail smoothly. China, with the help of its fellow nations and trading partners, must improve its environmental performance and find ways to maximize the return on its investment in environmental protection. And the country must use its substantial sway to encourage its regional and global partners to improve their own performance.



China Council for International Cooperation
on Environment and Development

<http://eng.cciced.org>



International
Institute for
Sustainable
Development

Institut
international du
développement
durable

<http://www.iisd.org>