China's Limits to Growth? The Difference Between Absolute, Relative and Precautionary Limits

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The contributions in this volume have sought to delve into the question of whether the greening of state and society is a reality or a myth, by highlighting the case of one of the world's fastest developing and most populous countries: China. The rise of China has worried many observers as it has led to a heightened pressure on the resources of the nation and the world. This has become painfully clear as a result of a sharp rise in soil, water and air pollution within China, as well as rising Chinese demand for natural and mineral resources such as oil, gas, timber and steel. The critical question concerning China's development is whether it can actually 'meet the needs of the present without compromising the ability of future generations to meet their own needs'?[1]

After examining this question, this volume reaches three conclusions. First, a greening of state and society is taking place in China; in some ways this is following a similar pattern to developments in other industrialized nations, in other ways it diverges from them.[2] Second, if anything is clear from China's explosive growth, it is that the greening of state and society are insufficient to guarantee the sustainability of Chinese development. Moreover, China's sheer size, the speed of its development, and the relative scarcity of its natural and mineral resources, imply that its economic growth will eventually also jeopardize sustainability at a global level. Third, if we want to meaningfully address the question of sustainable development in a Chinese and global context, it is necessary to move beyond both fatalistic views of the demise of the world, and overly-optimistic notions that incremental changes in technology, institutions and lifestyles will be enough to save us.

Before turning to a more detailed review of the book's main conclusions it might be useful to review some trends in China's environmental performance, governance and position in the world over the past decades.

1. In other words, whether it can live up to the most widely-accepted definition of sustainable development; see Brundtland (1987: 43).
2. See also Ho (2005) and the contribution by Mol in this volume.

Development and Change 37(1): 255–271 (2006). Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main St., Malden, MA 02148, USA

CHINA'S ENVIRONMENTAL RECORD

A combination of factors, including serious pollution, a restoration of normal government functions and a renewed international orientation, ensured a place for the environment on the Chinese political agenda at the beginning of the 1970s. Pollution accidents affected the supply of fish and shellfish to Beijing. Mercury and other heavy metals dumped in the Sungari and Nenni rivers had been poisoning fish and people for more than a decade and their effects could be ignored no longer. The decision to allow the reporting of such incidents reflected the beginning of an awareness among top leaders of the problems of pollution; it prepared China for participation in the Stockholm conference and for the adoption of its first environmental regulations. A 1977 survey of sea pollution found high industrial discharges of heavy metals and serious oil spills, covering most if not all of the Bohai Bay, a traditional source of seafood to the banquets of China's politicians and administrators. Early remedial policies focused on management of river systems, waste release standards for new or expanding large industries, the clean-up of major cities, a reduction in pesticide use, food safety inspection and research and monitoring. From 1979, industrial expansion plans were screened for their discharge standards. Metallurgy, oil, textile, paper, food, building materials and machinery industries were tackled first. However, compliance was very uneven, depending on the development level and financial resources of the local governments responsible (SEPA, 1994).

As China's economic reforms gained momentum during the 1980s, industrial pollution spread quickly. By the mid-1990s, half of China's industrial production came from township-and-village enterprises (TVEs), largely outside the control of local environmental protection bureaus. It takes time, considerable political effort and concentrated action to close down the worst polluting industries in the most affected eastern areas of China. Prompted by unacceptable levels of water pollution and drinking water disasters, clean-up programmes have begun for major cities, the Taihu Lake and medium-sized river basins, while polluting industries have been driven to interior provinces and rural areas (Vermeer, 1998). Problems are greatest in the arid north, where industries and households make great demands on shrinking water sources. The economically most rational solution is to raise water prices and reduce the allocation of irrigation water to farmers but this has met with political and practical objections. Since the 1990s, the lower reaches of the Yellow River have run dry for several months a year and have become a sandy sewer. Water standards in all the main lakes and half of the river sections of the Huang, Huai, Hai and Liao rivers in the East fall below the lowest grade, grade V. Three quarters of all lakes are seriously eutrophied and the already heavy chemical fertilizer use is still rising.

The north and west of China also burn a great deal of coal, even though most urban households have converted to gas for cooking. In spite of

greater energy efficiency and coal washing, rapid industrial growth of around 10 per cent a year pushed China's total sulphur dioxide (SO_2) and soot emissions to 20 billion tons and 11 billion tons respectively in 2000. Highest levels are found in the interior coal-burning cities in Shaanxi, Hebei, Chongqing, Guizhou and Sichuan. In one third of China's main cities the air is seriously polluted (below grade III). According to Wang Yuqing, the vice-chief of the State Environmental Protection Agency (SEPA), discharges of pollutants greatly surpass the absorption capacity of the environment. Wang concludes that China's method of development has to change: he argues that the emphasis should be on cleaner production, universal application of the discharge licensing system, improvement of urban infrastructure, treatment capacity of sewerage and urban waste, and use of clean energy sources. Moreover, organic and ecological agriculture should be promoted and ecological zoning applied.[3]

The Tenth Five Year Plan for Environmental Protection adopted by the State Council at the end of 2001 laid out the government's political and financial commitments for improving the environment up to 2005. It emphasized that local governments should bear the heaviest responsibility for achieving the set targets. Overall objectives include reducing pollution, the containment of ecological deterioration and improvement in environmental quality, particularly in large and medium-size cities and certain key areas. Environmental laws, policies and management systems are to be improved, the Plan setting a number of concrete targets for discharge control, environmental quality improvement, investments and projects. Unlike the annual statistics provided by the State Statistical Bureau, the Five Year Plan includes discharges by TVE industries which are currently responsible for 30 per cent of SO_2 and over half of soot and dust emissions. Table 1 presents some quantitative indicators and compares the 2005 targets with official data on the actual situation in 1995, 2000 and 2002.

As Table 1 demonstrates, the Chinese government has concentrated its present efforts to reduce pollution in selected areas. The control zone for SO_2 emissions consists of some major coal-burning cities and acid rain areas in central and south-west China. With the exception of the Three Gorges reservoir area on the Yangzi river upper reaches, all key areas for Chemical Oxygen Demand (COD) control lie in the coastal provinces, Shanghai and Beijing. Outside these areas, SO_2 emissions and COD discharges are expected to increase by about 10 per cent. The 2002 data show that industrial soot emissions, COD and solid waste discharges are being reduced much faster than anticipated, but since about 70 per cent, 35 per cent and 70 per cent respectively of these emissions originate from TVEs with

3. See Wang Yuqing's speech on www.zhb.gov.cn/64096689457561600/20030930/1041786.shtml (Zhongguo Xinwenshe 28 September 2003). More details on the extent of pollution are given in SEPA's annual reports on China's environment (see, for example, SEPA 1995, 2000, 2002).

Table 1. Discharge of Key Pollutants in China, 1995–2005

Discharges (million tons)	1995	2000	2002	2005 plan	Change between 2005 and 2000 (planned, %)
Sulphur dioxide	23.7	20.0	19.3	18.0	−10
-industry	18.5	16.1	15.6	14.5	−10
-domestic	5.2	3.8	3.7	3.5	−10
control zone		13.2		10.5	−20
elsewhere[a]		6.8		7.4	+9
Soot		11.7	10.1	10.6	−9
-industry	17.4	9.5	8.0	8.5	−11
-domestic		2.1	2.1	2.1	−1
Industrial dust	17.3	10.9	9.4	9.0	−18
Chemical Oxygen Demand (COD)	22.3	14.5	13.7	13.0	−10
-industry	14.3	7.0	5.8	6.5	−8
-domestic	8.0	7.4	7.8	6.5	−12
key areas[a]		7.5		5.3	−30
elsewhere[a]		7.0		7.7	+11
Ammonia nitrogen		18.4	12.9[b]	16.5	−10
-industry		7.8	4.2	7.1	−9
-domestic/agriculture		10.6	8.7	9.4	−11
Industrial solid waste	22.4	31.9	26.4	28.6	−10

Notes:
a: calculated by the authors
b: scope more narrow than for 2000 and 2005.
Sources: *China Environment News* (1996); China Environmental Yearbook Editing Committee and Society (1996: 115); SEPA (1995, 2000, 2002); State Council (2001).

incomplete statistical coverage, these figures may be too optimistic. In anticipation of the Olympic Games in 2008, Beijing alone will spend 54 billion yuan[4] on environmental improvements — that is one quarter of the total budget of China's 2001–2005 Green Project Plan, slightly more than the national total for air pollution and considerably more than has been allocated to water pollution treatment of the entire Yangzi river and its tributaries.

China's present Five Year plan for environmental protection recognizes that 'ecological deterioration is not under effective control' and emphasizes the linkages between economic growth, prevention of pollution and ecological conservation as parts of a strategic economic restructuring. As Table 1 shows, its targets for 2005 are ambitious, demanding a 10 per cent reduction of emissions of most pollutants with 10 per cent annual economic growth.[5] The giant construction schemes now underway — especially the

4. From 1994–2005, the yuan was pegged to the US dollar at 8:2770. Since 21 July 2005 the yuan is linked to several currencies including the dollar, euro, and Japanese yen at 8.11 against the dollar. The yuan can now fluctuate within a bandwidth of 0.3 per cent upwards or downwards.
5. Approved by the State Council on 26 December 2001; see www.zhb.gov.cn/english/plan/tenth.htm

'Development of the West', 'Water Transfer from South to North' and 'Sending Gas and Electricity from West to East' projects — have all been designed with much greater attention to their environmental consequences than before. Even the former apotheosis of China's disregard for the environment, the Three Gorges Dam, has been the subject of far more environmental attention, as Heggelund makes clear in her contribution to this volume. Nevertheless, new railroads, highways, mines and factories will lead to fuller exploitation of the resources of interior areas and greater pollution and other environmental damages. The greatest challenge is to local governments: how to reduce the negative environmental effects of forced rapid economic and infrastructural development.

GREENING AND GOVERNANCE

Reading through the various contributions — whether we are dealing with the Chinese car industry, cleaner production, biotechnology or food safety — we see that the level of greening of China's state and society is determined by fast economic growth or limited natural resources as much as it is by its institutions and governance styles. In fact, China faces great difficulties in reconciling environmental reform and economic growth through command-and-control type policies and legislation (see for instance, the contribution by van Rooij in this volume). In local Chinese environmental enforcement, such reconciliation has been difficult to establish, as the environmental interests embodied in increasingly strict legislation found no legitimacy with local actors dependent on pollution-related income. The lack of local legitimacy has adversely affected enforcement. Political campaigns, organized to enhance enforcement, were able to deliver short-term results, but these could only be sustained when a balance of economic and environmental interests had been achieved.

Although China's totalitarian tradition of state control over the economy and people's lives may have weakened since the 1980s,[6] it is clear that many state-imposed institutions and constraints on human action still persist. The Chinese Communist Party monopoly of political power, its ban on free speech and free association and the lack of an independent judiciary curtail public debate and restrict participation in environmental decision making. The different legal positions and administrative and socio-economic entitlements of urban and rural areas affect, among others, the location of industries, education and health programmes, labour standards and

6. See the description of Maoist policies in Shapiro (2001). However, Shapiro's account of a complete environmental disaster during collectivist times fails to recognize the limits of the reach of the Communist state, as well as the regional differences that exist in the implementation of Maoist policies; see Ho (2003).

environmental monitoring and control. The absence of well-protected private land property[7] and persistent state ownership in major industries, services and resource exploitation have enhanced a top-down, bureaucratic character of decisions over resource allocation and environmental control. Part of the obvious discrepancy between Beijing's ambitious Western-style environmental laws and policies and their defective implementation in most of China may be attributed to institutional constraints and the command-and-control style of its governance. Another explanation lies in the impossibility and impracticality of applying uniform rules and standards to regions and industries with enormous differences in economic development, levels of technology, environmental awareness and income. Any assessment of China's environmental record must start from an understanding of its political economy over the past decades.

Since the mid-1980s, China's newly created environmental protection bureaus (EPBs) at all levels use a wide range of legal, administrative and economic instruments for the achievement of their environmental objectives. The national and local governments provide direct financial support from their budgets and through state-controlled commercial banks. Pollution discharge fees collected from enterprises have become a regular source of financial support for the EPB staff, while a proportion of these fees is refunded to enterprises for implementation of pollution reduction schemes. The status and responsibilities of the National Environmental Protection Bureau was raised to ministerial level with the establishment of the State Environmental Protection Agency (SEPA) in 1998. Although central government agencies have been limited (to less than 2,000 staff), total numbers on the government payroll (excluding those operating in units that provide commercial services to enterprises and those responsible for environmental protection in other departments) have tripled since 1985 to 154,000 by 2002. Municipalities and counties all have environmental protection bureaus, usually with some twenty to sixty permanent staff. The Land Administration Bureau oversees land transfers and proper land use in accordance with local zoning regulations. Perhaps most importantly, since the mid-1990s performance in environmental matters has been one of the key criteria for evaluating the career record of city mayors and provincial governors.

Over the past decades, an impressive body of environmental laws and regulations has been adopted while political support for environmental measures has been substantially raised. The first administrative measure taken to improve environmental control was the so-called 'three synchronous' requirement. It demanded that planning, construction and environmental approval of new industrial projects be synchronized at an early stage. Subsequently, major construction projects were required to go through an environmental impact assessment before obtaining approval

7. For an overview of land property issues in China, see Ho (2001b).

from the local planning agencies. Both requirements demanded that officials in charge of environmental protection co-operate closely with municipal industrial and construction bureaus (to which they often belonged), and in this way they gained the necessary inside information and experience. With or without such formal requirements, the continued dominance of the communist party ensured that once political priorities had been set, local government could direct its strong institutions and state-owned enterprises to take fast action. The urban construction tax provided ample funds for expansion and improvement of urban infrastructure and the natural resource tax introduced in the 1990s supplied local governments with some means to reduce the negative environmental impact of mining and exploitation of other natural resources such as water.

In the 1990s, politicians became better educated, younger and more open to societal influences and Western ideas. More importantly, improvements in education, health and the socio-economic environment have greatly enhanced Chinese citizens' environmental awareness and receptiveness to government environmental programmes. Urban residents have started to demand improvements in their quality of life, as illustrated by the rise of urban-based green NGOs and environmental activists (Ho, 2001a; Ho and Edmonds, forthcoming; Yang, 2005). Although environmental NGOs and independent consumer organizations are still relatively weak, it might be expected that green and environmentally aware consumerism will gradually gain a social space in Chinese society. An indication for this is provided in the analysis by Ho and Vermeer of consumers' risk perceptions and willingness to buy genetically modified food. Consumers' actual understanding of the potential risks of GM food to the environment and human health is still very low, although green and organic products have been readily available on the Chinese market for the last couple of years.

On the other hand, there are still many institutional and market constraints on the producers' side that inhibit the development of green and organic agriculture. Sanders points out that in spite of the fact that recent developments of green and organic farming in China may give optimists some cause for cheer, the evidence thus far suggests that future prospects for such farming — given the current fragile institutional arrangements — remain uncertain. In particular, whether the Chinese state will make the necessary institutional interventions to support green and organic agriculture in the face of growing calls by scholars both inside and outside China for reduced government intervention and privatization of land remains to be seen. Sanders argues that, within the optimist–pessimist debate, it is difficult not to take an agnostic stance. Whether China's green and organic agriculture maintain their current upward trajectory continues to depend upon an array of interacting human, social, economic and political factors at local, national and international levels. And the difficulties of their extension will not be solved by ideological interventions, but by pragmatic, step-by-step, case-by-case responses.

China's national and local governments have adopted vigorous policies and measures over the past two decades to improve their control over environmental deterioration. Yet the effectiveness of the great variety of instruments of environmental policy in China has been limited, and for this there is no single explanation. Uneven commitment to environmental goals, lack of effective public pressure on government and polluting enterprises, limited awareness of environmental risks and inadequate state capacity for monitoring and control are among the factors that have been blamed. Two of the contributions to this volume give clear illustrations of the bureaucratic hurdles that still need to be taken on the road to the greening of state and society. Ohshita and Ortolano describe how China's experience with cleaner coal technologies exhibits a certain degree of greening of the state, but at the same time it highlights that significant effort is needed to reconcile environmental protection with economic development. Policies on the closure of small coal mines and limits on coal sulphur content are examples of effective co-ordination of central government plans that yield outcomes consistent with a 'win–win' ecological modernization paradigm. In contrast, fragmented authority of central government agencies during policy formulation on SO_2 fees has contributed to poor diffusion of flue gas desulphurization (FGD). Improved co-ordination among central government agencies on energy, environment and economic policies is needed to provide clear and consistent signals to local officials and enterprises and to counter market signals that lead to actions with negative environmental impacts.

The contribution by Oliver and Ortolano on cleaner production bears testimony to the fact that governmental commitment to environmental reform and protection is not a guarantee for success. Although the Chinese government has put considerable effort into promoting cleaner production technologies among companies since the early 1990s, the attempts to facilitate adoption of these technologies through cleaner production audit reporting requirements have not been successful. This is a clear demonstration that environmental policies without an appropriate institutional context cannot be effectively implemented. Policy implementation has suffered from significant barriers, including a weak regulatory basis for cleaner production policies, poor alignment between cleaner production requirements, and between the core missions and the operational routines of implementing agencies, as well as inadequate resources for implementation. Incentives are such that front-line cleaner production implementing agents have typically concentrated their efforts on collecting favourable audit reports from companies, instead of institutionalizing changes within companies that would lead them to embrace the technologies as core parts of their strategic planning. Cleaner production has great potential for greening the state and society, but China has not yet issued the kind of regulations or initiated the organizational changes needed to realize the potential gains of these green technologies.

Over the years, China's environmental bureaucracy has become stronger in terms of personnel, quality and status. However, it has had little room for independent action as the vertical chain of command has remained weak. Almost all personnel were and still are embedded in municipal and county construction bureaus. Administratively and budgetarily they depend on local governments whose primary concerns are economic (Jahiel, 1998). The central organization in Beijing, the State Environmental Protection Administration, is hardly a match for the powerful state economic and planning commissions. Moreover, as van Rooij shows, China's environmental system continues to rely on administrative and campaign-style measures rather than on legislation, while the parameters of liability are unclear. Material incentives to ensure compliance are few; instead there are pronounced elements of coercion. Thus, the environmental system lacks the democratic impetus that has informed much environmental law and practice in the West. To these institutional shortcomings one should add some unique physical difficulties: the sheer size of the country, its extraordinarily rapid economic growth over the past twenty-five years, limited farmland, water and forest resources and very large regional differentials in development and income (Edmonds, 1994). In the light of these limitations, the organization and performance of China's environmental agencies deserve the praise they have received from international donor bodies such as the World Bank (World Bank, 1997), even though many foreign academics are more critical.

CHINA AND THE WORLD

In recent years, China has acceded to most multilateral environmental agreements.[8] In view of its population size, the rapid growth of its economy and foreign trade, and huge emissions of greenhouse gases and discharge of other pollutants, China's participation in global measures is crucial. China, in common with other large developing countries, has had mixed motives in taking on board international environmental demands, many of which have caused domestic problems. In the international arena, China has typified itself as a developing nation that maintains a right to be less strict in its enforcement of certain environmental policies when compared to industrialized countries. China's principles in global environmental issues were laid down in 1990: that the environment should remain linked to the need for economic development and that developed countries are mainly responsible for present pollution; that the interests of developing countries should not be hurt by 'green' demands; that the world economic order should promote participation of developing countries in solving global problems; and that

8. For a list, see Fridtjof Nansen Institute (2002: 226–7).

by reducing its own environmental problems, China as a large country will contribute to the global situation (Ho, 2005). Thus, in spite of China's support for the Kyoto protocol and its embrace of the Clean Development Mechanism, it has refused to set any targets for reducing the rapid growth of carbon dioxide emissions.[9]

On the other hand, it is important to note that since the 1980s the Chinese government has been anxious to be seen as a responsible and co-operative player and has often used international commitments as a lever to promote changes at lower levels of its administration and within its traditional industrial sectors. It has also used such agreements to upgrade the capacity of its administrative staff and selected industries and to receive financial aid (Oksenberg, 1998). Indeed China's environmental efforts have received considerable support from foreign countries and international organizations such as the World Bank, both in terms of institutional support, such as in legislation and training programmes, and for investment projects. For instance, after China had successfully demanded the creation of the Multilateral Fund as a condition for ratifying the 1987 Montreal Protocol, it took many years of foreign training programmes, institutional strengthening and project subsidies before China's local environmental protection bureaus and refrigerator and foam manufacturers were able to stem the rapid increase in production of ozone-depleting substances (Zhao and Ortolano, 2003). By participating in new environmentally friendly technologies, China expanded its access to present and future Western markets (Ho, 2005). China's accession to the World Trade Organization and influx of foreign industries have brought it closer to international product standards and one may expect further standardization and manufacturers' compliance with international health and safety requirements. In many disciplines, including social sciences, joint scholarly research with foreign universities and institutes has produced valuable results.

Despite these positive developments, China's rapid economic growth has had an increasingly unfavourable impact on the international environment. Welford, Hills and Lam describe how the negative influences of rapid development of the southern Chinese economy spill over to neighbouring Hong Kong. The industrialization and urbanization in the corridor between Shenzhen and Guangzhou, as well as the explosive growth in road traffic and the construction of new power plants in the Pearl River Delta Region, have contributed to an increasing pollution burden, a significant part of which ultimately impacts on Hong Kong. China's phenomenal economic growth is coupled with a worldwide hunt for natural and mineral resources

9. The reported temporary reduction of China's CO_2 emissions between 1996 and 2000 is highly questionable and should probably be attributed mainly to erroneous official reporting of a 12 per cent decrease of coal production and consumption between those years.

to fuel that growth. Over the past few years, China has concluded large-scale contracts worth several billions of dollars for the production of oil, gas, soybean, iron ore and copper with countries ranging from Argentina and Brazil to Iran and Russia. In February 2005, a consortium of Chinese banks invested over US$ 6 billion in the Russian state company Rosneft in return for 48.2 million tons of oil over the five years up to 2010 (*NRC* Correspondent, 2005: 17).

Napoleon predicted that when China awakens the world will shudder. The critical problem of the rise of China is not just the rapidity of its socio-economic development, but the worrying combination of speed, limited resources and scale. As we said in the the introduction to this volume, 'when multiplied by the sheer numbers of China's population . . . any environmental process or phenomenon acquires a magnitude unparalleled in the rest of the world'. Rising pressure on the earth's resources is one of the main global phenomena that we are witnessing today. It is for this reason that the ultimate effects of the greening of state and society also need to be assessed and analysed in relation to the scale of processes of production and consumption, particularly in the Chinese case.

CONCLUSION: NEED FOR PRECAUTIONARY LIMITS?

From the different contributions to this volume, we have learnt that the Chinese state's sense of urgency about environmental protection and the number of its remedial efforts have risen rapidly over the past three decades.[10] At the same time, we have also seen that China's attempts at environmental reform and its policy implementation have been greatly frustrated by a mix of socio-economic, institutional and legal constraints — legacies of a 'Third World' centrally-planned state. In addition, and in common with governments in industrializing and industrialized nations, the Chinese state faces the eternal dilemma of how to reconcile economic growth with ecological sustainability, wavering between the protection of its polluting

10. Some of the milestones in environmental law in the past thirty years include a trial environmental law in 1979, which focused on pollution prevention and the principle of 'the polluter pays'. Surface water quality standards were introduced in 1983 and 1986, with local governments made responsible for monitoring water quality and preventing further degradation. Three standards of ambient air quality were set for different types of areas. Polluting enterprises were charged for emissions above these standards. Environmental laws were introduced for the marine environment (1982), water pollution (1984), air pollution (1987), solid waste (1995) and noise (1996). Environmental impact assessments were required for a growing number of construction projects. In 2000, a total emission control permit system was introduced for certain areas, whereby emission quotas are distributed or traded. In the 1980s, laws were also passed for the conservation of forests, grassland, fisheries and wild animals. By 2002, over 1,700 nature reserves occupied 13 per cent of China's territory, half of which was in Tibet and Xinjiang (SEPA, 2002).

industries, an exploding vehicle population and rising consumerism on the one hand, and the safeguarding of its environment and natural resources on the other. The danger of such governmental ambivalence is that it easily gives way to 'greenwash' (Greer and Bruno, 1996) rather than 'greening' by applying a thin layer of politically correct environmental friendliness over what are in essence environmentally-destructive processes of production and consumption.

However, what sets China apart from the development of any region since the industrial revolution is the magnitude and rate at which changes are taking place. This may make the crucial difference between relative and absolute 'limits to growth'. A poignant example of this is presented by Zhao Jimin in her contribution on recent developments in the Chinese automobile sector. American sociologist John Urry has dubbed the car an 'icon of globalization'; according to Zhao, China's motor vehicle population has now reached approximately 24 million vehicles. Whereas during the early and mid-1980s the streets were dominated by public buses, hordes of bicycles and the 'Red Flag' cars of party bosses, privately-owned vehicles nowadays account for more than half the traffic on the roads. In the period 1985–2003, the share of privately-owned cars increased more than five-fold, from less than 10 to over 50 per cent. The most important reason for this increase is the rise of China's middle-class, but a critical role was also played by the outbreak of the SARS epidemic in the beginning of 2003; as a result of SARS, many Chinese citizens refused to take public transportation and taxis, and bought private cars instead. The impact of China's boom in private cars is demonstrated with a few essential facts and figures:

- since 2003 China has become the world's fourth largest vehicle producer, following the USA, Japan and Germany
- with an estimated 33 per cent of the country's greenhouse gases originating from transportation, the International Energy Agency has predicted that from 2000 to 2030, the increase in greenhouse gas emissions in China alone will practically equal the increase in the rest of the world (see Zhao in this volume)
- third, the growth in the transportation sector is the primary factor driving China's hunger for oil; China is presently the world's second-largest oil consumer after the USA
- finally, if Chinese vehicle ownership per capita were to equal that of the USA, the world would see an increase of 900 million cars, the equivalent of 40 per cent more than today's world total. Simply to keep the Chinese vehicle population running, worldwide oil production would be exceeded by almost 20 per cent..

Let us revert to the theme of this volume — prospects for greening state and society. For the purpose of analytical clarity it is important to distinguish two levels at which these processes could occur: in terms of the

'incorporation and awareness of principles of sustainable development into governance, management and daily practices by social and political actors' (see the Introduction); or in terms of actual changes in environmental quality and a movement towards sustainability. At the first level, we see from the preceding contributions that the Chinese state and society have undeniably undergone a process of greening over the past decades. This is apparent from the substantive body of environmental laws and policies that have been promulgated by the Chinese government in recent years, such as the 2000 Air Pollution Prevention Law, the 2002 Environmental Impact Assessment Law and the 2003 Cleaner Production Law. It is also apparent from the government's changed thinking about energy use, dams, biotechnology, cleaner production and the emerging (though still restricted) space for environmental activism. Lastly, greening can be observed in an increased consumer awareness towards food safety and risks, while Chinese ecological and organic agriculture are gradually carving out a share of domestic and international markets. Yet, as Mol notes, greening in China — or ecological modernization for that matter — takes a different form from the European version that has been studied so widely.

Some critical observers would argue that greening is merely an environmentally correct discourse that serves the various interests of social actors in political ecology (see for example, Greer and Bruno, 1996; Hajer, 1995), while precise measurement of the effects of greening on the environment is a completely different matter. At this point, the focus on social and institutional change and continuity rather than on actual physical, environmental changes implicit in the notions of greening and ecological modernization begs the question 'indeed China is greening, but what does that imply?'.

Being nihilistic about the environment might be a self-defeating strategy as each postponement of the environmental doomsday leaves the way open for mockery and criticism by 'sceptical environmentalists' (Lomborg, 2001) Yet, starting from the premise that modern industrialized society's current course of development is heading towards environmental collapse need not imply a wallowing in pessimism. If we conceive of environmental collapse — in China and the world — as unthinkable (because its premise is itself unthinkable), we might be foreclosing a discussion that could be vital. One of the many virtues of Joseph Tainter's classic *The Collapse of Complex Societies* (1988) was the way in which he dissipated some of the pejorative mists surrounding the term collapse, defining it simply as a reduction in social complexity. This might helps us to see that the process can manifest itself in different ways. It can occur gradually or suddenly (the process could take decades or even centuries, and maybe we are only witnessing its beginnings with China's present take-off, with Brazil, Russia and India following soon); it can be complete or partial; and it can be controlled or chaotic. Such an understanding also leads one to envision the possibility of a 'managed collapse'.

In this regard, the post-modern industrialized world might need to reconsider some of its core values. An observer in Beijing in 1955 remarked about China that 'this regime is probably the first in history which could officially adopt birth control as a compulsory measure, and make sure that its orders will be universally obeyed' (MacFarquhar and Fairbank, 1991: 699). And indeed, China did exactly that. At the time, no developing country had ever ventured to undertake a project with such a grand scale and ambitions. Yet, China's birth control policy has been so successful over the past decades (bringing down the annual natural growth rate from 20 per cent in the 1950s to a mere 0.7 per cent in 2001[11]) that its need is no longer felt in the cities, resulting in a more relaxed implementation of regulations. China's rigorous one-child policy has long been criticized for a lack of regard for human rights, but in retrospect one might wonder if China's self-imposed limits to growth have not rendered the world a great environmental service. Is China's developmental experience in this sense something we might learn from? Does it help us to reconsider some of Western society's core values in relation to global environmental sustainability and security? In contrast to the Club of Rome's pessimism, the Brundtland Report posited that limits to growth are relative as societal, economic and technological change will open up new opportunities to push against those limits. Yet, in the debates over China's potential environmental impact on itself and the world, we must ask ourselves how much time is left for such trajectories of change. Maybe we need to move beyond the endless discussions over absolute versus relative limits, and instead explore possibilities of 'precautionary' limits to growth. In a similar vein to China's one-child policy, governments might need to consider 'one-car policies' or 'one-airco policies'.

Because of its population size, its explosive economic growth, its limitations in terms of natural and mineral resources and the anticipated global impact as China increasingly seeks out resources beyond its own boundaries, the Chinese case presents a number of compelling reasons for setting such precautionary limits. These factors together constitute a perilous mix that cause global environmental ills — a rise in greenhouse gasses, increased pressure on oil and gas, and the spread of illegal logging and deforestation — of which we are only witnessing the very beginnings as China's growth takes off. Against this background, a well-considered assessment of China's environmental impact, not just along the lines of 'ecological footprints' (Wackernagel et al., 2002) or 're- and delinking' (Opschoor, 2000), but also in terms of what limitations society and polity are willing to impose on themselves, becomes an important scholarly task. The rate and magnitude of China's development warrant such an approach.

11. By contrast, in 2001 the world average was 1.3 per cent, for the US 1.1 per cent, and for Africa 2.4 per cent (China Statistical Bureau, 2003: 969).

Perhaps the best way to conclude this book is to give a moment's thought to Ulrich Beck's vision of future society, and two potential major directions for societal evolution. Beck (1992) posited that late modern, industrial society would come to be increasingly dominated by fear of technological and environmental risks. The escalating uncertainty about the value of technological progress and public recognition of the shortcomings of both the state and science in dealing with these risks would trigger 'sub-political activities'. The mobilization of these social forces, which fundamentally question the direction of societal development, would lead to the collapse of the monopoly on expertise held by academic, political and commercial institutions. This is the essence of what Huber dubbed 'reflexive modernization' (Huber, 1982, 1985). On the other hand, as Cohen argues, 'if society is unable to wrest control of its technology away from an increasingly discredited scientific–political establishment, the future takes on a much gloomier colour. . . . The opportunity for democratic governance slips away as the scientific community, and the political institutions that depend on its input, struggles to preserve its legitimacy before an alienated public whose sense of alarm receives new justification with each periodic catastrophe' (Cohen, 1997: 108). Let us hope that Chinese development gives rise to a certain reflexive greening, both in China and abroad.

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