China Perspectives

2007/1 | 2007

Climate change: the China Challenge

Ethics and Models of Development

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Édition électronique

URL : <http://journals.openedition.org/chinaperspectives/1153>

DOI : 10.4000/chinaperspectives.1153

ISSN : 1996-4617

Éditeur

Centre d'étude français sur la Chine contemporaine

Édition imprimée

Date de publication : 15 janvier 2007

ISSN : 2070-3449

Référence électronique

Jean-François Huchet et Jean-Paul Maréchal, « Ethics and Models of Development », *China Perspectives* [En ligne], 2007/1 | 2007, mis en ligne le 08 avril 2008, consulté le 28 octobre 2019. URL : <http://journals.openedition.org/chinaperspectives/1153> ; DOI : 10.4000/chinaperspectives.1153

Ethics and Development Model

China's Economic Growth Challenges the Future of World Climate

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The consequences of global warming are now well defined and particularly alarming. In view of the stupendous economic advances of the larger NICs, with China in the first rank, no "business as usual" scenario in the matter of GHG emissions can be acceptable. The aim of this article is to expose the challenges posed to the Chinese economy in adapting to the disciplines of sustainability.

« Cela n'est pas volontaire, vous êtes embarqué. »
Blaise Pascal, *Pensées*

Although we have still a long way to go in the field of modelling the earth's climate, the consequences of global warming are now pretty well understood. Such doubts as still persist do not indeed justify any illusions about what humanity may expect if, facing this ever more precise threat, we indulge in time-wasting. The consequences would of course vary according to how high temperatures might rise, but in any case they would affect food supplies (lower agricultural output), supplies of drinking water (the melting of glaciers), salt water (rises in sea level leading to salinisation in river deltas and the flooding of some cities, such as New York and Hong Kong), ecosystems (coral reefs) and the frequency and intensity of extreme meteorological phenomena (hurricanes and forest fires). Moreover, rising temperatures and humidity levels would threaten us mortals and our livestock with the proliferation of numerous pathogenic agents. Lastly, the disappearance of the polar ice-cap and the disruption of ocean currents might very well lead to rapid and generalised disturbances of the climate. In fact, according to the overwhelming majority of scientists, many of these phenomena are already with us. If we do not take swift and far-reaching measures, Nicholas Stern⁽¹⁾ explains in a report published last autumn, climatic change will cost the world economy the astronomic sum of 5,500 billion euros over the next half century and create more than 200 million migrants. Assuming an average increase of between 5°C and 6°C in global

temperatures (a perfectly reasonable expectation), the writer estimates that global GDP would fall by between 5% and 10%.

Reading this data forces us to a conclusion: all of us, human beings and nations, have a collective interest in arresting the present course of climate change. But there is another argument just as blindingly obvious and no less persuasive: all of us have just as great an interest, with a view to maximising our short-term benefits, in keeping up our voracious consumption of fossil fuels. Thus, each of us—states and individual citizens, rich and poor alike—ends up, with the fine reasoning of *homo economicus*, by being unreasonable . . . at the deepest level of reason. Economists call that "the prisoner's dilemma." Furthermore, as if that were not enough, this dilemma has been sharpened by the staggering economic advances made by some Newly Industrialised Countries (NICs). In their first rank is China which, this very year, is expected to overtake the United States in emissions of greenhouse gases (GHGs). Despite the undeniable historical responsibility of developed countries for anthropogenic global warming, recent forecasts by the International Energy Agency (IEA) indicate that the increase in China's emissions of CO₂ between now and 2030—four additional gigatons (Gt)—would by itself constitute 40% of all additional emissions by all the world's countries and nearly double those of the industrialised countries⁽²⁾. China's right to development and that of

1. Nicholas Stern, *The Economics of Climate Change*, Oxford, Oxford University Press, 2006, p. 188.

2. International Energy Agency, *World Energy Outlook 2006*, Paris, 2006, p. 188.

other big NICs such as India and Brazil is entirely legitimate, but it does raise a very particular ethical problem in the context of future climate change: how can the legitimate economic development of these great nations be assured without nullifying international efforts to limit GHG emissions? What is more, the effects caused by the size and population of these countries make it impossible for us to argue solely in relative terms. The fact that each American emits (expressed as a yearly average) three times more CO₂ than a Chinese person cannot in any way lead us to conclude that, in the interests of “justice,” no measures for controlling Chinese emissions should be taken so long as Chinese individual emissions lag behind American ones. Indeed, if individual emissions in China did reach levels comparable to those in America, one can easily imagine the state that the world climate would be in.

International negotiations on climate control are thus held up pending the outcome of a sort of team poker game. Facing each other over the cards are not, as people too casually assert, the North and the South; the teams are, on one side, the developed countries and, on the other, the NICs—and China in particular⁽³⁾. The interaction between the American and Chinese positions throws light on the internal logic of this kind of rivalry, the immensity of the problem that humankind absolutely must solve over the next decade. At the risk of over-simplifying, one might say that, so far at least (even though at the level of a few big American cities and one state, California, things seem to be developing favourably)⁽⁴⁾, Washington is tied up in knots seeking to defend its rejection of the Kyoto Protocol while Beijing refuses any coercive measure that might limit China’s emissions of GHGs. Admittedly, each government has excellent arguments to deploy. The United States asserts that any unilateral reduction of its CO₂ emissions would not only be likely to harm its overall economic performance but also—and this is true enough—would have no really positive effect on the world’s climate unless the developing countries (China in particular) followed suit. In answer, the Chinese authorities counter—not unreasonably—that they have no historical responsibility for global warming and that it is outrageous to suggest curtailing their right to economic growth and, therefore, to the benefits of the consumer society. It would be hard to imagine a more intractable deadlock—or a more troubling one, in that the resulting clash of state urgently threatens a “global public good”: climatic stability.

The “business as usual” scenario is not an option if we want to avoid in the medium term throwing the earth’s climate out of balance. Thus, we must find a way out of the logical, eth-

ical and practical trap that we are in, by devising a solution acceptable to all. Adopting a more sustainable form of growth on a global scale seems to be the only answer to the dilemma posed by the big NICs. As we shall show in the first part of this article, in terms of GHG emissions, China is the prisoner of its own growth model. Since the Chinese government wishes, quite legitimately, to continue improving its people’s living standards over the decades ahead, the only possible way of solving the equation lies in the rapid emergence of a more sustainable form of growth. This development would, in addition, allow China to take a more active stance in international climate negotiations: it might even break the stalemate with the United States which, deprived of any realistic arguments against, ought to play a full part in the “post-Kyoto” processes. Nevertheless, as we shall amplify in the second part, despite a new awareness on the part of the Chinese government and the launching of multiple political initiatives designed to control emissions, there still remain numerous setbacks on the technological and economic fronts, as well as problems with political incentives for industrial managers to change their behaviour.

A non sustainable form of growth

In 1950, China emitted 79 million tons of CO₂, which was 1.13% of the total for world emissions at that time⁽⁵⁾. In 2004, it emitted 6.1 Gt of GHGs⁽⁶⁾, an amount equal to 15% of world emissions and all experts now agree that China is about to overtake the United States and to become the world’s biggest emitter of GHGs. The rapid expansion of these emissions in China, averaging a yearly increase of nearly 4% between 1994 and 2004⁽⁷⁾, is obviously linked to the acceleration in the rate of economic growth since the

3. Indeed, the Kyoto Protocol, which came into force on 16 February 2005, was on that date ratified by 156 countries (22 developed countries, 13 newly industrialised countries and 121 developing countries); six countries signed without ratifying (among them the United States and Australia who declared they had no intention of so doing); lastly, 30 countries neither signed nor ratified the Protocol. The signatories are divided into two groups. The smaller group, the developed countries, have signed Annex I, committing themselves to reduce their emissions of GHGs. The “non Annex I” countries include the developing countries and the NICs (including China): none of them are yet committed to reducing emissions. And after the failure of the Hague Conference of 2001, the countries of the European Union decided to adhere to the Kyoto Protocol at a time when it was not legally binding.
4. See for example Philippe Grangereau, “La Californie prend l’auto par les cornes,” *Libération*, 22 September 2006 and Guillaume Serina, “Climat. La révolte des maires américains,” *Le Monde*, 12 October 2006.
5. People’s Republic of China National Climate Change Programme, 4 June 2007, 56 pp.
6. Or 6.1 Gt of CO₂ equivalent (GtCO₂e), *ibid.*, p. 4.
7. *Ibid.* p. 5.

launch of the reforms in 1978. But beyond that observation, it is important to identify some basic factors in China's economic development that have caused such a phenomenon. This analysis will help us, secondly, to identify the challenges facing the Chinese government as it attempts to promote a more sustainable form of development.

The increase in China's population is most certainly the most fundamental indirect factor in explaining the huge growth in emissions of GHGs and, more generally, the rapid pollution of the environment that we have been witnessing over the past half-century in China. The campaign to raise the birth rate that Mao launched at the end of the 1950s led to an exponential increase in the population. Today there are estimated to be 750 million more people in China than were registered in the first census in 1953. Although each individual Chinese person emits three times less CO₂ than do individuals in the OECD countries, the demographic weight of China is such that it is impossible to calculate only in relative terms when assessing the impact of China's GHG emissions on world climate⁽⁸⁾. The economic takeoff of so populous a country leads inevitably to an explosion in the demand for energy. Last year alone, five new 300 megawatt power stations came into production each week in China, raising its energy output in just one year by the equivalent of the total output of France⁽⁹⁾. Between 1990 and 2004, China's additional production of electrical energy has caused emissions of 2.5 Gt of CO₂⁽¹⁰⁾, this sector being principally responsible for the country's emissions of GHGs.

Furthermore, as is shown in the article by Jean-Marie Martin Amouroux published in this dossier, 83% of China's electricity is generated by conventional coal-burning power plants. It so happens that coal, compared with the other forms of fossil fuel traditionally used in power plants, namely gas and oil, releases into the atmosphere twice as much CO₂. That explains the rapidly growing contribution made by power stations to China's total GHG emissions: it has risen from 14% to 43% between 1980 and 2000⁽¹¹⁾. In Guangdong province, China's biggest industrial and exporting region, electricity production has doubled between 1998 and 2004 and, by themselves, the conventional coal-burning power plants supplied nearly two-thirds of overall production as against the 20% supplied by oil-fired power stations⁽¹²⁾. For so populous a country, achieving such record rates of economic growth, China's dependence on coal for its enormous electricity requirements is an additional exacerbating factor in its unfavourable performance in atmospheric pollution.

The importance of industry in China's economic growth has also played a crucial role in the rapid increases in GHG

emissions. The country's socialist heritage strongly influenced the choice of investments in favour of heavy industry, which is highly energy-intensive. Despite the emergence of market mechanisms within the Chinese economy, industry (and, even more so, heavy industry) remains the sector in which investment rates and production growth rates are highest. Economic development normally tends to promote a lessening of energy intensity⁽¹³⁾ (and, in consequence, lower levels of gas emission in relation to GDP) due to faster growth in the services sector than in industry. Even so, despite better accounting methods in the informal services sector (leading in December 2005 to an official revaluation of Chinese GDP by nearly US\$300 billion), the services sector has levelled off at around 40% while industry has seen its share going up ever since the start of the 2000s. Yet, between 1980 and 2000, energy intensity did fall steadily at an average 20% every five years. In other words, whereas 100 energy units were used in 1980 to produce 100 GDP units, Chinese producers were using only 40 energy units by 2000 to produce the same quantity of GDP⁽¹⁴⁾. That amounts to a remarkable performance for an emerging country. However, since 2002, energy intensity has started going up again, which may portend serious difficulties for the government in its attempts to limit GHG emissions. The high growth of investment observed in heavy industry since the start of the 2000s is directly connected to that development. Within industry, it is precisely the steel, chemicals and cement sectors—very high consumers of electricity—that have recorded the highest growth. The fact that industrial sectors consuming most energy have grown more quickly than industrial sectors using less energy creates a paradoxical effect: energy intensity has certainly continued to fall in all industrial sectors but, because the production growth in sectors using more energy was more rapid, energy intensity measured across the

8. The value of international comparisons based only on per capita emissions is further weakened to the extent that, in a country like China, calculations include a significant part of the rural population that plays no part, other than marginally, in the modern economy centred upon the cities and on mass consumption. China's GHG emissions are principally the product of a modern market economy in which at best only 400-500 million people are taking any part.

9. Reuters, 23 March 2007.

10. *World Energy Outlook 2006*, *op. cit.*, p. 80.

11. *Ibid.*

12. Bill Barron *et al.*, "Owning up to Responsibility for Manufacturing Contributions to the Pearl River Delta's Poor Air Quality," Institute for the Environment, The Hong Kong University of Science and Technology and Civic Exchange, Hong Kong, 2006, 37 pp.

13. As measured according to the following formula: quantity of energy consumed divided by GDP.

14. Jiang Lin, "Managing Energy Demand: the Bridge to Sustainability", *China Economic Quarterly*, 4th quarter, 2006, p. 30

Baotou Steel works at dusk

whole of industry has increased⁽¹⁵⁾. Of course, this development has an undesirable impact on GHG emissions. Two adjustments would be necessary to limit their growth. Firstly, a production slowdown in those industrial sectors where energy consumption was strongest and, secondly, fast growth in services than in industry. Sadly, nothing suggests that, for the present, the Chinese economy is moving in that direction.

Lastly, we should take a detour by way of the political economics of the Chinese reforms, to understand the last fundamental factor explaining the rapid upward trend of GHG emissions. Political, fiscal and financial incentives offered to state officials at the local level led to over-investment and to fragmentation of the industrial structure. Decollectivisation of the countryside in 1978 opened the way to the creation of a multitude of small enterprises in rural areas, known as Township and Village Enterprises. At first they sprang up from the repair workshops of the people's communes but later on they widened their fields of activity into all industrial sectors. The development strategy of the Maoist period—"counting on one's own strengths"—applied also to rural areas which, in the context of the people's communes, were required to be largely autonomous when it came to producing and repairing agricultural equipment. In these cir-

cumstances, starting from the late 1960s and continuing through the 1970s, there was an explosion of small production units for cement, fertiliser, steel⁽¹⁶⁾ and even electricity. The 1978 reforms allowed these production workshops to expand into enterprises and to extend their scope of activity. From 1978 onwards, provincial and local leaders were judged not only on their political loyalty but also on their capacity to develop local industry. Their control over local financial dealings (and particularly over provincial branches of the big state banks) enabled them to pursue all-out industrialisation without worrying about any national effects arising out of the duplication of investments. China holds some unfortunate world records for the fragmentation of its industrial fabric. Thousands of small, indeed undersized, producers making the same products are scattered the length and breadth of the country. By the end of the 1990s, 8,000 independent cement producers were operating on Chinese soil, whereas in the rest of the world the number is put at no more

15. See the studies done by the Lawrence Berkeley National Laboratory.

16. The census records nearly 500 enterprises making steel at the end of the 1970s. See D. Perkins, "China's Economic Policy and Performances," in D. Twitchett and J. K. Fairbank, *The Cambridge History of China*, vol. 15, *The People's Republic*, Part 2, Cambridge Mass., Cambridge University Press, 1991, pp. 475-539.

than 1,500⁽¹⁷⁾. The same situation could be observed in practically all sectors of industry: 123 car producers, 1,500 steel plants, 2,900 glass producers⁽¹⁸⁾. Since the mid 1990s, the authorities have tried—with results varying according to sector—to rationalise industrial structures by closing and merging a large number of state and collective enterprises⁽¹⁹⁾. Fragmentation of the industrial fabric to this extent has had direct consequences for GHG emissions in that it has prevented quite a number of producers from reaching the critical mass allowing rationalisation of the means of production or the replacement of old, energy-intensive technologies. Moreover, this fragmentation has also affected the electricity production sector. The proliferation of conventional coal-burning power stations has impeded concentration of production, which would have allowed energy economies and, in particular, the introduction of new, less polluting technology. A study recently carried out in Guangdong⁽²⁰⁾ reveals that many factories operating in the textile, paper and agro-alimentary sectors have elected to produce electricity themselves, building small coal-fired power plants on their own sites. Obviously, such decisions slow down the provincial government's efforts to control SO₂ and CO₂ emissions. More generally, the government's repeated attempts to rationalise industrial structures have been blocked by the strong political (and monetary) incentives for local officials to favour quantitative growth; this in turn is dictated by the concern, at all state levels, to avoid uncontrolled growth in unemployment, so as to maintain social stability and, in the last resort, the legitimacy of the Communist Party.

All these factors—rapid increases in population, dependence on “conventional coal burning” for the generation of electricity, the high proportion of heavy industry in the economy and the fragmentation of industry—have combined, ever since the end of the 1970s, to create economic growth characterised by heavy GHGs. So when we consider the present rate of global warming, China appears in some ways the prisoner of its own non-sustainable form of growth. Its diplomatic status in international climate negotiations is thus weakened: being anxious not to endanger its own economic development or the stability of the present political system, Beijing has very tight margins for manoeuvre when asked to accept concessions on limiting GHG emissions. The only possible way forward for China, and likewise for the future of international climate control, would be a progressive transition to a more sustainable and more energy-saving form of development.

Towards sustainable development in China: the narrow path towards a domestic and diplomatic solution

The requirement for sustainable development on the international scale

In economics, as in other fields of knowledge, progress has always arisen from two phenomena (simultaneous or independent): taking account of a new reality and/or conceiving of a new perspective. When states are confronted by climate change, just as the “business as usual” approach is ineffective, the same applies to the neo-liberal economic approach, which sees in *laissez-faire* the remedy for all evils affecting both the social sphere and the biosphere. What is needed is a change of viewpoint, supplied in present circumstances by this notion, both new (it was formulated just about twenty years ago⁽²¹⁾) and also, in a certain sense, very old (one can trace its beginnings back to the Old Testament⁽²²⁾) but at any rate wholly at odds with the market forces ideology: sustainable development.

A development process is known as “sustainable” when it can “satisfy the needs of the present without compromising the chance for future generations to satisfy theirs.” This is a programmatic concept that calls for the creation of a double form of solidarity: sustainable development is “horizontal” as regards the most impoverished people of today and “vertical” between the generations; it invites us to think of economic activity in a global sense both in space (all the real economies are involved) and in time (the fate of generations to come must be taken into account). The influence of this

17. China Research Team, “China: Price War and Price Control,” in Warburg Dillon Read, December 1998, p. 14.
18. Zhongguo shehuixueyuan gongye jingji yanjiusuo, Zhongguo gongye fazhan baogao 1997 (Report on industrial development in China 1997), Beijing, Jingji guanli chubanshi, 1997.
19. Jean-François Huchet, “Privatisation et restructuration des PME d'État en Chine,” *Critique internationale*, n° 32, July 2006, p. 173-197 and “Industry Reorganisation and Restructuring: Prospects, Problems and Policy Priorities,” in OECD (ed), China in the World Economy. The Domestic Policy Challenges, Paris, OECD, 2002, pp. 161-192.
20. Bill Barron *et al.*, “Owning up to Responsibility for Manufacturing Contributions to the Pearl River Delta's Poor Air Quality,” *op. cit.*
21. The notion of sustainable development was defined for the first time in WCED (World Commission on Environment and Development), *Our Common Future*, Montreal, Les Éditions du Fleuve, 1988 (1st English edition 1987). For a brief history of the idea, see Jean-Paul Maréchal, “Développement durable,” in Jean-Louis Laville and Antonio David Cattani (dir.), *Dictionnaire de l'autre économie*, Paris, Gallimard, col. “Folio”, 2006, pp. 153-163.
22. See Jean-Paul Maréchal, “L'éthique écologique de la Bible,” *Écologie et politique*, n° 33, 2006, pp. 187-200.

expression has been such that the very meaning of the term “development” has been affected by it. It does not hark back to what French people remember as the “Glorious Thirty”—the three decades following the Second World War, when the so-called “economics of development” consisted of a collection of analyses and proposals aimed at helping the third world to catch up with the industrialised countries; rather, it derives from an all-embracing reflection, taking in all countries, on the ultimate ends of economic life and thought, and from the requirement to look afresh at the relationships between economics, society and the biosphere.

Sustainable development is a normative concept opposed to any sacrificial approach by economic life: it demands that, in all circumstances, only equitable solutions should be conceived and put into effect, this being an essential condition of their being accepted. From Emmanuel Kant to John Rawls by way of Michael Walzer, Charles Kindleberger or Jürgen Habermas, there is no shortage of ideas from around the world offering peace between nations and co-operation to assure wellbeing for all⁽²³⁾. Yet, whatever may be the theory advanced, the institutional arrangements imagined, the mechanisms devised, yearly emissions of GHGs must not exceed 5 Gt of CO₂ equivalent (that figure representing only 12% of the present rate of emissions, now estimated at 42 GTCO₂e)⁽²⁴⁾. This limit for the planet must be applied as a constraint over and above all political and economic calculations.

A feasible mechanism, one that is fundamental to the Kyoto Protocol and also to the European Emissions Trading Scheme (ETS), which took effect on 1 January 2005, is that known as “cap and trade.” By this expression is meant an approach whereby a maximum limit is set upon the overall amount of a pollutant that can be emitted (the cap) and a market is created where polluters who emit more GHGs than their agreed allowances must buy credits from those who pollute less (the trade).

However, while the cap and trade method does settle the question of the overall limits to pollution, it does not resolve that of the initial allocation of emission rights. Possible solutions range between two opposing cases. At one extreme there is the proposal for “acquired rights” (also known as “grandfathering”) whereby each polluter, state or company, is allocated a quantity of polluting rights calculated on two bases: the overall target for emissions reduction and its own level of emissions during a trial year. At the other extreme, there is the proposal for quotas based on a uniform allocation per inhabitant: the scheme is based upon the notion that each human being should have the individual and uni-

versal right to emit a certain quantity of GHGs. Between these extremes, of course, other schemes are proposed. One idea, for example, is for polluters to start with an initial allocation based on acquired rights, but each would be set the long-term target of reaching convergence of emission levels⁽²⁵⁾.

To achieve that demand, despite the obvious need for it, is no easy thing. In fact, the formulation of a Global Public Good is complicated by the absence of any transnational authority. Unlike a private good, a public good such as the climate—and this is also the case with national defence or internal security—has, according to economic theory, the following two properties: “non-exclusion” and “non-rivalry.” What is understood by the first is that no economic agent may be deprived of the benefit of the production of the good in question; the second is that the consumption of the said good by one person does not in any way lessen its availability for others to consume it. It is this double condition that makes the market incapable of producing these goods, indispensable though they are to the proper functioning of the economic sphere⁽²⁶⁾ itself; and, by that very fact, it makes it essential for the state to intervene, being the only agent in a position to finance the production of public benefits out of taxation. Originally conceived as relating to the national economy, the notion of public goods has, these past few years, been extended to the international sphere. Hence the expressions International Public Good, World Public Good or Global Public Good and figuring among these goods, of course, are peace and units of measurement—and also climatic stability.

Added to the failures of the market, however, which justify state intervention to produce National Public Goods, are the failures of states themselves in supplying Global Public Goods; what is true for economic agents in the framework of the domestic market (namely, opportunistic behaviour) is also true for states in the relationships they maintain with each other.

So, one thing is essential: to progress from rivalry to co-operation. For that, game theory teaches us that there is no

23. See Philip Golub and Jean-Paul Maréchal, “Hyper-puissance américaine et biens publics globaux,” *Géoeconomie*, n° 30, summer 2004, pp. 9-40.

24. Nicholas Stern, *The Economics of Climate Change*, *op. cit.*

25. For further details on these measures, see Renaud Crassous and Sandrine Mathy, “Peut-on étendre le système des quotas échangeables aux PED?,” *Problèmes économiques*, n° 2, 904, 19 July 2006, pp. 25-29; Philippe Roos, “Les marchés de droits à polluer,” *Problèmes économiques*, n° 2, 904, 19 July 2006, pp. 21-24; Annie Vallée, *Économie de l’environnement*, Paris, Seuil, col. “Points”, 2002.

26. Indeed, in such circumstances, no consumer has any interest in paying for something that is available free; and in consequence no enterprise has any incentive to produce it.

need for friendship (fortunately: if there were, we should consider moving at once to another habitable planet!), but only for interactions taking place in time. To put it more precisely, co-operation may be created out of the sustainability of the relations between the players, in that the latter may be ready to meet each other again. Who could deny that negotiations on climate control are an example of this kind of situation? But there is still the possibility of tit for tat: one player failing to attend might push others into retaliating by staying away themselves. This outcome would, in the case of climate negotiations, be a recipe for disaster.

Of course, a desirable solution would consist in finding a central power capable of enforcing support for a set of standards⁽²⁷⁾. Here, there is a French idea that might turn out particularly apt (targeting specifically the United States and Australia)⁽²⁸⁾. The proposal is for a “carbon tax” on imports of industrial products coming from countries refusing to commit themselves post-2012 to some mechanism similar to that adopted at Kyoto. Such a tax would work well in the European context in the fight against environmental dumping. One would remind those who assert that such a measure would be as Peter Mandelson stated “contrary to the spirit of international co-operation,” that Article 4 of the Montreal Protocol of 16 September 1987 (came into force on 1 January 1989) on substances weakening the ozone layer, obliged all participating countries to ban, by 1 January 1990 at the latest, any CFC trade with states which did not sign up to the said Protocol.

In the absence of any such transnational power, it is for the present the example set by national policies—adopted unilaterally or in concert—that might turn out to be decisive. Some countries have the courage to take measures harmful to their own immediate interests, even though, in the long run, these measures serve the common good (including their own). In so doing, they are able to make an impact—at least a partial one—on the way their partners and rivals prepare themselves to face climate change. Thus, they exert a persuasive influence, they play a constructive role, they are (to borrow a phrase from François Perroux) “active units,” which is to say that they are agents likely to change the context within which they act. One example was the perseverance of the European Union after the failure of the Hague Conference and the US withdrawal from the process begun in 1997: this made it possible, following Russian ratification in 2005, for the Kyoto Protocol to come into force. The emergence of a more sustainable form of development in a country like China would represent, clearly, a historical crossroads.

Is China the prisoner of its growth model?

China is facing serious damage to its environment. According to the “Environmental Sustainability Index” produced in 2005 by the American universities of Yale and Columbia, out of 144 countries listed, China lies in 133rd position⁽²⁹⁾. All studies are unanimous: Chinese growth must now be reshaped into a more sustainable model, if it is not to cause irreversible damage to the environment and a severe threat to human health⁽³⁰⁾. The question of GHG emissions is at the heart of this crisis: policies must be adopted to allow less intensive use of energy and to reduce the pressure on the environmental resources of the country and the planet. The sheer extent of the damage so far has shocked China’s leaders and its people. And, ever since the mid 1990s, numerous measures favouring the environment have been introduced. To control GHG emissions, China has in recent years introduced several energy-saving plans setting ambitious targets for the decades ahead. The Eleventh Plan (2006-2010) contains an important section on the environment and on steps towards a more sustainable form of economic development. Moreover, the law on renewable forms of energy came into force on 1 January 2006. The target set in the Plan is to reduce dependence on coal from the present level of 74% to something less than 60%, to restrict usage of oil because of China’s dependence on foreign suppliers and to exploit renewable sources of energy (including nuclear and hydroelectric) to the point where they provide 30% of China’s energy needs by 2030. Last June, the Chinese government published a national plan on global warming⁽³¹⁾ partly taking up the measures in the Eleventh Plan and those in the law on renewable energy sources while proposing a series of institutional innovations and specific measures on agriculture, industry, services and R&D with the aim of promoting growth less dependent on GHG emissions. Further, China is an active participant in the Clean Development Mechanism as provided for under the Kyoto Protocol. The mechanism is designed to help reduce GHG emissions in the developing world using technologies funded by companies in the developed countries (see the interview

27. See Robert Axelrod, *Donnant donnant. Théorie du comportement coopératif*, Paris, Odile Jacob, 1992.

28. See Dominique de Villepin, “Allocution à l’occasion du Comité interministériel pour le développement durable,” 13 November 2006.

29. Jin Bei, “China Under Resource and Environmental Constraints,” *China Economist*, March 2006, pp. 11-23.

30. See the most recent report by the World Bank, “Cost of Pollution in China,” Washington, World Bank & SEPA, 2007, 151 pp.

with Philippe Delhaise published in this dossier). And indeed, Chinese enterprises are the first, among the developing countries, to benefit from such financial transfers. A grant for an exchange of CO₂ emission rights modelled on the European experiment is being examined between Guangdong province and Hong Kong⁽³²⁾. Lastly, among the initiatives launched in recent years, several pilot trials to cut air pollution have been carried out in collaboration between environmental protection agencies of industrialised countries and Chinese municipalities, notably in the cities of Benxi (in the north-east) and Taiyuan. Even though these pilots are mainly designed to limit SO₂ emissions, they do contribute directly to reducing CO₂ emissions by cutting consumption of coal. Also, the measures put in place during these experiments could be used in other Chinese cities⁽³³⁾. In sum, if one takes account of all these government initiatives, China is certainly, at this stage of economic development, ahead of other NICs in its efforts to introduce measures to reduce energy consumption.

These projects, including initiatives being taken by private citizens, are detailed and discussed at length in articles within this dossier. We seek here merely to assess in a more general way their chances of success. Indeed, the Chinese government has commissioned more than one official report on the environment. This type of document, indicating the direction of the country's industrial and technological policy, is often no more than a declaration of intent, too ambitious and without any precise operating plans, one that fades on contact with reality and local clientelism. Pan Yue, Vice Minister of the State Environmental Protection Administration (SEPA), declared recently, "China has signed [. . .] nearly fifty international agreements on respect for the environment, and we do very little to honour them. [. . .] Although the new five-year plan sets some good targets, many provinces have not yet succeeded in respecting the objectives set in the previous five-year plan⁽³⁴⁾." Also, before going back over the uncertainties attending China's capacity to advance towards a sustainable form of growth, let us try to estimate what might contribute to the success of these policies or, at the very least, to their being more effective than those adopted in the past.

The sense of urgency combined with the seriousness of the damage to the environment and the concomitant threat to the pursuit of growth might play a positive role. They may push the central government into maintaining over time its pressure on local government officials, thus limiting the effects of local clientelism. Further pressure is also exerted on different levels of the state via the press and Web discussion forums, the latter increasingly reflect the growing awareness

in Chinese society of environmental questions⁽³⁵⁾. When it comes to financing these policies, the Chinese government is in a far more favourable situation than it was during the 1990s. Savings rates continue to be among the highest in the world and government finances are considerably more healthy thanks to economic growth and the introduction of far-reaching fiscal reforms in 1994. The Chinese government has become far more competent at devising and implementing its industrial and technological strategy than it was in the 1990s⁽³⁶⁾. It enjoys the special advantage of being a late comer in terms of power-generating technology, particularly at a time of strong growth in energy demand. Between now and 2015, China is planning to build new power stations whose combined output will equal the total output of all countries of the European Union⁽³⁷⁾. The building of these new plants provides an opportunity for concentrating production of electricity in large-scale units emitting much smaller quantities of GHGs, unlike those countries where growth in energy demand is weak, the stock of existing power stations can respond to new requirements. Accordingly, China can expect to achieve a significant reduction in energy intensity by building power stations using new technology⁽³⁸⁾. Similarly, the relative price of substitution technology is likely to drop far more quickly in China in view of the extent of demand. Between now and 2010, the cost per kilowatt in US dollars of an IGCC (Integrated Gasification Combined Cycle) power plant could well be halved, because of Chinese demand for this type of plant⁽³⁹⁾. In sum, these different factors are likely to play a positive role in the success of government policies designed to limit GHG emissions and to achieve energy savings. They are nevertheless counterbalanced by the grave uncertainty weighing on China as to its capacity to break swiftly with the existing growth model that we have described in the first part, and

31. National Development and Reform Commission, *China's National Climate Change Program*, Beijing, June 2007, 63 pp., available at: www.en.ndrc.gov.cn/newsrelease/PO20070604561191006823.pdf.

32. Simon Powell *et al.*, *The Emissions Game. How Markets Can Help Save the Planet*, CLSA, Blue Book, Global Environment, January 2007, p. 41.

33. *Ibid.*, p. 39.

34. "Towards a Green GDP, *South China Morning Post*, 2 December 2006.

35. Susan Shirk, *China, Fragile Superpower*, New York, Oxford University Press, 2007, 320 pp.

36. Shulin Gu and Bengt-Åke Lundvall, *China's Innovation System and the Move Towards Harmonious Growth and Endogenous Innovation*, working document, Copenhagen Business School, Department of Industrial Economics and Strategy, Department of Business Studies, 2007, 33 pp.

37. *World Energy Outlook 2006*, *op. cit.*

38. James Brock, "Energy Substitution, when China Is Different", *China Economic Quarterly*, 4th quarter, 2006, p. 20.

to advance towards a more sustainable method of developing its economy.

The government's stated aims are still to maintain growth fast enough to quadruple China's GDP by 2020. The fundamentals of the Chinese economy (education, infrastructure, domestic market, exports, budget, foreign debt) are certainly on course to achieve that rate of growth, even to surpass it. In this context, the demand for energy is likely to continue to grow at a steady rate. The IEA, in its forecast up to 2030, considers that China will by itself represent 30% of the world's extra demand for energy. For its part, the Chinese government has forecast, consistent with its aim of quadrupling GDP by 2020, only double the usage of energy⁽⁴⁰⁾, which would imply a significant fall in energy intensity. We noted earlier that China recorded considerable gains in energy intensity between 1980 and the early 2000s but that, from 2002 onwards, energy intensity began to increase. In line with those factors associated with the growth of industry that we have remarked on, several elements suggest that this turnaround could also reflect that the improvements most easily achieved are coming to an end. In fact, easy progress was recorded by replacing obsolete technology dating back to Maoist times and to the start of the reforms. Important sectorial and regional advances were also made between 1993 and 2002 after the launch of massive restructuring of the state sector. That had led in turn to the closure or concentration of enterprises set up during the period of socialist industrialisation, these being inefficient in their consumption of energy⁽⁴¹⁾. Such readily accessible forms of improvement are now perhaps in short supply: consequently it is increasingly difficult to maintain the rate of reduction in CO₂ emissions per unit of GDP, all the more so since strong growth in industrial sectors will continue⁽⁴²⁾.

To this difficulty is added another, probably lasting, problem: strong dependence on conventional coal-burning in the production of energy and, more particularly, of electricity. According to the IEA, Chinese demand for electrical power will continue to swell at a high rate, rising by an estimated 7.6% annually up until 2015 and afterwards by nearly 5% until 2030. Because of still relatively low coal prices and the growing external dependence on oil, the IEA estimates that most of this extra electrical supply will be provided by coal-burning power stations⁽⁴³⁾. When we come to the promotion of renewable energy sources (not including hydroelectric), even with the best will in the world, their contribution would rise no higher than 10% by 2030⁽⁴⁴⁾. In passing, it is interesting to note that, as a proportion of China's overall investment allocated to energy, investment in energy-saving has

fallen considerably over recent years: from 8% in the 1990s to 4% since the start of the new millennium⁽⁴⁵⁾. One of the most important concerns relating to GHG emissions is whether China will be able promote widespread use of the new "clean coal" technology and the CO₂ capture process in coal-fired power plants. We saw a little earlier that, in the context of strong demand and falling prices for new technology, China could mark a technological leap in the new plants that it plans to build over the next two decades. But as Jean-Marie Martin Amouroux points out elsewhere in this dossier, the general application of new technology, such as the building of IGCC plants, will be possible only in twenty years' time. It is also interesting to note that the IEA, in its energy scenario for 2030, includes none of the technologies for capture and stocking of CO₂ in coal-fired power plants⁽⁴⁶⁾. In 2030—and particularly in Asia where demand will be strongest—coal would remain the main source of energy; according to the IEA, China and India would be responsible for up to 60% of the additional emissions of CO₂ from the new coal-fired power stations.

As regards the concentration of the industrial system, including the total stock of power plants, despite the progress since the mid 1990s, one has to observe that China's industrial structure will still be widely dispersed, compared with prevailing world trends⁽⁴⁷⁾. Studies by the OECD show, moreover, that concentration indices have varied hardly at all since 1998⁽⁴⁸⁾. Market forces, which traditionally favour concentration, operate differently in China: political, fiscal and monetary incentives induce local government officials to favour the building of factories in their areas without worrying about the effects of duplication on the national scale. The decentralisation of the decision-making system as regards investment, launched in 1978 by Deng Xiaoping, is at

39. *Ibid.*, p. 22.

40. *World Energy Outlook 2006*, *op. cit.*, 2006.

41. See studies by Johanna Lewis *et al.*, "Sectorial and Geographical Analysis of the Decline in China's National Energy Consumption in the Late 1990s," prepared for the ACEEE conference; also "Energy Efficiency in Industry," Rye Brook, New York, July 2003, available at http://china.lbl.gov/china_pubs-ind.html. Jiang Lin, "Managing Energy Demand. The Bridge to Sustainability", *op. cit.*, p. 30.

42. *World Energy Outlook 2006*, *op. cit.*, p. 138.

43. *World Energy Outlook 2006*, *op. cit.*, p. 138.

44. Research Centre for Sustainable Development, *Understanding China's Energy Policy*, Background Paper for Stern Review on the Economics of Climate Change, Academy of Social Sciences, Beijing, 2006, p. 41.

45. *Ibid.*, p. 185.

46. OECD, *China Economic Survey*, Paris, OECD, 2006, pp. 116 and 117.

47. *Ibid.*

48. Barry Naughton, *The Chinese Economy: Transitions and Growth*, Cambridge Mass., MIT Press, 2007, 504 pp.

the heart of the economic reforms. And Prime Minister Zhu Rongji's attempts during the 1990s to recentralise the system did not fundamentally change it. In a system where the state continues to account (via its own public enterprises) for a little over half of all investment⁽⁴⁹⁾ and where the banking system remains under state control, decentralising the decisions on investment to the local authorities continues to cause serious dispersal of investment. The proof is that, despite constant calls to order by central government since 2003, and warnings about over-investment and the creation of bubbles in several industrial sectors, provincial and local administrations have turned a deaf ear. They have continued to authorise and to finance the building of factories in their own areas, in such sectors as steel, car making, construction and chemicals where production capacity was already excessive. Central government is well aware that decentralising decisions about investment to regional and local administrations is just as much a source of dynamism (growth rates) as of inefficiencies (in terms of energy and financing). Even so, as Susan Shirk demonstrates⁽⁵⁰⁾, social stability is an obsession with the Chinese Communist Party: and only a high rate of growth can guarantee it. So it is probable that the central authorities are opting to keep this decentralised and somewhat anarchic mode of decision-making on investments, in preference to a more centralised system that might lead to a concentration of the industrial machine but would impair the decision-making autonomy of the provinces and remove the local officials' incentives. Population growth is less likely to play an unfavourable role. The demographic transition has been largely under way ever since the start of the 1980s. China's population is expected to continue increasing at a moderate rate until around 2031, and thereafter to decline sharply from 2050 onwards. Nevertheless, rapid urbanisation will inevitably have negative effects on GHG emissions since it is estimated that nearly 400 million people will migrate from the countryside to the cities over the next thirty years⁽⁵¹⁾. This huge movement of people is expected to bring about significant growth in the demand for energy as rural lifestyles change. China's Academy of Social Sciences estimated recently that city-dwellers were consuming 3.5 times more energy than people living in the countryside⁽⁵²⁾. The demand for energy generated by the construction and residential sectors, which already amounts to 11% of total demand (ranking second after industry), will therefore grow considerably over the decades ahead. As is shown in the article by Julien Allaire in this dossier, inasmuch as, once built, cities' levels of GHG emissions are more or less fixed, the decisions taken over the coming years

on the building of energy-saving residential apartment blocks will be crucial, if Chinese cities are to keep GHG emissions low. Lastly, urbanisation is also likely to contribute in substantially increasing private car usage. The total number of cars in the country could thus rise from 25 million vehicles in 2004 to over 150 million by 2030⁽⁵³⁾. It goes without saying that, if the Chinese authorities do not resolutely pursue public transport and strict controls over vehicle pollution, accompanied by the promotion of clean alternative fuels, this exponential increase in the numbers of vehicles on Chinese roads will lead to big increases in GHG emissions, threatening to cancel out all the efforts being made in other sectors of the economy.

So it is still difficult to see whether China will really commit itself to the path of sustainable development over the coming years. Despite a genuine awareness in government and society, as reflected in the proliferation of plans to limit GHG emissions, numerous uncertainties and difficulties remain. As we pointed out at the start of this article, inertia and the pursuit of short-term prosperity are formidable foes when it comes to tackling environmental problems: they push individuals and governments into maintaining irrational options that imperil their long-term survival. In a country like China, where nearly two-thirds of the population have only marginal stakes in the market economy, this "prisoner's dilemma" is more real than in the developed countries, inasmuch as access to material well-being will remain the first objective for several hundred million people over the decades ahead. The Chinese state is modernising rapidly, but is it truly ready to pursue policies that will have to alter lastingly and profoundly the behaviour of economic agents, sometimes risking unpopularity, at a time when many other states, economically more developed, are meeting many difficulties along this path? It is legitimate to express doubts, as we have shown in the second part of this article. It is not surprising that, in its forecast for 2030, the IEA took a prudent, even pessimistic, line in its predictions for China as regards GHG emissions: these could amount to 8.8 Gt of CO₂ by 2030, which would be 28% of world emissions. They would

49. Susan Shirk, *China, Fragile Superpower*, *op. cit.*

50. Research Centre for Sustainable Development, *Understanding China's Energy Policy*, Background Paper for Stern Review on the Economics of Climate Change, *op. cit.*, p. 12.

51. *Ibid.*, p. 14.

52. Doug Ogden, *China's Sustainable Energy Prospect*, The Energy Foundation, The China Sustainable Energy Program, Beijing, 2006.

53. *World Energy Outlook 2006*, *op. cit.*. See also the estimates in Research Centre for Sustainable Development, *Understanding China's Energy Policy*, Background Paper for Stern Review on the Economics of Climate Change, *op. cit.*, pp. 10-13.

represent half the emissions by NICs; and, between now and 2030, China's additional GHG emissions might be double the combined total emissions of the OECD countries⁵⁴. If this scenario were realised, it would be disastrous news for the global climate. China's emissions (together with India's) would go a long way towards confirming the pessimistic forecast in the Stern report. Confronted by these challenges, one can only hope that the anxieties expressed in this article turn out to be unfounded, and that the arguments for China being capable of swift development towards more sustainable economic development will prevail. The

role of the United States in this international and domestic "poker game" will be decisive. A gesture and a full commitment towards climate control, similar to those made by the European Union, Japan and Canada, would give extra time for China (and for India too) to adjust their energy strategy. Further, it would place China in an increasingly isolated diplomatic situation in its refusal to accept restrictions on GHG emissions. The need for China to switch to a more sustainable form of development would become still more urgent. •

54. Nicholas Stern, *The Economics of Climate Change*, *op. cit.*.