DOI:10.16262/j.cnki.1005-0841.2005.01.022

China: Green Development and Green GDP

Hu Angang

(School of Public and Management, Tsinghua University, Beijing 100084)

During the past 20 years, China has been one of the countries whose economic growth rate is the fastest in the world, and whose domestic saving rate (as a percentage of GDP) and domestic investment rate (as a percentage of GDP) are the highest. According to the statistics of World Bank (2000a)[1] the average GDP growth rates of 1980s and 1990s in China are respectively 10. 1% and 10.7%, ranking the second among the 206 countries and regions in the world (only second to Botswana, a natural abundant African Country), and the first. In 1999, the domestic saving rate and investment rate in China were respectively 42% and 40%, listed top in the world, 20% higher than the average world level at that time. Meanwhile, however, according to the just published World Bank Database (2002, 2003), the cost of natural capital in China is also shockingly high. To a great extent, it counteracts the nominal domestic saving rate and investment rate, cutting down at least 20% of the genuine domestic savings rate in 1985, and 4.5% up to 1998, and reversed to 6.3% by 2001.

Presently, the national economic accounts system, which is based on nominal GDP, has severe flaws. It does not take out the cost of natural capital, and puts the values of overexploited resources and energy, especially the non-reproducible resources, into the GDP as additional value. This will factitiously exaggerate the economic income, at the expense of rapid consumption of natural resources and severe deterioration of environment, and will inevitably lead to great reduction of the real national welfare. Therefore, it is necessary to emendate the current national accounts system[2,3].

Since 1995, experts from World Bank have begun to redefine and measure the world's wealth. They proposed the green national accounts system to measure the national wealth[4]. The meaning of the so-called wealth is comprehensive. It includes produced assets, natural capital and human resources, among which the produced capital are traditionally measured by national economic accounts system as national wealth, whereas natural capital and human resources are significant parts of national wealth in the new synthesized national economic accounts system. Green GDP is a new type of national wealth, or a new type of income estimation. Human resources are the most important part of the real national wealth, accounting for about 40% ~ 80% of the gross national wealth. Generally speaking, the rate of advanced countries is higher than that of the natural resources abundant countries. The produced capital is the second important factor, accounting for 15% ~30% of the gross national wealth. Natural resources rank the third, accounting for 2%~40%, whereas this factor lists in the second place in some regions in the Middle East and West Africa.

World Bank (1997)[4] first proposed the concept and calculation method of genuine domestic savings, which means the real savings rate of a country, after the depletion of natural resources (especially the non-reproducible resources) and the cost of environment pollution are deducted. Natural resources depletion is measured by the rent of exploiting and procuring natural resources. The rent is the difference of the producing price (calculated by the international price) and total producing costs. The costs include the depreciation of fixed capital and return of capital. One thing must be pointed out: rational exploitation of natural resources is necessary to promot economic growth, however, if the resource rent is too low, it will induce over-exploitation. If the resources rents are not put into reinvestment (e.g. investment in human resources), but are put into consumption, it is also "irrational". Pollution cost mostly refers to CO_2 pollution. It is calculated by the global margin cost caused by emission of one ton CO_2, for which Fankhauser suggested as 20 US dollars (1995)[5]. This calculation does not include air, water and other pollution. According to the calculation of World Bank, 39% of the gross wealth in the Middle East comes from natural capital, most of which are oil and natural gas. After taken out natural resources deple-

tion, the genuine savings rates in these countries are all negative (see Table 1). According to the research of Sachs and Warner in Harvard University (1995)[6], ever since the 1970s, the economic growth rate of natural resources abundant countries has been much lower than that of the resources barren ones. The study of World Bank also shows that countries relying heavily on natural resources suffer greater cost, and the genuine domestic savings are low or even negative.

Table 1 Genuine Savings Rate (ratio as a percentage of GDP, %)

Regions and Income Types	1970—1979	1980—1989	1990—1993
Regions south to Sahara, Africa	7 3	−3 2 (1 7)—1.7 (2.4)	
Latin America and Caribbean	10 4	1 9 (1 7)	5 1 (3 4)
East Asia and the Pacific Ocean	15 1	12 6 (8 0)	19 3 (7 4)
The Middle East and North Africa	−8 9	−7 7 (2 0)	−7 0 (3 0)
South Asia	7 2	6 5 (5 7)	6 9 (5 7)
High income OECD countries	15 7	12 4 (3.1)	14 5 (2 4)
Low Income Group	9 8	3 3 (4 4)	8 2 (2 4)
Medium High Income Group	7.2	2 9 (3 2)	8 9 (3 5)
High Income Group	15 2	12 3 (3 1)	14 7 (2 4)

Source: Kirk Hamilton and Michael Clemens, 1998; World Bank, 2000a
Data in the brackets are economic growth rate respectively in the 1980s and 1990s.

World Bank (2000b)[7] has estimated various natural resources cost in many countries since 1970. Here we list the data of China, USA and Japan. The conclusions are: First, energy depletion accounts for the most part of natural capital cost. The natural capital cost as a percentage of GDP experienced a rising and falling curve (see Fig. 1). In the 1970s, with the large-scale oil and coal exploitation, the natural capital cost as a percentage of GDP rose sharply, and peaked in the 1980—close to about 1/4 of GDP. In the late of 1980s, it fell to about 10%, and further declined to a little over 5% in the early of 1990s. During recent years, the rate dropped rapidly to less than 1.5% in 1998, and reversed to 2.8% in 2001. Such change explained that the industrial restructuring, especially energy consumption restructuring during the "ninth five-year plan" is one of the key reasons for the declining share of energy depletion as share of GDP. Energy depletion accounts for a large share in natural asset cost, and it has an influential effect on cutting down the natural capital cost rate as a percentage of GDP during this period. However, after entering into the "tenth five-year plan", the economic development in China, driven by the high capital input and high energy depletion rather than the technology progress and improved efficiency, reversed back to the low-quality, high-growth path. According to the latest statistics of BP in 2004, China's coal production accounted for 33.5% of the world total (US coal production was 21.9% of the world total) in 2003, and its coal consumption accounted for 31. 0 % of the world total (22. 3 % for the US). These two shares are much higher than the share of China's population and China's GDP in the world total. Thus we can draw the conclusion, that China is the largest dirty energy producer and consumer. The dirty energy production and consumption has not only made the Chinese people the gravest victims, but also affected the global environment and the safety of mankind to a large extent.

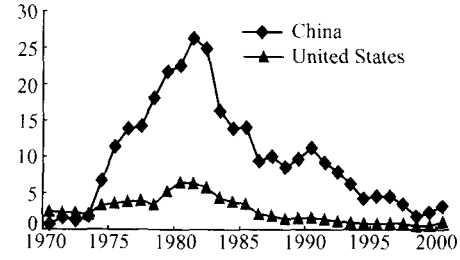

Fig. 1 Energy Depletion Cost (% of GDP).

Second, the cost of CO_2 pollution ranks the second as a percentage of GDP. In the 1970s, the cost was over 4%, and around 4% in the 1980s. In the 1990s, the rate began to decline. The declining trend was especially obvious during the late 1990s and reached the lowest point since the 1970s to 2. 33% in 1998. However, compared with the other countries, this rate is still much higher than that of the USA and Japan (see Fig. 2). There is still one thing to add: the calculation does not include the cost of water pollution, SO_2 and other noxious emission pollution.

If these are taken into account, the total cost of pollution will be probably 3.5%. World Bank (1997b)[8] calculated China's cost caused by air and water pollution by human capital method, and the result accounted for 3.8% ~ 7.8% of GDP. The decrease of the cost of CO_2 emission as a percentage of GDP during the late of the 1990s also helps to reduce the rate of natural resources as a percentage of GDP. We noted that the unit CO_2 emission as a percentage of GDP is a rising and falling curve since the middle of the 1960s, and during the late of 1990s, it shows an obvious trend of falling (See Fig. 3). This phenomenon indicates that the economic growth rate is higher than the CO_2 emission speed. The increase of their difference implies that the pollutant emission intensity is decreasing. However, due to the high growth of energy consumption during the "tenth five-year plan", especially the rapid increase in coal consumption, the CO_2 emission cost in 2003 might reverse back to the level of mid-1990s.

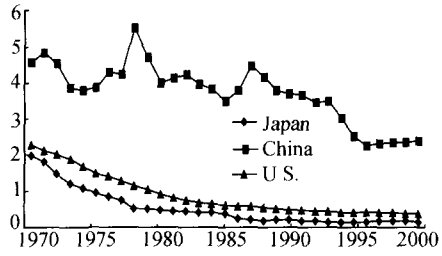

Fig. 2 CO_2 Emission Cost as Share of GDP (%).

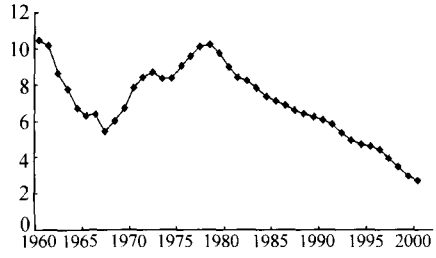

Fig. 3 China's Unit GDP CO_2 Emission (kg/1995 dollar).

Third, mineral consumption or depletion ranks the third in natural capital cost. During the recent 20 years, there have been successively two exploitation depletions (see Fig. 4). The first exploitation depletion took place between the late 1970s and the early 1980s, and the cost accounted for 1.2% of GDP. The second one was between the late 1980s and the early 1990s, and the cost was 0.8% ~ 1.2% of GDP. Since the 1990s, this cost as a percentage of GDP distinctly fell down, till less than 0.2% in 2001. The mineral output of the USA is very large, but its mineral depletion cost as a percentage of GDP is much less than China.

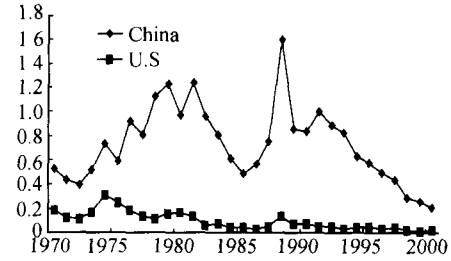

Fig. 4 Mineral Resources Depletion as Share of GDP (%).

Fourth, the cost of forest depletion as a percentage of GDP is comparatively the smallest. However, it shows a rising trend ever since the reform, mounting from less than 0.2% of GDP up to 0.8% in the middle of the 1990s. During the "ninth five-year plan" period, this rate dropped substantively, declined to 0.43% in 1998, 0.07% in 2000, but increased to 1.0% in 2001 (see Fig. 5). There is one thing to be pointed out. Since the reform, the timber output has been ascending, and peaked at 67673 in 1995. After that, the government carried out the project to protect natural forest, forbade disafforestation, cut down timber output target, and increased timber import. By 2002, timber output decreased to 44.36 million steres, which is 1/3 (34.4%) lower than in 1995 (see Fig. 6). If the current forest protection policy can be carried on, the forest depletion cost as a percentage of GDP in the future years will be less than 0.2%. During the past 50 years, the cardinal point of China's forestry policy was to "cut big woods"; the Ministry of Forestry was "Ministry of Felling"; the state-owned forestry enterprises were "felling enterprises" that destroyed the forest ecology. China experienced a process of large-scale exploitation and fast speed of forest resources depletion. Not until the late 1990s did this situation begin to reverse towards limited felling and vigorous protection. The history shows that we did not have a deep understanding of China's basic situation, and took a false step of "first destroy, then protect". According to the data provided by World Bank (1997)[4], although the natural capital per capita of China is only a bit higher than that of Japan, the forest resource capital per capita of Japan is 2.4 times more than that of China. The forest coverage rate in Japan is as high as 65%. However, Japan still keeps import timbers in

large scale, accounting for 22. 4% of the world's gross amount in 1998, whereas the import amount of China accounted for only 4.7% . Canada, Russia and the USA are the three largest timbers export countries, accounting for 45.0% of the international timber export market ("World Situation", Japan, 2000/2001) This situation indicates that China needs to further cut down the import tariffs on timbers and its processed products (e. g. paper or paper pulp), or even to practice zero tariffs, so as to expand its power of utilizing the international forest resources, and to protect the domestic forest resources for 50 years.

Fifth, China's cost of natural capital as a percentage of GDP is shockingly high. It is a rising

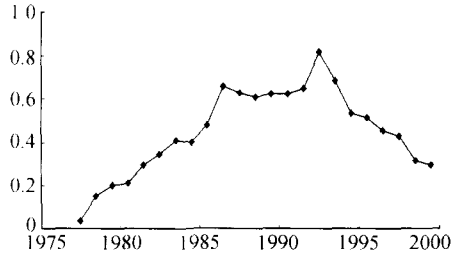

Fig. 5 China's Forest Depletion as Share of GDP (%).

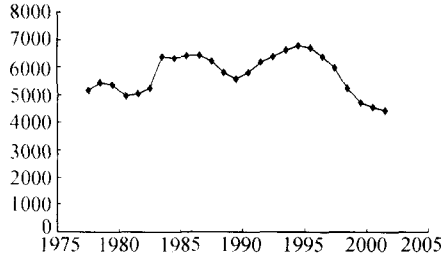

Fig. *6 China's Timber Production* (*10 thousand stere*).

and then falling process (see Fig. 7). According to this condition, we can give an objective evaluation on the economic, energy and environment protection policies and their effects in different times. During the early 1970s, the cost accounted for 6% ~ 7% of GDP. Between the late 1970s and 1980s, the economic cost reached its peak, as high as 30% of GDP. After that, it began to drop, reaching about 15% in the late 1980s. Just as the author pointed out in the national situation report " Subsistence and Development" (1989), the economic development in the early days of the reform was at the expense of natural resources and ecological environment "overdraft". By far, the expense is much more costly than the estimate made at that time. In the 1990s, the cost began to fall down. Up to 1995, it decreased by half to 7. 80% . During the late 1990s, this falling trend was quite distinct, reaching a low of 4.53% in 1998 (see Table 2). The changing trend of natural capital cost as a percentage of GDP reflects that China has experienced a big detour during the past 20 years, which is "first destroy, then protect; first pollute, then purify; first deplete, then retrench; first felling, then planting" . For this, both the country and the people have paid heavy price. The genuine domestic savings rate is greatly discounted for the cost of natural resources. It is reflected in the trend of genuine domestic savings rate, which gradually rises after a sharp fall. Since, after the natural capital cost is taken out, the net domestic savings rate appears to rise after the 1990s, and the two curves tend to converge (see Fig. 8).

Table 2 Natural Capital and Genuine Domestic Savings Rate in China (ratio as a percentage of GDP, %)

	1980	1985	1990	1995	1998	2001
Gross Domestic Investment	35 19	37.77	34 74	40 83	38 28	
Domestic Savings	35 19	33 48	37 95	43 13	42.63	40 9
Net Domestic Savings	29.32	27 69	31 73	35 18	34 5	30 9
Energy Depletion	22.53	13.66	10 28	4.19	1 48	2 8
Mineral Depletion	0 96	0 48	0 84	0.58	0.29	0 2
Net Forest Depletion	0 21	0 70	0 62	0 53	0.43	0 1
CO_2 Damage	2.34	3 48	3.69	2 50	2.33	2 2
Natural Capita! Cost	26 03	19 83	15 43	7 80	4.53	6.3
Education Expenditure	2 27	2 21	2 18	1 98	2 00	2 00
Genuine Domestic Savings	4.86	11.87	18 47	29.38	31.98	26 6

Source: World Bank, World Development Indicators CD ROM, 2002, 2003

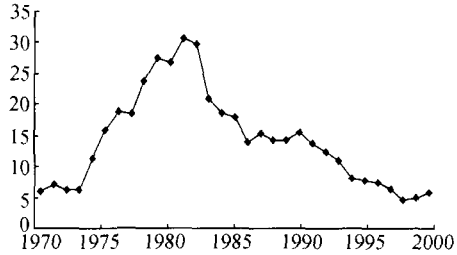

Fig. 7 China's Natural Capital Cost as Share of GDP (%).

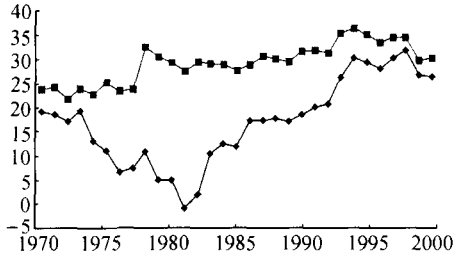

Fig. 8 Real Domestic Saving and Net Domestic Saving Rate (as percentage share of GDP).

To sum up, in the traditional national economic accounts system, neither high economic growth rate nor high domestic savings rate could really identify the genuine national wealth and the cost of natural resources. Only the new green GDP national economic accounts system can faithfully reflect the above circumstances. Though there are still some defects in the assessment of World Bank, it provides us a clear description of the historical environment and development track China has experienced during the past 20 years. It describes the transformation of China's economy growth mode, its changing trend of natural capital cost as a percentage of GDP, and the international comparison. Thus, it offers a beneficial reference to expand the genuine national wealth, especially to improve the genuine domestic savings rate. We should largely reduce the depletion of non-reproducible energy, mineral resources and forest reserves. And we should also transfer from the highly "autarkic" traditional resources security strategy of using domestic scarce resources to the new global resources security strategy, i.e. making full use of two kinds of resources, especially the global strategic resources, such as oil, natural gas, timbers and its processed products. This is because China's three main types of resource reserves respectively account for 2.36%, 0.94% and 3% of the world's gross reserves ("World Situation", Japan, 2000/2001). By boosting the import and export growth, especially the export of labor density and technology density products, we could increase the power of international resources import and procurement. We should open up energy and timber import market, practice zero tariffs, eradicate tariff barrier, eliminate the distortion of domestic price system and market, and establish energy reserve system for the country and enterprises. We should largely cut down coal consumption, eliminate the subsidy for coal production and transportation, firmly close small-scaled thermal power stations, encourage the use of clean and reproducible energy, and purify environment pollution. We should also carry out the environment friendly industry strategy and economic development strategy, increase the environment capital, and improve the environment for people's living. This means to increase all the people's natural capital, and largely improve the national investment in human resources, which include education, sanitation and health, family planning and procreation health, and investment in R&D etc. It also implies to improve everybody's developing ability, and increase everybody's real wealth.

References

[1] World Bank 2000 a, World Development Report 2000/2001: Attacking Poverty, Oxford University Press.

[2] Arundhati Kunte, Kirk Hamilton, John Dixon, Michael Clemens. Estimating National Wealth: Methodology and Results. January, 1998, The Environment Department, The World Bank.

[3] Kirk Hamilton, Michael Clemens. Genuine Savings Rates in Developing Countries. August, 1998, The Environment Department, The World Bank.

[4] World Bank, 1997, Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development, The Environment Department, The World Bank, Chinese Edition, China Environment Science Press, 1998.

[5] Fankhauser S. Valuing Climate Change: The Economics of the Greenhouse, London: Earth scan, 1995.

[6] Sachs, J. and Warner. Natural Resource Abundance and Economic Growth, Development Discussion Paper No. 517a, Harvard Institute for International Development, Harvard University, 1995.

[7] World Bank, 2000b, World Development Indicator Database 2000.

[8] World Bank, China 2020, Development Challenges in the New Century, The World Bank, Washington, D. C. 1997b.