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ENVIRONMENTAL PRIORITIES FOR CHINA'S SUSTAINABLE DEVELOPMENT

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Each Chapter of the study is distributed separately under its own code as indicated in the documents CCNM/CHINA(2001)2, entitled "Outline of the Full Study".

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CHAPTER III.E.3. ENVIRONMENTAL PRIORITIES FOR CHINA'S SUSTAINABLE DEVELOPMENT

Introduction and Presentation of the Structure of the Chapter

1. China's past two decades of rapid economic growth, urbanization, and industrialization have been accompanied by steady deterioration of the environment. For example, the air and water pollution damages, especially the dangers that fine airborne particulates pose to human health, have been estimated to be at least US$54 billion a year – or nearly 8 percent of GDP in 1995[1]. Water pollution has contaminated over half of monitored urban river sections, which do not even meet the lowest standards necessary for irrigation purposes, putting future access to drinking water under threat. Acid rain in the high-sulfur coal regions of southern and south- western China threatens to damage 10 percent of the land area, and may already have reduced crops and forestry productivity by 3 percent. Soil erosion, deforestation, damage to wetlands and grasslands have resulted in deterioration of China's ecosystems and pose a threat to future agricultural sustainability. Rapid urbanisation has led to additional pressures on water and land resources and the quality of urban air has been deteriorating rapidly. Without reforming economic and environmental policies, restructuring inefficient industries, conserving scarce natural resources and without investing in cleaner, material and resource efficient production the situation is likely to worsen, affecting potential for further economic growth.

2. The environmental situation of China has become a major factor in determining the future of economic development in China. Any analysis of opportunities for, and obstacles to, economic growth linked to trade and investment liberalisation should take environmental issues into account as trade and investment flows can significantly influence, positively of negatively, the state of environment.

3. Several analyses show that liberalised trade and investment regimes can improve resource allocation contributing directly to the improvements in protecting the environment, including better use of natural resources. They can also indirectly promote demand for better quality of ambient air, water and other media. However, in the absence of adequate environmental policies, investment liberalisation may lead to increased production and consumption of polluting goods, or to a non-sustainable use of natural resources, both of which would exacerbate the negative (scale) effects of economic activity for the environment. The analysis of linkages between trade, investment and environmental issues has received growing attention throughout the world, including the OECD region[2].

4. This paper contributes to the OECD-wide study of the domestic economic implications for China's trade and investment liberalisation. It aims to assist the Chinese authorities in identifying areas where analysis is necessary to design and implement policies which would promote positive impacts of trade and investment liberalisation on the environment and reduce the negative ones. The paper first presents the main concepts in discussing the relations between trade, investment and environment. Then, a brief description of key environmental problems in China is provided. It is followed by the presentation of China's environmental regulatory framework together with examples of environmental and sectoral policies and institutions influencing FDI and trade as well as examples of negative and positive impacts of different trade and investment patterns in China. The subsequent parts present the main pressures on the

1 *China's Environment in the New Century: Clear Water, Blue Skies*, World Bank, 1997

2 See for example: *Foreign Direct Investment and Environment*, OECD, 1999; *Assessing the Environmental Effects of Trade Liberalisation Agreements: Methodologies*, OECD, 2000; *Sustainable Development: Critical Issues*, OECD, 2001

environment and the trends in light of changes in trade and investment flows. Finally, the approaches to assessing effects of trade and investment liberalisation are presented with examples of practical application of the assessment methodologies in OECD countries and the potential for applying them in China.

1. General Context for Relations Between Trade and Investment and the Environment

1.1 Effects of trade and investment on the environment

5. As has been shown in other parts of the OECD study, trade and investment promote growth, alter the composition and geographical distribution of economic activities, stimulate competition and facilitate the international diffusion of technologies. Depending on the circumstances, trade and investment can have significant effects, both positive and negative, for the environment. Trade and investment are not the only factors determining these effects, but they both clearly amplify and accelerate them.

6. Most environmental consequences of trade and investment liberalisation can be characterised by one of five effects (Box 1):

- scale - the result of an expansion of world economic output;
- structural - a reallocation of production and consumption worldwide and between sectors;
- technology - the stimulation of technological development and diffusion;
- product - impacts from product trade flows; and
- regulatory - changes in legal instruments[3].

7. On the one hand, trade and investment liberalisation – like any policy fostering economic growth – may lead to increased production and consumption of polluting goods or to an expansion in industrial or other polluting activity. This can exert pressures on the environment, such as increased emissions of pollutants and use of resources, rapid urbanisation, or damage to protected areas, and pose problems for pollution control, ecological and public health protection. In OECD countries, scale effects have often tended to outpace efficiency gains in the use of natural resources. In developing countries, including China, these risks are exacerbated due to their, often weak, environmental policies, as well as weak frameworks for resource tenure and enforcement of ownership rights. Increased economic activity stimulated by trade and investment liberalisation brings into the open or exacerbates distortions and weaknesses of the existing policy framework. This often results in severe environmental degradation. When sources of environmental degradation or under-priced resources (e.g. forests, fish, water or air) are not adequately addressed, rapid export growth – while not the root cause – can worsen the problem.

8. On the other hand, trade and investment liberalisation – when paired with the implementation of strong regulatory frameworks to protect the environment – can have a beneficial impact on the environment by improving resource allocation, promoting economic growth and increasing welfare. For example, trade and Foreign Direct Investment (FDI) can improve structural efficiencies and make new investments in environmental protection possible.

9. In general, sectoral studies have underscored that trade and investment liberalisation can go hand in hand with environmental improvements. Opportunities to realise economies of scale and the effects of increased competition on efficiency can be expected to lead to welfare gains. For example, liberalisation of environmental goods and services – by opening domestic markets to foreign suppliers by reducing tariffs and other measures – enables advanced know-how and environmental technologies to become more readily

[3] *Methodologies for Environmental and Trade Reviews*, OECD, 1994

available and spurs economic growth and employment. Economic modelling of energy markets also has indicated that trade liberalisation and energy policy reforms would not only increase economic welfare, but also reduce global carbon emissions. Energy subsidies, particularly those encouraging energy consumption by keeping prices below costs, impose a heavy weight on economic efficiency and environmental performance. In this case, reductions in both local and global pollution can accrue from proper pricing.

Box 1. Types of Trade-Related Effects

Environmental impacts may stem from the effects of the trade measure or agreement on: 1) the level of trade or of economic activity *(scale effect*s), 2) the pattern of economic activity *(structural effect*s), 3) technology trade flows *(technology effect*s), 4) product trade flows *(product effect*s, and 5) legal instruments *(regulatory effect*s). These different types of effects can be both positive and negative for the environment.

Scale Effects -- Scale effects are associated with the overall level of economic activity or the macro-economic effects resulting from the trade measure or agreement. *Positive scale effects* may result from higher levels of economic growth and financial gain, particularly when appropriate environmental policies are present. *Negative scale effects* may occur when higher levels of economic growth, trade and/or transport bring increased pollution and faster draw-down of resources due to the absence of appropriate environmental policies.

Structural Effects -- Structural effects are associated with changes in the patterns of economic activity or the micro-economic effects resulting from the trade measure or agreement. *Positive structural effects* may result when trade measures and agreements promote an efficient allocation of resources and efficient patterns of production and consumption. *Negative structural effects* may occur when appropriate environmental policies do not accompany changes in patterns of economic activity, and when environmental costs and benefits are not reflected in the prices of traded goods.

Technology Effects -- Technology effects are associated with changes in the way products are made depending largely on the technology used. *Positive technology effects* may result when the output of pollution per unit of economic product is reduced. Foreign producers may transfer cleaner technologies abroad when a trade measure or agreement results in a more open market and a business climate more conducive to investment. If there are positive scale effects which generate an increase in income levels, the public may demand a cleaner environment as an expression of their increased national wealth, which in turn will generate demand for cleaner technologies, more stringent pollution standards and stricter enforcement of existing environmental laws. *Negative technology effects* or the lack of positive effects may occur if neither of the above scenarios eventuates.

Product Effects -- Product effects are associated with trade in specific products which can enhance or harm the environment. *Positive product effects* may result from increased trade in goods which are environmentally beneficial relative to competing products, such as energy-efficient machinery, low-sulphur coal, or recyclable containers. Positive product effects would also stem from increased trade in environmental goods and technologies themselves, such as equipment for water treatment, waste management and air quality. *Negative product effects* may result from increased trade in goods which are environmentally sensitive, such as hazardous wastes, dangerous chemicals or endangered species.

Regulatory Effects -- Regulatory effects are associated with the legal and policy effects of a trade measure or agreement on environmental regulations, standards and other measures. *Positive regulatory effects* result when trade measures and agreements take care to maintain the ability of governments to pursue appropriate and effective environmental policies. *Negative regulatory effects* may occur when the ability of governments to enact and implement appropriate environmental regulations is undermined by the provisions of the trade measure or agreement.

Source: *Methodologies for Environmental and Trade Reviews*, OECD, 1994

10. Trade and investment flows can also assist in abating pollution, or have other positive environmental impacts, through the worldwide dissemination of technologies. With tighter regulations at home, Multinational Enterprises (MNEs) have a strong incentive to innovate in areas that improve resource efficiency or reduce industrial waste. Once developed, new technologies can be applied on a world-wide

basis by the firm, in order to benefit from economies of scale. These modern technologies can be licensed directly to foreign producers, imported through abatement equipment or installed directly by MNEs in their foreign affiliates. FDI by MNEs can also have positive spill-over effects on the technological characteristics of national firms since local firms may imitate multinationals' technological practices in order to improve their own production practices. However, technology effects need not always be positive. Even if industrial production plants use advanced technologies, FDI can increase the total environmental burden on a country if before that investment no such plants existed. Also, there have been instances of "technology dumping", where equipment banned in environmentally strict countries (because of its poor environmental performance) is sold to or "dumped" in countries with less demanding environmental standards.

11. While the role of trade and FDI are important vehicles for both technological change and diffusion, international capital flows are also an important determinant of the technologies of production. The internationalisation of capital markets, by giving firms access to foreign sources of savings, can ease financial constraints that prevent firms from investing in potentially more efficient and environmentally preferable technologies. In some cases, these financial constraints have arisen from national policies towards foreign capital, such as foreign exchange restrictions, international credit controls, and ownership restrictions.

12. Whether the simple fact that by contributing to an economy's growth, trade and investment liberalisation contributes to an increased societal demand for a healthier environment, remains the subject of debate. While some put forward that wealthier societies are more willing – and able – to pay for protection of the environment, which is supported by evidence illustrating a relationship between per capita income and indicators of environmental quality (the Environmental Kuznets Curve), others contest the causality in this relationship. They put forward that, first not all measures of environmental quality fit into this pattern, e.g. growth contributes monotonically to global emissions of carbon dioxide, levels of waste disposal and urban congestion. Second, while income growth may well be necessary, it may not be sufficient for environmental improvements.[4]

1.2 The pollution haven and halo hypotheses

13. Long-term environmental impacts of trade and investment will depend in large part on how government environmental policies respond to their pressures and opportunities. For example, the so-called "*pollution haven*" hypothesis implies that competitive forces would move foreign direct investment away from countries with high environmental standards, or attract it towards those with low environmental standards. Closely related to this hypothesis is that of the "*regulatory chill*", which would reflect resistance to enacting or upgrading home country environmental standards on competitiveness grounds[5].

14. It is possible that some countries could be attracted by the idea of relaxing environmental standards or refraining from upgrading low standards in order to attract certain types of investments, and individual firms may be sensitive to the costs of complying with more stringent environmental standards. FDI flows to a wide range of industries and companies – some of which are careful environmental stewards, some of which are not. However, empirical research shows that the risk of redeployment of productive resources towards low standard countries is rather small. Environmental costs are only one of a broad number of factors, including quality of infrastructure, access to inputs, wage costs, labour productivity, political risk, the size and growth potential of markets, that investors take into account in

4 *Foreign Direct Investment and Sustainable Development*, Fortanier F., Maher M., 2000

5 For further discussion of these concepts see for example: *Foreign Direct Investment and Environment*, OECD, 1999

location decisions. The costs of adhering to environmental regulations are also typically a small part (on average 2-3 percent) of total production costs for most firms, although in certain resource-intensive sectors the costs may be higher. Instead, multinational enterprises generally seek *consistent* environmental enforcement, rather than *lax* environmental enforcement. In spite of the strength of empirical findings concerning the relative unimportance of pollution havens there is some evidence that competitiveness concerns have dampened governments' enthusiasm to raise environmental standards.[6]

15. The converse notion of "*pollution halos*" suggests that FDI might promote the establishment of higher environmental standards through technology transfer or via existing management practice within multinational or other firms. For example, a large share of FDI directed to non-OECD countries is related to privatisation, and privatised firms are typically managed better and more accountably, which tends to reduce waste and pollution. The bulk of international investment is undertaken by large multinational enterprises that typically operate at the highest corporate standard of environmental performance worldwide rather than tailoring their production methods to the level of regulatory enforcement prevailing in host country markets.[7] Close to three-quarters of global FDI flows originate in, and are directed towards, industrialised countries and are subject to the stringent environmental standards that typically apply in OECD countries. However, it is important that appropriate policies are in place at the national level to ensure that such standards are effectively enforced.

2. Main Features of the State of China's Environment

16. China has experienced a long-term and outstandingly rapid economic growth since its opening-up to the world in 1978. While having significantly improved the quality of life of the large part of the population, the economic development has resulted in serious environmental problems, such as widespread water and air pollution, solid waste accumulation, high air pollution and water scarcity in urban areas. The rural environmental quality has been deteriorating following an expansion of Town and Village Industrial Enterprises (TVIEs) and intensive farming practices. The state of the environment is still worsening and posing, in several areas, obstacles to economic growth.

2.1 Water

17. Economic growth in China has been accompanied by a substantial increase in demand for water. Between 1980 and 1993 urban water consumption increased by 350 percent and industrial consumption doubled[8]. Demand for water has been increasing at the time when several parts of China experienced water shortages, significant water pollution, and falling groundwater tables as well as flood and drought damage. These factors have aggravated the shortage of water resources, increased costs of water purification, and in cases where appropriate infrastructure has not been in place, threatened the safety of drinking water, thus the health of the population. They also had serious impacts on the safety of industrial and agricultural

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6 For example, see *"Foreign direct investment and the environment: From pollution havens to sustainable development"*, Mabey and McNally, WWF, 1999; *"Policy competition for FDI: A study of competition among governments to attract FDI"*, Oman C., OECD, 1999 and *"Trade and Environment", WTO Special Studies 4, WTO Washington*, Nordstrom H. and Vaughan S., 1999.

7 For example, it may be more efficient to run a single set of environmental practices worldwide than to scale back environmental practices at a single overseas location. Also the high visibility of MNEs can make them particularly attractive targets for local enforcement officials, and the ensuing legal difficulties encourages MNEs to be especially conscious of their potential environmental liabilities overseas.

8 *China: Air, Land, and Water: Environmental Priorities for a New Millenium*, World Bank, 2001

production and led to losses in fishing industry. It is estimated that the annual economic loss from water pollution in China reaches 1.5-3 percent of GDP, having more significant impact than floods and drought[9]. The problems are particularly acute in northern China (i.e. north of the Yangze River) and in the catchments of the three rivers: Huai, Hai and Huang (Yellow). These three catchments account for about 35 percent of total GDP and include the economically and politically important Beijing-Tianjin region.

18. The main causes of water pollution are industrial wastewater discharge, untreated municipal sewage discharge as well as non-point pollution from agriculture. In recent years, non-point water pollution, which originates from fertilizer and pesticide runoff, and discharges from intensive animal production enterprises, is becoming serious and can be expected to increase even further.

2.1.1 Quality of surface and coastal water and groundwater

19. The chemical and biological quality of the surface water is generally low. The main pollutants are organic material from domestic and industrial sources, industrial hydrocarbons, light lubricating oil, plant nutrients and heavy metals. Bacteriological pollution is probably widespread and substantial though not regularly monitored.

20. From 1996 to 1998, the water quality in almost all seven main river basins deteriorated (Figure 1). Among these river basins, the organic pollution in Liao River, Hai River and Huai River is considered very serious. For instance, in the Hai River the proportion of monitoring sections with water quality classified as Class I to III decreased from 58.9 percent in 1996 to 28 percent in 1998, while the share of the sections with Class IV and below jumped from 41.1 percent in 1996 to 72 percent in 1998[10].

21. It is estimated that 25 percent of all lakes in China is being adversely affected by eutrophication which is a result of heavy organic pollution and excessive pollution by nutrients (mainly nitrogen and phosphorus) from agricultural production and urbanisation. In 1999, the watershed of Tai Lake (Jiangsu-Zhejiang Provinces) was at medium level of eutrophication while Chao Lake (Anhui Province) and Dianci Lake (Yunnan Province) were hyper-eutrophic. The main consequences of eutrophication are shifts in the biological structure in standing waters, production of toxins potentially poisonous to fish, cattle and humans and increased costs of water purification.

Figure 1: Comparison of Surface Water Quality in Seven Main Rivers in 1996 and 1998

22. The coastal waters are mainly polluted by increasing industrial and municipal wastewater discharge, solid waste dumping, agricultural run-off and waste from ships. The most serious pollutant is inorganic nitrogen, followed by phosphate and oil. In about one third of the sampling points the coastal waters in China are classified as Class IV[11] or below. An indirect indication of euthrophication in China's coastal areas are the incidences of red tides which increased significantly during the 1990's.

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9 *Comprehensive Report on Water Resources Strategy for China's Sustainable Development*, Chinese Academy of Engineering, 2000

10 China's ambient water quality standards classify water bodies into five categories. The classification scheme is based on types of water uses to be protected and water quality goals. Water designated as Class I have the highest quality I (and can be used for drinking water intakes, fishing and swimming), whereas Class V waters have the poorest quality and can be used only for industrial cooling water and other limited purposes.

11 Class IV is the lowest level stipulated by national seawater quality standard.

23. The quality of groundwater is worsening, particularly in near-surface aquifers and in the vicinity of major cities. The most common pollutants are nitrate, nitrite and ammonia infiltrating groundwater from leaking sewers and overflowing septic tanks. There are no systematic data on contaminants such as pesticides, herbicides, heavy metals or other potentially toxic compounds. In many places over-extraction of groundwater is a serious problem and has not been adequately controlled.

2.1.2 Water availability and use

24. China has substantial water resources but they are unevenly distributed. As average, per capita water availability in China is 2,343 m^3/person/day with the availability being almost four times higher in the southern rivers than the northern rivers[12]. Availability of water in many northern rivers (including the Huai and Huang basins) is lower than 1,000 m^3/person/year which is the internationally accepted definition of water scarcity. In the north, the water resource accounts for only 7.7 percent while the arable land accounts for 39 percent and the population for 35 percent of the total. In the north-western inland river basins, the land area accounts for 35 percent while the water resource accounts for only 4.8%. The rainfall is highly seasonal, in most areas 60-80 percent of precipitation is observed within 4 months of the flood season. Groundwater resources are significant only in the northern river systems, particularly in the lower catchments of the Huai, Hai and Huang Rivers.

25. The annual water use increased in China from the initial value around 100 billion m^3 in 1949 to 556 billion m^3 in 1997[13]. Water use projections show that 700-800 billion m^3 will be consumed in 2030, approaching to the actual water resource availability of 800-900 billion m^3.

26. Agriculture, industrial and urban residential water use accounts for 75.3 percent, 20.2 percent and 4.5 percent respectively. Contrary to the patterns in most OECD countries, agricultural use is still dominant by far. However, its share in total water use has decreased as well as water consumption for industrial purposes. On the contrary, domestic water uses have been increasing rapidly (Figure 2). Domestic water consumption in urban areas rose from around 113 litre/capita/day in 1980 to about 230 litre/capita/day in 1997[14]. At the same time, in urban areas in China out of 640 cities more than 300 face water shortages and 100 face severe water scarcities.

Figure 2: Changes in Water Consumption for Municipal and Industrial Purposes

27. The latest national demand projections, prepared in 1999 by the Institute of Water Resources and Hydropower of the Ministry of Water Resources, indicate that the balance between irrigation and other consumptive uses will continue to change in the future. Water use for irrigation purposes is projected to decline from current levels of approx. 75 percent of total consumption to 50 percent in 2050. Consumption for urban and industrial purposes will increase significantly. Both of these forms of consumption lead to emissions of polluted water, so it is likely that water pollution pressures will increase substantially[15].

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12 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

13 *Comprehensive Report on Water Resources Strategy for China's Sustainable Development*, Chinese Academy of Engineering, 2000

14 In OECD countries the individual consumption of water varies between just over 100 litre/capita/day for countries such as the Czech Republic, Portugal or Germany to around 250 litre/capita/day for Australia, Canada and Japan.

15 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

28. Inefficient use of water in China is widespread. The average utilization coefficient of farmland irrigation water is 0.45, while the value in developed countries is 0.7-0.8. The industrial water use per unit of output value was 5-10 times that of the OECD countries. The reuse rate of industrial water was 30-40 percent while in OECD countries it reaches 75-85 percent. The loss rate of water use facilities and water supply pipelines in most cities is more than 20 percent.[16]

2.1.3 Drinking water quality in urban and rural areas

29. In absolute terms, China has the largest urban population of any country in the world, and urbanization has been increasing. The official annual growth rate of the urban population through the 1990s was about 3.1 percent, while the actual rate was probably higher. Urbanization is expected to accelerate even further over the next 10 to 20 years. The number of officially designated cities increased by about 40 percent to 668. Total water consumption in designated cities increased at a rate of about 8 percent per year. Although installed wastewater treatment capacity increased at an even greater rate of about 19 percent per year, the length of sewers increased at only about half that rate[17]. Although the level of wastewater discharges from industry has decreased an increased amount of wastewater released from municipal sources will require expansion of municipal wastewater treatment infrastucture (Figure 3).

Figure 3. Comparison of Wastewater Discharges from Industry and Households (1991-2000)

30. Due to heavy surface water and groundwater pollution and lack of water supply facilities, especially in rural areas, the quality of drinking water in China is low. Even though water supply coverage in the cities was 96.8 percent in 1998 three quarters of drinking water leaving water supply plants did not meet standard requirements[18]. In rural areas, however, the tap water beneficiaries in late 1990's accounted for only 23.3 percent of the whole population, half of which is served with drinking water that does not comply with national standards. It should be noted that China's current standard on drinking water quality, introduced in 1986, are much lower than those defined by the World Health Organisation (WHO). For example only 35 quality indicators are measured in China, far less than that of the standards of WHO (49), Japan (59), EU (66) and the US (83). In addition, thresholds for several indicators are lower. For instance, China's standards for turbidity is three to five times lower than that in OECD countries. The standard values in rural areas are even less stringent.

2.2 Air Pollution

31. Air pollution is affecting both human health and environment and it will continue to be one of major environmental problems in China in the future. Studies carried out by the World Bank have linked the high incidence of premature death in China to serious ambient and indoor pollution. About one third of the territory of China is affected by acid rain, which can retard forest and crop growth and endanger aquatic life. Coal burning is the main contributor to ambient and indoor air pollution in China, but air pollution from motor vehicle emissions is growing fast and is likely to become a major and widespread urban pollution problem over the next 10 years. Re-suspension of surface dust from the construction sites and eroded soil is an important factor affecting air quality in many northern cities, such as Beijing and Xi'an.

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16 *Comprehensive Report on Water Resources Strategy for China's Sustainable Development*, Chinese Academy of Engineering, 2000

17 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

18 *State and Characteristics of Urban Water Supply in China*, Cui, Y., Fu T., 2000

2.2.1 Urban air quality

32. The main air pollutants are total suspended particulates (TSP) and sulphur dioxide (SO_2). Ambient concentrations of TSP and SO_2 in Chinese cities are among the world's highest. In 1998, seven Chinese cities, with Taiyuan and Beijing ranked the first and third respectively, were among WHO's list of world's ten most polluted cities in terms of air quality[19]. In 1995, more than one half of 88 cities monitored for SO_2 were above the WHO guidelines (in the cases of cities Taiyuan and Lanzhou by factor 10) and all but two of 87 cities monitored for TSP far exceeded the WHO guidelines[20].

33. More recently, rapid expansion of motor vehicle fleets in large cities has heightened ambient pollution by carbon monoxide (CO), nitrogen oxides (NO_x), and related pollutants which contribute to deterioration of the urban air quality by causing serious local photochemical smog pollution (Figure 4). The pollution of NO_x in some major cities with a population of more than 1 million (such as Guangzhou, Beijing, Shanghai, Anshan, Wuhan, Zhengzhou, Shenyang, Lanzhou, Dalian, Hangzhou) is growing exceeding the Class 2 standard[21] by factor 2. Among 60 cities with reported monitoring data, total human exposure to ambient NO_x levels above the Class 2 level increased almost 60 percent between 1991 and 1998. Nearly all of the increase occurred in the 32 largest cities. Ambient levels of other pollutants such as carbon monoxide (CO), ozone (O_3) and lead (Pb) are not systematically controlled.

Figure 4: Concentrations of NOx and the Trends in Motor Vehicle Numbers in China (1980-1998)

34. Indoor air pollution is also a serious problem as about 80 percent of China's people still use solid fuel, such as coal, firewood and crop stalks for cooking and space heating. Burning this fuel in inadequately ventilated households leads to serious indoor air pollution.

2.2.2 Acid Rain

35. Human-induced acid rain deposition in China is mainly associated with SO_2 emissions originating from burning coal with high sulphur content that dominates the fuel mix.

36. China is among the world's three major acid rain regions, following Europe and the North America. After a sharp increase in the areas affected by acid rain pollution in the 1980's the situation has stabilised in recent years. The serious acid rain pollution, which affects 30 percent of the country territory, occurs in some regions of central China, represented by cities such as Chansha, Zhuzhou, Ganzhou and Nanchang.[22].

2.2.3 Impacts of air pollution

37. Many Chinese cities have concentrations of fine particulates and sulphur dioxide that are the highest in the world. Based on dose-response functions, it was estimated by the World Bank that nearly 178,000 deaths per year or 7 percent of all deaths in urban areas in China could be prevented if air pollution were reduced to standard levels. Also, 346,000 hospitalizations per year were found associated

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19 *1998-1999 World Resources: A Guide to the Global Environment,* WRI, UNDP, UNEP and World Bank, 1998

20 *National Environmental Quality Report, 1991-1995,* NEPA, 1996

21 Class 2 is a national standard for air quality in residential and commercial areas

22 *State of Environment in China,* SEPA, 2000

with the excess levels of air pollution in urban areas. Major consequences of air pollution include respiratory infections, asthma and chronic bronchitis. The serious health consequences of indoor air pollution due to combustion of coal have been documented in several studies in China[23].

38. The decline of forests and crops, damage to buildings and fabrics are examples of acidification. According to a study carried out by the environmental authorities in 1994, the annual economic loss from acid rain in China is about 14 billion yuan, including loss of agriculture and forests products[24].

39. Air pollution is also impairing visibility in the cities through light scattering. In Beijing, partly due to high level of fine particulate and the effect of photochemical smog, low air visibility is frequent in winter. In Guangzhou, visibility decreased from 30km in 1960s to 18km in 1990s, and the annual sunshine time has also decreased by more than 800 hr during the last 30 years.

2.2.4 Global Environmental Issues

40. In terms of air emission, China's two most important global concerns are emissions of carbon dioxide (CO_2) from burning fossil fuel and the production and consumption of ozone-depleting substances (ODS)[25]. CO_2 emissions contribute to global warming and ODS to the damage to the ozone layer.

41. Growth in energy demand, particularly coal, increased rapidly during the first half of 1990s which has resulted in a 21 percent increase of carbon emissions between 1990 and 1998[26]. China's global share of CO_2 emissions increased from 10 percent to 12 percent during the 1990's. In the next 20 years, the power sector could become the dominant user of coal, accounting for 50 percent or more of total coal consumption.

42. China's consumption of ODS grew by more than 12 percent per annum from 1986 to 1994. After ODS in developed countries were phased out by 1995, China became the world's largest ODS producer and consumer. Although production and consumption of ODS in China were banned in 1999 a number of cases of ODS import have been recorded.

2.3 Waste

2.3.1 Industrial solid waste

43. Industrial waste, and especially toxic and hazardous waste, can affect the environment and human health, by contaminating the soil and groundwater, by leaching toxic substances such as heavy metals and metalloids, nitrogen compounds, chlorinated compounds and other organics. Industrial solid

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23 See for example: *China's Environment in the New Century: Clear Water, Blue Skies*, World Bank, 1997, *Health and Environment in Sustainable Development: Five years after the Earth Summit*, WHO, 1997 and *World Resources: A Guide to the Global Environment*, WRI, UNDP, UNEP and World Bank, 1998

24 *More penalties to Curb Acid Rain*, in China Daily, Zhu Boaxia, 1995

25 The artificial sources of chlorine and bromine which cause accelerating depletion of the stratospheric ozone layer are chlorofluorocarbons (CFCs of freons) and bromofluorocarbons (halons). CFCs used to be widely applied as propellants in aerosols, coolants in refrigerators and air-conditioning units, foaming agents in the production of insulating and packaging material, and cleaning agents. Halons have been used particularly in fire extinguishers.

26 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

wastes in China are mostly smelting wastes, coal ash, slag, coal refuses, chemical waste residues, tailings and radioactive wastes. In 1999, 780 million tonnes of industrial solid waste were generated, among which 38.8 million tonnes, including 10.2 million tonnes of hazardous waste, were finally disposed. The rate of the utilisation and safe disposal of industrial solid waste was only 45.6 percent and 13.7 percent respectively[27].

44. The discharged industrial wastes have inevitably led to great or potential environmental and health problems. The toxic and hazardous heavy metals and their compounds as well as phenols and radioactive substances, can have immediate or potential impact on human health through skin contact, food contamination and respiration. Indirect impacts include the lowering quality of surface water and groundwater, and contamination of soil and eco-systems.

2.3.2 Municipal solid waste

45. China's annual generation of municipal solid waste (MSW) per capita jumped from 320kg in the early 1980s to about 540kg in the 1990s[28]. Due to rapid increase of cities and urban population, the total amount of solid waste is growing by 8-10 percent annually. According to statistics in 668 cities in 1999, over 114 million tonnes of MSW were collected, of which over 72 million tonnes (which account for 63.5 percent of the total) were treated. The municipal waste composition has changed with the increased share of organic, combustible, recoverable and reusable matters.

46. Municipal solid waste generation imposes significant environmental pressures, especially when inefficient waste treatment and disposal leads to an accumulative piling of large amount of solid waste. In 1998, two thirds of 668 cities are surrounded by solid waste dumping sites, occupying land of about 50,000 ha. Open central landfills is the most applied disposal procedure. In addition, methane which is generated from decomposition of organic components in municipal waste disposal site may cause explosion. According to recent studies, at least 20 cities experienced such explosion incidents in 1999[29].

2.4 Nature and Land

2.4.1 Land degradation

47. China's growth and development is having a significant impact on its land systems. China is now considered one of the most seriously eroded countries in the world. The Chinese Academy of Sciences (CAS) estimates that in the early 1990s some 375 million hectares, or nearly 40 percent of the country, were affected by moderate to severe erosion and desertification. The biggest problems are water and wind erosion, followed by salinization.

48. Due to over-intensified use of marginal lands, inappropriate use of pesticides and fertilisers, and improper irrigation practices, a number of agricultural ecological problems have occurred. China is experiencing a continuous loss of cultivated area. The Chinese Academy of Sciences has estimated that the net cultivated land area is declining by over 300,000 hectares per year.

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27 *State of Environment in China*, SEPA, 2000

28 *Strategy for Municipal Solid Waste Management in China*, Zhu B. (key note speech presented at ISWA International Symposium on Waste Management in Asia cities, October 2000)

29 *Study on Countermeasures of Municipal Waste in China*, Wang Wiping, in Journal of Natural Resources v15 n2, 2000

49. Desertification is occurring most visibly in the agro-pastoral zone in northern China. In this area, the most significant contributor to this process over the last 50 years was excessive land reclamation during the 1960s and 1970s, combined with an excessive build-up in livestock numbers in the 1960s. Both were driven by the government's drive for food self-sufficiency. Generally, it appears that the desertification trend throughout the region has progressively worsened through the 1980s and possibly into the 1990s, notwithstanding government control efforts in the late 1980s and 1990s[30].

2.4.2 Forests

50. Before 1998, China's forests provided about 40 percent of the country's rural energy, almost all the panels and lumber for the construction sector, and raw material for the pulp and paper industry. China was the third largest consumer of timber in the world, and was already facing a widening imbalance between supply and demand for wood products. In the early 1990s the forestland area in China was 260 million hectares and the forest area was 130 million ha[31]. The per capita forest area was 0.11 hectares, about 17.2 percent of the world average figure and ranking the 119th in the world. At the rate of extraction that applied until 1998 (around 300 million m^3/year), the resource had less than 10 years of remaining life[32].

51. This situation changed following the devastating floods in the middle reaches of the Yangtze River and in northeast China during the summer of 1998, which many local environmental experts said were caused at least in part by deforestation in the catchments of the rivers in these areas. As a result, the State Council imposed in 1998 a ban on logging in natural forests. The opening of new lands at the expense of forests was prohibited, all construction projects on forestland were frozen for one year; and a new requirement for direct cabinet approval for any occupation of forested land was introduced. In addition, a major new investment programme (Natural Forest Protection Program—NFPP) was launched to improve natural forest management, covering approximately 95 million hectares of state-owned forests in 17 provinces. Finally, a new land-use law was enacted to promote more efficient use of land and increased afforestation[33].

2.4.3 Biodiversity

52. China has one of the greatest ranges of ecological diversity of any country in the world, and probably contains around 10 percent of all species living on earth. It has an especially high number of plant species (about 30,000), including 3,116 genera, of which 243 are endemic. Vertebrate diversity is also high with 2,340 species, including 499 species of mammals, 1,244 species of birds, 387 species of reptiles, and 274 species of amphibians[34].

53. China is also one of the eight original centers of crop diversity in the world. It is the original source of approximately 200 of the world's 1,200 species of cultivated crops. It contains nearly 600 varieties of domesticated animals and poultry. A wide variety of domestic plant and animal species are harvested and used for economic purposes. The Ministry of Agriculture estimates there are more than 3,000 species of wild "economic" plants, including 1,000 species of medicinal plants, 300 species of

30 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

31 *State of Environment in China*, SEPA, 2000

32 *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

33 ibid.

34 ibid.

timber trees, and 500 plants with insecticidal properties. There are also 330 species of "economic" birds, 190 economic mammals, and 60 species of economic fish.

54. However, biodiversity in China is being threatened due to a large human population, economic development, and excessive utilization of biological resources and shrinking of natural habitats. It is estimated that 15-20 percent of the species in China is now endangered. This significantly exceeds the global average that 10-15 percent of species is considered threatened. Of the 640 species listed in CITES[35], 156, or nearly 25 percent, are found in China.

3. Main Pressures on the Environment and Future Trends in Light of Trade and Investment Liberalisation

55. Over the decades unsustainable and inefficient investment, production and consumption patterns have lead to serious deterioration of the environment. These pressures came from rapid industrialisation based on pollution intensive industries and inefficient technologies, reliance on low quality coal in the energy sector and lack of appropriate pollution control technologies. Inefficient practices and the use of low quality fertilizers and pesticides in agriculture imposed high pressures on human health, water and land resources. Overuse of natural resources, such as water and forests, limited the natural processes of their renewal.

56. However, recent changes in the structure of the economy, in particular an increasing share of less-polluting industries in the economy and introduction of modern technologies, as well as environmental policies, have led to some significant reduction of environmental pressures. These changes have been, in many cases, stimulated by liberalisation of trade and investment which created greater competition in the economy, opened up an access of Chinese enterprises to modern technologies and increased efficiency of operations. Liberalised trade and investment stimulated better use of natural resources and promoted demand for better environment. The gross value of industrial output doubled between 1991 and 1998 while total discharge of major pollutants increased only slightly. Water pollution, especially from small enterprises and TVIEs, decreased significantly, emissions of particulates and other pollutants have been curbed, pressures on water quality from the use of pesticides and fertilizers in agriculture decreased[36].

57. In many cases, however, the positive changes have been offset by emerging new problems stemming from the fast growing market economy and continuous population growth. Decrease in emission of conventional point source pollutants, such as particulates and SO_2, is accompanied by an increased significance of intractable and non-point source pollution. Rapid growth of motor vehicles in urban areas leads to increased CO and NO_x emissions which adds to low air quality. Fast urbanisation leads to additional pressures on drinking water resources and increased discharges of untreated wastewater. Urban encroachment has led to the loss of approximately 1 million hectares of cultivated land between 1987 and 1995.

58. These developments have occurred in the context of weak, or in many cases lack of adequate, environmental policies. For example, high speed of urbanisation has not been accompanied by provisions for parallel development of appropriate infrastructure and physical planning policies, the increased use of motor vehicles has not been accompanied by appropriate exhaust emission standards. It is expected, however, that the continuation of structural changes of the Chinese economy, increased modernisation of economy through investment and trade liberalisation with the parallel application of appropriate policies will lead to gradual reductions of these pressures in the long-term perspective.

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[35]. CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora

[36] *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

3.1 Pressures and Trends in Energy Sector

59. China is the world's second energy consumer and the third largest energy producer. It is also the largest producer of coal and the sixth largest producer of crude oil. At the same time energy consumption, especially generated from coal burning (which currently provides about 76 percent of China's energy needs), is the main source of anthropogenic air pollution in China. A majority (60 percent) of the fuel combusted is consumed in the industrial sector and only 5 percent in the commercial sector[37]. Sixty five percent of China's power generating capacity is concentrated in industrial and heavily polluted East, South Central and South-West regions. China is also the world's second largest emitter of carbon dioxide, accounting for 14 percent of the world's total emissions and is projected to become the largest over the next few decades[38]. China's industrial sector is, by far, the largest source of China's carbon emissions, producing 75 percent of total emissions. Small industrial enterprises (essentially TVIEs) are the main source of particulate emissions while medium and large industrial enterprises dominate SO_2 emissions, with the main sources being power plants.

60. Energy efficiency in China is quite low by industrial countries standards. The average thermal efficiency of China's power plants is 25 to 29 percent compared to rates of 35 and 38 percent in industrialised countries. In other segments of energy generation the difference is even higher, e.g. 52 percent compared to 72 percent of industrial boilers, 28 percent compared to 52 percent in iron and steel heat generation and 15 percent compared to 55 percent of commercial and household energy use[39].

61. Since the early 1990s, China's deficit in energy has sharply increased due to its rapid economic expansion. This gap in China's energy needs and available resources is certain to grow wider in the next decades. Conscious of its rising dependency on external energy sources and of the need to improve its energy sector efficiency and competitiveness on the world market, China began a radical restructuring and reform of its energy industries and management in 1998, apparently trying to introduce a more market-oriented approach in the energy sector. Chinese power authorities have made improving energy efficiency a priority. It is envisaged to increase the average thermal efficiency of power generation by discouraging the building of small plants, introducing higher efficiency units, and retrofitting or eliminating low-efficiency units. In the power sector, China lacks both the manufacturing able to supply the needed generating equipment and the required financial resources. It was estimated that only 80 percent of the investment needed to meet the year 2000 capacity targets could be generated by domestic resources. Thus, the central government has made attracting FDI to power generation sector an explicit goal. The FDI is not only attractive as a sources of funds but it has potential to enhance energy efficiency by expediting the transfer of advance and cleaner generating technologies and management techniques. It is estimated that by upgrading technologies in power generation, and in several major industrial energy activities to industrialized-country levels, China could cut 20 percent of its projected coal consumption. However, there are still some obstacles to the rapid transfer of new technologies to China which relate to establishing an appropriate framework for ensuring intellectual property rights, lowering risks and reluctance to open the markets for the foreign technologies as well as proper pricing of energy and electricity (Box 2).

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37 *China's Worldwide Quest for Energy Security*, IEA, 2000

38 While China ranks second in the world behind the US in total energy consumption and carbon emission, its per capita energy consumption and carbon emissions are much lower than the world average. With a growing economy and increasing living standards, however, per capita energy use and carbon emissions are expected to rise.

39 *Foreign Direct Investment in China's Power Sector: Trends, Benefits and Barriers*. Blackman A., Wu X., WRI, 1998

Box 2. China's Challenge to Reduce Negative Environmental Impacts

… from Mining and the Use of Coal in Energy Sector:

As the world's largest producer and consumer of coal, China faces "special needs" in managing and balancing the environmental consequences of a growing economy fuelled primarily by coal. There are readily identifiable potential areas for environmental improvement throughout the whole of the coal chain. Opportunities exist to improve mining methods to reduce methane emission levels and improve underground mine safety. Management of water and land resources can be improved through the introduction of modern mining practices.

Solid waste disposal is a major problem and can be addressed by increasing the proportion of coal washed. This would have the benefit of improving the quality of coal fed into power stations, thereby improving thermal efficiencies and reducing the costs of boiler maintenance. Significant problems are also caused through the use of high ash coal and the lack of scrubbers in power stations. The pattern of coal use, with so many residential and domestic consumers burning coal directly, is a further significant cause of environmental air pollution.

Many of the environmental problems facing China can be addressed through the transfer of technology in both the mining sector and in the use of coal. However, in China there is strong competition for a limited amount of capital. Whilst the benefits of adopting existing, more efficient, technologies may be obvious to the outside world, from China's perspective there must be an economic benefit as well as a social (environmental) benefit for a technology transfer project to rank highly in China's overall agenda. This is not a problem peculiar to China; it is common for all developing countries.

In China's case, there is a large potential to significantly improve the country's environmental emission levels through the transfer of existing and proven technology. Much can be done through the exchange and implementation of what is standard practice in the mining and power industries in other parts of the world. Major improvements can be achieved across a wide spectrum of environmental issues with "off-the-shelf" technology transfers. However, in order to take advantage of the available technology, the Chinese authorities must address a number of the legitimate concerns of their foreign partners

- Firstly there is a need to fully recognise intellectual property rights and ensure the legal means of protecting these rights.
- Secondly, China is perceived as a higher risk country which, when coupled with the existing low levels of return, discourages potential investors. Positive encouragement is needed to provide foreign investors with the confidence to invest.
- Thirdly, the implementation of new technology may be slow because of China's desire to develop its own home-grown version. Given the pace of economic development and escalation in the environmental problems resulting from that growth, China may not be able to afford the luxury of waiting for the development of home-grown solutions. China may need to embrace more quickly much of the new technology if it is to achieve acceptable standards of environmental management.

…and by reducing energy subsidies:

Although not primarily prompted by climate change concerns, China has made remarkable progress in reducing energy subsidies since the mid-1980s. This is particularly the case for subsidies to the coal sector. Subsidy rates for coal have fallen from 61 percent in 1984 to 11 percent in 1995. At the same time, China removed price controls on coal, and encouraged the development of private coal mines. This subsidy reform has produced multiple benefits. The economic performance of coal mines has improved rapidly, reducing government spending and - along with other policy reforms and technological change - contributing to energy conservation and environmental protection. Energy intensity has fallen by 30 per cent since 1985, leading to energy consumption (in oil equivalents) and CO_2 emissions, respectively, 0.3 billion metric tons and 1.1 billion metric tons less than if the reform had not taken place.

Source: *Coal in the Energy Supply of China*, IEA, 1999

62. Continuing rapid growth will also require diversification of energy sources. The gap between domestic oil and gas production and demand is widening. From 1990 to 1995, China's oil demand grew from 4.3 percent per year, while oil production increased only 1.2 percent. As a result of these trends, China has become a net oil importer and in order to bridge the gap China will need to import more than 8 million barrels a day by 2020 (Figure 5). This will make it a major importer in the world oil markets. It is expected that the substitution of high polluting coal by other sources of energy will contribute to reducing environmental pressures and stabilise or lower emissions of "greenhouse gases".

Figure 5. Domestic Supply and Net Oil Import in China, IEA, 1999

3.2 Pressures and Trends in Industrial Development

63. It is estimated that that discharges from industry - including power plants - account for more than 70 percent of national pollutant emissions. Many polluting industries, dominated by the refining, smelting, metallurgical, chemical, machinery, textiles, leather, timber processing as well as pulp and paper sectors, are located in densely populated metropolitan areas, exposing urban residents to serious health risks.

64. In recent years growth has been uneven among various industrial sub-sectors, with some of the most polluting industries experiencing reduction of outputs. This has led to the reduction of the overall pollution loads. Many sub-sectors in heavy industry that are important sources of intractable pollution have been growing at rates significantly lower than the all-industrial average. At the same time, less-polluting industries (such as electronics, communications, and household appliances) have been growing at proportionately higher rates. Certainly, not all the "new" industries are without pollution problems, but growth and development favour industries that tend to use less raw material and tend to produce less pollution per unit of output. The World Bank estimates show that industrial pollution loads (indexed emission of three major pollutants: COD, sulphur dioxide and soot) increased at much lower rates than industrial output during the 1989-99 period, and that they actually declined after 1995. Some of these effects are the result of an increased regulatory effectiveness, but industrial restructuring also played an important role. The switch to a more competitive, demand driven industrial sector has also led to an increased earning retention and re-investment. This has increased technological innovation and resource use efficiency, allowing reduction of industrial pollution intensity per unit of output value[40].

65. Industrial restructuring also has narrowed the primary sources of industrial pollution leading to the situation when high quantities of industrial pollution load continued to be emitted by a small sector of industry. As of 1998, just eight industrial sub-sectors were discharging about 85 percent of all industrial pollution. In several cases, these sub-sectors are also making only modest contributions to gross industrial output value (GIOV). For example, the pulp and paper sector generated about 46 percent of industrial chemical oxygen demand, but only 1.8 percent of GIOV. The industrial structure still is characterised by relatively polluting upstream manufacturing, but as industrial reform continues, the share of downstream, less polluting, and high value-added manufacturing is expected to increase[41].

66. Prior to 1996 TVIEs were a significant source of pollution. Between 1990 and 1995, they increased their combined pollutant emissions by about 120 percent, while emissions from SOEs actually declined by 9 percent. Following a major pollution incident in July 1994 in the Huai River the central government adopted in 1996 drastic new pollution control measures for TVIEs, and launched a national campaign to close down some 72,000 highly polluting TVIEs in 15 sub-sectors. About 65,000 were actually shut down, including over 1,000 paper mills. This emergency shutdown programme had a measurable impact on industrial wastewater emissions (though had also potentially serious adverse social

[40] *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

[41] ibid.

impacts). Some 20 to 30 percent restarted, either illegally or after bringing their enterprises into compliance with relevant discharge standards[42].

67. Further economic restructuring combined with further liberalisation of trade and investment will affect various branches of industry as well as their contribution to environmental problems. The industries most adversely affected will be the "smokestack" industries. The reduction in production from this sector will influence positively environment as these are usually significant pollution sources and are frequently characterised by their low state of technological development, low product quality and high consumption of raw materials, including energy and waste. At the same time, it is expected that economic changes will lead to growth in such sector as electronics, textile, leather, food processing and other light manufacturing. Most of these industries are less-pollution intensive and their management is more efficient. These factors should help to reduce their contribution to environmental pollution. Some of these industries, such as leather and food processing can be significant sources of pollution, so it would be important that they are brought into regulatory network with the special attention.

68. Environmental performance of industrial firms depends on the amount of earnings which is invested in the improvement of technology applied or the installation of the new one. Facing a stronger competition as well as environmental regulations and tougher enforcement, many Chinese enterprises improved the efficiency of resource use. For example, over the last 10 years, industrial energy intensity declined by 50 percent. More efficient technology is estimated to account for about one third of the improvement. However, there is still considerably more room for improvement. There is a potential for increasing industrial water use efficiency, which has traditionally been very low in China, partly due to low water prices. Some examples include the chemical and paper manufacturing sectors, which are the leading water polluting industries in China. In some areas, particularly north China, increased water scarcity is leading to increased prices and an increased interest on the part of enterprises in water saving technology and other cleaner production strategies.

69. Since the beginning of 1990s, the environmental goods and services industry has become a new sector in the Chinese national economy. Although it has developed quickly it accounts now for only 0,85 percent of GDP. The current structure of this industry is unbalanced with most of the firms (over 90 percent) operating in coastal provinces and the industry is dominated by small and medium size enterprises. The participation of the foreign companies is very limited. With the projected increase of investment in protecting the environment and the improvement of nation's environmental awareness, environmental pollution control and treatment installations will be more needed and the market demand for these services will significantly increase. It is estimated that the industry will surpass 250 billion yuan of the annual production value and account for over 2 percent of GDP in the year 2010. The development of this industry, and opening the sector to foreign investors, can provide much needed pollution control and treatment equipment and provide additional employment in the Chinese economy. [43]

3.3. Pressures and Trends in Agriculture

70. Increasing fertilizers' use has been a major factor in the increase in grain and food consumption in China over the last 50 years. Total fertilizer consumption increased by more than 500 percent between 1980 and 1998, by which time it amounted to about 41 million metric tons a year. Applied fertilisers are the main non-point sources of nutrients which contribute significantly to eutrophication which occurs in many lakes throughout China and also in near-shore marine areas.

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42 *Environmental Regulations in China: Institutions, Enforcement and Compliance*, Ma X., Ortolano L., 2000

43 *Globalisation, Trade, Environment and Sustainable Development: Implications for China and its Entry to the WTO, Tisdell C., 2000*

71. Pesticides played a part in the agricultural sector's growth in output. In the early 1950s, total domestic pesticide production was only about 1,000 tons. By 1999, this increased to about 625,000 tonnes, by which time China had become the second largest producer and consumer in the world. In early 1980s China produced high volumes of pesticides with a high proportion of "high-toxicity, high-residue" chemicals. Domestic production of most of these toxic compounds was banned in 1983. As a result, total domestic pesticide production declined by about 60 percent in 1985. As production recovered through the late 1980s and 1990s, the range of chemicals produced changed, but not very advantageously from an environmental point of view. Two of the top three insecticides produced in 1996 were classified as WHO Class 1 (highest toxicity) chemicals. The ban of high-toxicity chemicals was not completely effective, and there remains a substantial domestic trade, and perhaps also production, of the supposedly banned chemicals. The main environmental effects from the overuse of pesticides are the occurrence of pesticide residues in Chinese food crops and biodiversity impacts. Residues in vegetables, fruit and meat can affect health of the population in China and other countries through exports.

72. While per capita grain production has been declining, the consumption of animal products has increased significantly leading to the increase of domestic livestock production. Production of livestock raised in intensive production units can be a significant source of solid and liquid waste, as well as odors. The World Bank estimates that the COD[44], load in untreated piggery wastes was about 2.6 million tonnes in 1996 and will be about 8.2 million tonnes in 2010, representing 28 percent and 90 percent respectively of current urban and industrial COD loads. One recent study estimated that, in certain areas within the Huai and Hai River basins, current COD loads from all livestock already amount to between 30 percent (in Zhangjiakou) and 80 percent (in Chengde) of industrial COD loads.

73. In general, it is expected that land-intensive industries, such as forestry products, plantation, and water-intensive grain production and tradition husbandry, would decrease their share in agriculture production. These changes are likely to reduce pressures on land and natural resources, such as water and forests. For example, grain production sector will experience reduction in the use of chemical fertilisers and pesticides and therefore reduce non-point source of pollution. It will also reduce the use of water for irrigation purposes[45].

3.4 Pressures and Trends in Urban Development

74. China's urban population is vast and growing rapidly. The current "official" urban population is estimated at 400 million people, or 30 percent of the population. Each year during the 1990s, it grew by about 10 million people. It is considered that the actual urban population is much larger, about 455 million, or 36 percent of the total population. A World Bank model predicts that by the year 2002, 42 percent of the population, more than 600 million people, will live in urban areas, concentrated in Eastern and South-Eastern provinces.

75. The Chinese authorities estimate that urbanization growth rates will be maintained at 0.5-1.0 percent per annum during the period of the Tenth Five-Year Plan. This implies a substantial increase in urbanization over the next 10 years. The demand for urban environmental infrastructure, already high, will increase accordingly. This will represent another significant environmental challenge for the government. Priority environmental issues in China's urban areas include air pollution, municipal wastewater treatment, solid waste management and urban encroachment in arable land.

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44 Because decomposition of organic matter in a river requires oxygen the level of organic pollution from domestic and industrial sources (mainly sewage) is expressed in chemical oxygen demand (COD).

45 for more detailed discussion of this issue see "*Agricultural Prospects and Policies in the Wake of Trade and Investment Liberalisation"*, CCNM/CHINA(2001)5

76. Residential and commercial emissions to air, while relatively small compared to industrial emissions, usually cause much more significant pollution effects because of their low emission height and proximity to residential areas. The principal source of this emission is burning fossil fuel. Residential sector accounts for approximately 15 percent of total use of coal, yet it is estimated that it contributes to more than 30 percent of urban ground-level air pollution. China has promoted the use of gaseous fuels, especially in large cities. Largely as a result of government investment, about one third of urban residents in China now have access to gas for cooking, and coal burning households are increasingly turning to the use of cleaner and more efficient briquettes. As a result SO_2 and TSP pollution have declined significantly.

77. These reductions, however, have been accompanied by an increased pollution from motor vehicle following the sharp increase of the number of cars, especially in the biggest cities. The number of vehicles has tripled between 1986 and 1996, and if the growth rate continues, their number will reach approximately 180 million cars by the year 2020, similar to the number of cars in the US. The main impact of motor vehicle is associated with poor performance of engines of domestic-made vehicles which emit often 5-6 times more pollutants (mostly NO_x and CO) that the imported cars. Although emissions from individual car engines will decrease pollution levels may not be affected as these gains will be offset by the increase in the number of vehicles. It should be noted, however, that a government programme launched in 1997 to phase-out leaded gasoline should help significantly to reduce health impact of urban transportation. Notwithstanding such initiatives, motor vehicle, and especially passenger cars, will be one of the main sources of urban air pollution in the future taking account of the current projections of urban transportation growth.

78. The combination of a rapidly increasing urban population, increasing urban water supply service levels, and increasing per capita urban water consumption are producing increases in municipal wastewater flows and pollutant loads. According to the SEPA, total wastewater flows and loads from municipal sources now exceed those from industrial sources. Despite double-digit growth of municipal wastewater treatment capacity over the last decade, Chinese cities continue to be under-served by sewers and wastewater treatment plants. It is estimated that only about 2 billion m^3 of non-industrial municipal wastewater received secondary treatment in 1998, representing only about 10 percent of the total discharge. Given municipal water demand projections, current municipal wastewater treatment capacity will have to be nearly quadrupled over the next 20 years just to maintain the current level of municipal treatment service. If the level of service were to be doubled over the same period, and making no allowance for an increased acceptance of industrial flows, installed capacity would have to increase by six- or seven-fold, which will require massive investments.

79. There are several main constraints in the effective management of municipal waste in China. Firstly, the current waste management and control system lacks sound regulatory mechanisms. Secondly, the waste collection and disposal charges are low and they do not cover the costs which are born by the public budgets. Thirdly, unsuitable consumption patterns, including excessive packaging, have led to the increased waste volume. Fourthly, the classification and screening system for hazardous waste has not been developed which leads to contamination of municipal waste by toxic waste, such as batteries and used oil. The recovery and recycling rate of waste is very low and waste treatment technologies are still at early stage of development, with the lack of facilities or their low efficiency.

80. Substantial policy actions and investment will be required to improve urban environmental quality. Priorities include fuel switching for domestic and residential use, promotion of the public transport as well as increasing efficiency of motor vehicle engines to reduce air pollution; increased municipal wastewater treatment capacity and extension of sewers to reduce water pollution and better waste management and treatment. In addition, water and energy conservation as well as waste minimisation programmes should be launched to influence consumer behaviour. These changes, however, have to be

underpinned by market-based pricing of environmental services in urban areas to increase incentives to save water and energy, switch to less polluting modes of transport and to recover costs of services.

4. Development of China's Policies, Regulatory and Institutional Framework for Environmental Protection

4.1 Early Stages of Creating the Basis for Environmental Protection in China

81. China's policy and institutional setting for environmental protection have undergone several transformation over the past decades, reflecting different stages of restructuring and an increasing emphasis placed by the Government and the society on environmental issues. The preparations for the 1972 United Nations Conference on the Human Environment (UNCHE) in Stockholm gave an important impetus for organising environmental management within the Chinese government. The first country-wide discussion on environmental protection was launched at the first National Conference in 1973. Following on from the conference further analysis of environmental consequences of economic development were carried out by a group of experts and officials under the State Council. This work resulted in publishing in 1974 a report entitled "Key Points in the Environmental Protection". The report stated that China could not afford to adopt the approach of "polluting first and control pollution later" and presented a framework for administrative management of environmental protection at the national level.

82. As experience with different environmental management approaches accumulated, the National People's Congress Standing Committee promulgated in 1979 a provisional version of China's basic environmental law "The PRC Environmental Protection Law for Trial Implementation". This statute required polluters to comply with pollution and waste discharge standards, directed enterprises to assess environmental impacts of proposed projects and ensured that new projects satisfied applicable environmental standards. This statute also established national and local environmental agencies. Following this trial period, the formal Environmental Protection Law of the People's Republic of China came into effect in 1989. This legal act now constitutes a basis for China's environmental protection system[46].

4.2. Institutional Framework

83. The first version of China's top environmental agency was the Environmental Protection Office, a unit with a staff of twenty set up in 1974 under the State Council. The office concentrated on planning and had no authority over lower levels of government. In 1982, three years after the promulgation of the trial environmental law the State Council set up the Ministry of Urban and Rural Construction and Environmental Protection with the Environmental Protection Bureau within its structure. Subsequent reorganisations in 1984 and 1988 elevated the status of the environmental bureau to a separate office. First, the Bureau was renamed the National Environmental Protection Bureau. Its staff size doubled (from 60 to 120 persons) and it became subordinated to the Ministry of Construction and the State Council's Environmental Protection Commission. Then, the Bureau was brought out from under the Ministry of Construction and renamed the National Environmental Protection Agency. In making this change, the State Council increased the agency's authority. More than doubled the number of staff (from 120 to 320), and signalled that the State Council attached importance to environmental protection. Like main line ministries, NEPA had direct links to the State Council.

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[46] *Environmental Regulations in China: Institutions, Enforcement and Compliance*, Ma X., Ortolano L., 2000

84. In 1998 China's environmental agency was transformed again, renamed the State Environmental Protection Agency (SEPA) and upgraded to a full ministerial rank. The restructuring involved dismantling the Ministry of Forestry and consolidating some of its staff and functions of NEPA. The fact that senior officials from other restructured ministries: Geology and Mineral Resources and the Chemical Industry have been appointed vice administrators of SEPA gave this institution even greater weight. In the new structure, the agency's had a better position to influence other government agencies. Notwithstanding this change, SEPA remains far less powerful than some other key ministries or agencies. Unfortunately, the 1998 reorganisation also dismantled the State Council's Environmental Protection Commission. With the membership that included thirty-one ministries and commissions and several representatives of large enterprises and the media the Commission played an active role in policy-making, co-ordinating environmental efforts of ministries and assisting in resolving controversies in the proposed laws related to the environment. This change was regarded as a step which weakened the possibilities for proper co-ordination of environmental measures within the State Council.

85. In general, government organisations involved in environmental protection are organised hierarchically along three lines:

- environmental protection committees of people's congresses, responsible for proposing environmental laws;
- SEPA which formulates environmental policies and programmes and environmental protection bureaus (EPBs)[47] which implement local and national regulations, and
- environmental protection commissions of people's governments which co-ordinate agency responses to pressing environmental problems.

86. China's SEPA now plays a key role in designing pollution and control policies and programmes, but its role in day-to-day implementation of the regulations is limited. SEPA, which has a staff of a few hundred people, implements rules only for projects undertaken by the sectoral agencies at the national level, or activities that are of national significance. In all other cases, EPBs implement industrial pollution control rules and deal with enterprises on a daily basis.

87. There are several other administrative units at the national and sub-national level which play a significant role in environmental protection in China. These include sectoral Ministries and agencies at the central level; and Mayor's offices, planning commissions and economic commissions, industrial, finance and urban construction bureaus at the sub-national level. For example, Mayor's offices undertake key decisions on large investment projects involving industrial development and environmental protection. They also settle disputes between the municipal EPBs and enterprises supervised by a municipality's industrial bureaus. Planning commissions at the county level and above are responsible for revising EPBs' environmental protection plans and integrating them into local economic and social development plans. Many industrial bureaus have environmental protection divisions that assist enterprises associated with their bureaus with technical aspects of pollution control.

4.3. Current Policy and Legal Framework

88. In 1996 the National People's Congress approved China's Ninth Five-Year Plan for Social and Economic Development, which for the first time included environmental goals. Several months later, the State Council approved the Ninth Five-Year Plan for Environmental Protection and Long-Term Targets to the Year 2010. The two implementation strategy documents were attached to the latter: one describing a

[47] EPBs are elements of government at sub-national level, including provincial, municipal, county/district and township levels.

national programme to control total waste discharge (which represented an important shift from concentration-based to mass-based control of pollution emissions) and the second detailed China's "Transcentury Green Projects". The "Transcentury" programme included a list of over 800 pollution abatement projects to be implemented in the context of the Ninth Five-year Plan.

89. In the year 2000, China's Tenth Five-Year Plan for Social and Economic Development was elaborated and approved along with the Tenth Five-Year Plan for Environmental Protection. The environmental plan set the new goals for the following five years taking account of progress in implementing the provisions of the previous plan. Its emphasis continued to be placed on reducing further all forms of pollution, including reducing the length of polluted sections in the main rivers, reducing acid deposition across China and addressing more vigorously pollution from agricultural sources. Other goals included slowing down the trend in destruction of natural habitats and to improve environmental quality in major municipalities and regions. Further elaboration of environmental legislation and resource management strategies aimed to strengthen enforcement of environmental legislation and increase environmental expenditure.

90. In addition to the basic environmental law of 1989, China has more than twenty special environmental statutes. The State Council, SEPA and other state agencies have issued numerous administrative regulations to implement environmental policies stipulated in the basic and special environmental laws. Many of the priority environmental problems are subject of national plans and programmes. Several of China's environmental programmes are tied to international agreements, such as the "Country Programme for the Phaseout of Ozone Depleting Substances under the Montreal Protocol".

91. The current framework of regulations, supplemented by economic, voluntary, and public disclosure instruments provides a good basis for effective pollution control. The regulatory framework (mainly based on so called "command-and-control" instruments) has been developed in the most comprehensive way (Box 3). It includes a number of instruments and programmes, such as environmental discharge and quality standards, Environmental Impact Assessment (EIA) and reporting, a variation of compliance schedules called "pollution control within deadlines", discharge permit system and pollution control management, called "centralised pollution control".

92. The application of economic instruments for environmental protection has been increasing. This category of instruments includes, inter alia, pollution discharge fee system and non-compliance fees. Under the discharge fee system enterprises must pay fees for releases on air-borne and water-borne pollutants. In addition to paying fees for the release of pollutants beyond standards (non-compliance fee), enterprises violating requirements may have to pay four other kinds of penalty charges, referred to as "four small pieces". These fees serve the purpose of penalising breaching environmental requirements, such as long-lasting non-compliance, non-compliance by new enterprises (or failure to comply with administrative orders requiring pollution control by a fixed date), penalty for non- or late fee payment, and finally, the compensation for economic losses or adverse human health effects[48]. A number of other economic instruments have been introduced on the experimental basis, such as sulphur emission fees, emission trading, subsidies for energy saving products and regulation on refuse credit to high-polluting firms[49].

[48] *Environmental Regulations in China: Institutions, Enforcement and Compliance*, Ma X., Ortolano L., 2000

[49] *China: Air, Land, and Water: Environmental Priorities for a New Millennium*, World Bank, 2001

Box 3. Regulatory Instruments Applied in China's Environmental Policy

Emission/Discharge and Ambient (Quality) Standards

The 1989 PRC Environmental Protection Law authorised NEPA to establish two types of national standards: ambient (environmental quality) standards and waste discharge/emission standards. Ambient standards are illustrated by restrictions on the minimum allowable concentration of a pollutant in the environment. Discharge/emission standards are exemplified by a limit on the maximum permissible concentration of a pollutant in industrial emissions or discharges, e.g. mercury in a factory wastewater release. Local governments may create ambient and discharge standards for pollutants not specified in national standards, and they may also establish more restrictive limiting values for pollutants included in national discharge standards. For a long time China's effluent standards only constrained concentrations and were met by diluting wastewater with uncontaminated water. Thus, pilot schemes have been launched to introduce mass-based controls on total provincial discharges. In this connection another programme, called "Two Compliance Policy", has been launched. This programme aims to promote compliance with discharge standards and ambient standards at the same time (hence "two compliance") to help the move from concentration-based to mass-based or total pollution load control.

Discharge Permit Systems (DPS)

Under the DPS environmental protection bureaus issue permits that limit both the quantities and concentrations of pollutants in an enterprise's wastewater and air emissions. DPS rules require enterprises to register with EPBs and apply for a permit. EPBs then allocate allowable pollution loads to enterprise, issue discharge permit, and enforce permit conditions. Unlike other systems and programmes the DPS has not been affirmed by legislation and it is based on administrative edicts.

Pollution Control Within Deadlines

Under the 1989 *PRC Environmental Protection Law* government can require polluting enterprises to control their waste releases by specific dates. Clean-up deadlines for enterprises can only be imposed by national or local people's governments, but local governments sometimes give EPBs the authority to set deadlines. Enterprises that do not abate pollution on time risk being fined or shut down.

Environmental Impact Assessment (EIA) and Reporting Systems

The EIA requires every project with possibly negative effect on the environment to be reviewed to assess its environmental impacts. Project proposals should contain an analysis of environmental impact and the corresponding preventive measures, and be submitted to the environmental administrative authorities for screening. After the review of the proposal, the applicant needs to engage a qualified firm to prepare an Environmental Impact Report. It is only after the approval by the state or regional environmental authority that the project can be formally launched.

"***Three synchronisations" System***

The system of "three synchronisations" (called also "Three Simultaneous Steps") requires that the i) design, ii) construction and iii) operation of a new industrial enterprise (or an existing factory expanding or changing its operations) must be synchronised with the design, construction and operation of an appropriate pollution treatment facility. Once the construction of the project is completed, inspection and approval by environmental authorities are required (for large projects, or in case of a dispute at the local level, the approval has to be confirmed by the national level authority). If project operations begin without the approval from the local EPB, the owner of the project can be sanctioned. In many instances though the sanctions have not been applied and there are many departures form the above mentioned procedures, especially by many TVIEs. Overall, however, this programme has played an important role in stimulating investment in pollution abatement facilities at industrial enterprises, especially at new factories.

Centralised Pollution Control

Until the 1980s, China's pollution reduction efforts focused on treatment by individual enterprises. This strategy has not always been effective as the costs of individual treatment plants were higher per unit of waste treated than in case of larger centralized plants. Recognizing the possible economic advantages of building large treatment plants, the State Council and the environment agency issued documents requiring governments at all levels to promote centralised control of waste within their jurisdictions.

Source: Environmental Regulations in China: Institutions, Enforcement and Compliance, Ma X., Ortolano L., 2000

93. In the late 1980's NEPA proposed an "environmental responsibility system" in which provincial governors, city mayors and county magistrates would be responsible for overall environmental quality in their jurisdictions. Instead of issuing detailed guidelines for implementing environmental responsibility system, NEPA encouraged local innovation. Some municipalities responded by creating formal contracts between mayors and directors of industrial bureaus, or between mayors and heads of urban districts and rural counties. These contracts spelled out mutually agreed environmental goals and clean-up targets. In some cities, the environmental responsibility system has been implemented using informal contracts between EPBs and managers of enterprises. This approach, as well as other programmes to promote Cleaner Production, certification with ISO 14000 standards and environmental labeling, are examples of voluntary instruments (Box 4). These instruments have been introduced in environmental management in China only recently following the experience from their application in OECD countries. In addition, some information-based instruments and awareness raising campaigns have also been launched to promote compliance.

4.4. Enforcement of, and Compliance with, Environmental Requirements

94. Despite the complex system of legislative and policy tools in place and the network of environmental officials throughout the country, compliance with environmental regulations remains low, essentially because economic development, and in many cases, social considerations remain the country's priority at all levels of society. Instances in which, for example, a mayor's office interfered with an EPB's decisions on the economic grounds are common. A typical case involves a mayor's office that asked an EPB to return fines that an enterprise paid to an EPB. The mayor's office argued that the enterprise had financial problems, and the EPB's fines made the enterprise's position even worse.[50]

95. Because China's environmental laws are general and often intentionally ambiguous, they allow the State Council, national agencies, and local governments to add details that influence implementation. As most day-to-day implementation of national environmental laws occur at the local level, local people's congresses and the executive branches of local governments respond to national edicts by producing their own versions of national regulations, notices and other executive orders. Although the laws and regulations issued by these bodies must be consistent with national enactments, they allow for a flexible interpretation of the requirements which very often leads to compromising environmental objectives. In many cases, the degree of actual compliance and enforcement depends on the region concerned and the personalities involved and the ability of enterprises to comply with the laws. There are cases in which the more strictly environmental policy is applied to the richer potential investors as well as cases in which environmental requirements have been lowered to attract local and foreign investment.

96. Vagueness of standards in many laws and regulations combined with lack of a strong enforcement activities as well as strong impartial judiciary to interpret the laws and arbitrate legal and regulatory disputes are other factors allowing wide-spread non-compliance with environmental requirements. The problems are further magnified by contradictions related to vertical responsibility in environmental administration, lack of technical capacity and resources available to SEPA and EPBs to carry out their duties. However, as part of its efforts to strengthen environmental law enforcement, the government revised its criminal code to punish violations against the environment. These steps may provide law enforcement agencies with some powers.

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[50] *Environmental Regulations in China: Institutions, Enforcement and Compliance*, Ma X., Ortolano L., 2000

Box 4. Voluntary Instruments Applied in Environmental Policy in China

Recently adopted requirements to shift to a comprehensive control of technological processes is being encouraged by promotion of the "cleaner production" concept, adoption of ISO 14000 certification[51] procedures and environmental labeling.

Cleaner Production. The Cleaner Production (CP) programme, which started in 1993, encourages enterprises to adopt in-plant waste minimization technologies as supplements to traditional "end-of-pipe" pollution-control approaches. There is considerable potential in the CP programmes, since many of the older and more polluting enterprises are very inefficient and use outdated production technology. Some successful examples can be found mainly in areas with strong incentives, such as the water-scarce areas of northern China. Nevertheless, the technical capacity to undertake cleaner production audits and feasibility studies has been established, as for example China National Cleaner Production Centre under the Chinese Research Academy of Environmental Sciences. The institutions like this one have created the foundations for the establishment of an environmental audit service industry and the capacity to respond as the demand for these services develops.

Environmental Management Standards. The application of ISO 14000 series in China is expected to encourage Chinese companies, directly or indirectly through pressure from purchasers of their products and services, to promote compliance with environmental requirements. Such self-implementation can ease the burden on regulators and foster corporate culture of compliance, while enhancing the competitiveness of Chinese enterprises in international trade.

The ISO 14000 certification procedures were introduced in 1997 building on a long tradition of standard-setting process which served to promote business, science and technology. The Standarisation Law of 1988 provides that the state shall encourage the active adoption of international standards. Standarisation under the statute encourages to protect people's health and safety, the rights of consumers, the environment and promote resource efficiency as well as economic and technological co-operation with foreign entities and foreign trade.[52]

The introduction of ISO 14000 certification was initiated by SEPA's Office of Environmental Management Systems. Subsequently, a Steering Committee for Environmental Management System Certification was established under the State Council to provide accreditation services for certification bodies and auditors. Several environmental management and consulting centres have been established to conduct ISO 14000 certification, including the Environmental Management Committee of China Registration Board for Auditors. Initially the adoption rate, as experienced in other countries, has been slow. During the first year 27 enterprises received ISO 14001 certification but during the subsequent year over 100 enterprises have been certified. The majority of the participants are either foreign firms (more than half in the electronics and household appliances industries) or domestic firms engaged in production of export-oriented products. Unfortunately, nation's main polluters have not been so far very active in applying for the environmental certification.

Environmental Labeling. In 1994, China began to implement an environmental labeling programme. A number of rules and technical specifications for products eligible for environmental labels have been issued and over 500 products from 150 enterprises have received such labels by early 1999.

Sources: *China: Environmental Protection, Domestic Policy Trends, Patterns of Participation in Regimes and Compliance with International Norms*, in the China Quarterly, L. Ross, 1998

97. In addition to problems with lax enforcement, the under-pricing of natural resources and environmental services has encouraged their wasteful use and has not provided appropriate incentive for internalising environmental costs. Despite the fact that China's resources are scarce prices of energy and water has been, for a long time, far lower that the actual costs of providing these services. However, great strides are being made to rectify the situation. For example, over the past years, the government has raised, and partly deregulated, coal prices. In most areas, coal prices now cover the costs of production and delivery. In terms of environmental services, many cities and provinces are currently preparing to increase sewage and water charges to consumers and industries. In Taiyuan of Shanxi province, for instance, the

51 The ISO 14000 series of environmental management standards has been developed and adopted by the International Organisation for Standardisation (ISO). ISO 14000 series drew heavily on environmental management standards in Great Britain (BS 7750) and the European Union's Eco-Management and Audit Scheme (EMAS). China participated through the process of development and adoption of these standards.

52 *PRC Standarisation Law* (1998)

price bureaus have announced the water prices would quadruple over the subsequent years in order to recover supply costs. Shanghai recently increased tap water prices between 25 and 40 percent to fund water quality improvement programmes and to make sewage self-financing. Other cities are planning to follow this pattern. In 2001 a proposal was put forward by China's Ministry of Water Resources to increase prices of water in Beijing from 1.6 yuan per cubic meter to five yuan by 2005 to stimulate water conservation and recover the costs of providing the service.

5. Environmental Regulatory and Institutional Framework and Foreign Direct Investment and Trade

98. With the introduction of economic reform in 1978, China liberalised foreign trade and investment, which has expedited its integration with the global economy. The reform was vital for generating inflow of financial resources for investment, introduction of modern-technology and know-how. Over the years, however, environmental policies have not been successful in influencing China's decision-making in the area of trade and investment. This occurred in spite of existence of specific policies and administrative procedures governing, screening and monitoring trade and investment flows with respect to their impact on the environment. In practice, production costs, market access, and resource availability have been more important considerations in making trade and investment decisions. China has encouraged foreign companies to invest to finance its development goals and to assist in opening up its markets; environmental requirements have, in many cases, been compromised. As a consequence, trade and investment liberalisation has resulted in several incidents of negative effects on the environment. For example, some foreign firms promoted imports of outdated technologies and polluting or toxic substances, taking advantage of the lower (or more flexible) environmental standards in China. Opening up new trade relations has not always brought about improvements of environmental performance. Some indications at the sector level, as in textile and leather production, show that the quantity of pollution in these sectors has increased as their exports grow[53].

99. Over time, however, experience from implementing environmental policies has accumulated and institutions have become more mature in understanding the environmental impacts of economic activities and the ways to influence them. A number of positive examples have shown that FDI and trade can result in transferring advanced technologies which improve the performance of polluting industries and reduce energy and resources consumption. At the same time, importing raw materials such as fuels, minerals, petrochemical and rubber products, or the paper pulp have reduced negative environmental pressures which could have been exerted by extracting or processing these materials at home. With a growing number of such evidence, the trade and investment liberalisation and environmental interface has recently received greater attention in China. New policies and instruments have been put in place to promote environmentally friendly investment, and counteract negative impacts on environment.

5.1. Policy and Institutional Framework for Integrating Environmental Consideration into Trade and Investment Policies

100. In general, China does not have separate environmental standards for foreign investment, although some relevant clauses governing foreign investors' environmental behaviour can be found in a number of national laws and regulations. For example, Article 18 of the Constitution contains the principle that all foreign investors must comply with the Chinese laws and regulations and meet the host country's environmental standards. Furthermore, Article 30 of the 1998 *PRC Environmental Protection Law*

53 *Policy Research on Interactions between China's Foreign Trade and Environmental Protection*, Ye R. et al., 1999

stipulates that imports of environmental unfriendly technology and equipment is forbidden. The procedures for regulating the environmental aspects of FDI are similar to those of domestic firms. The environmental protection programmes and instruments presented earlier (Box 3), such as Environmental Impact Assessment and Reporting, the "three synchronisations", registration and licensing systems for discharge of pollutants and the system of effluent charges are equally applicable to domestic as well as foreign industrial operations.

101. There are, however, additional specific policies and administrative procedures governing the screening and monitoring of FDI with respect to their impacts on the environment. According to the "Notice on Reinforcing Environmental Protection Management of Foreign Investment Projects" issued in 1992 foreign investors should prevent environmental pollution and ecological damage, and accept monitoring and supervision by environmental protection authorities. The "Notice" also sets out procedures for screening the environmental implications of investment projects and monitoring the implementation of environmental protection measures. Similar provisions can be found in other regulatory documents, such as "Implementing Regulations on Joint Ventures" or "Regulations of Ocean Oil Exploiting by Foreign Firms". They stipulate that foreign investors are required to comply with relevant environmental laws and that regulations and projects with negative environmental impacts cannot be approved. Some of the regulations in the manufacturing and mining sectors, such as the "Application Form for Establishing Foreign Invested Enterprise in China", require enterprises to present indicators of treatment and control of their pollution releases to the air, land and water (so called "three wastes" indicators). Other examples of such regulations include the 1994 Law of Foreign Trade, the 1995 Law on Contractual Join Ventures or the 1994 Regulations on the Labour Management in Foreign-Invested Enterprises. All include clauses prohibiting projects with negative impacts on the environment or human health and describe sanctions for breaching environmental regulations.

102. In 1995, China promulgated "Interim Provisions for Guiding Foreign Investment" and a "Guiding List of Industries for Foreign Investors". Since then the guidelines have been updated regularly reflecting the latest economic developments and policy priorities. In these official documents, FDI projects are divided in four major categories: i) encouraged, ii) permitted, iii) restricted and iv) prohibited. The "encouraged" category includes projects requiring advanced technology to improve products and production processes, increase energy and material efficiency and stimulate effective management of enterprises in general. The "encouraged" projects should also aim to reduce the negative impact on the environment and develop systems to control pollution and increase recycling. The provisions also encourage investment in the mid- and western parts of the country which exhibit low pollution levels. Projects that adversely affect human health, pollute the environment, or destroy natural resources falls under category of "prohibited".

103. These guidelines have enhanced the transparency of the admission and approval process for foreign investors. They also provided guidance for policy implementation agencies in screening FDI with a view of maximising its benefits to the development process and minimising negative impacts, while protecting the legal rights of investors. On the other hand government, and especially the authorities at the local level, tend to adjust their decisions (often by lowering environmental requirements) in order to improve the local investment climate for foreign investors. One of the arguments used in considering investment flows is that strict environmental regulations would make investment less attractive and push foreign investors away from locating their operations in the part of the country under consideration. This situation is reinforced by the weak position of local environmental protection administration and lack of human capacities to deal with application screening and monitoring mechanism and procedures. According to one survey, only 97 out of 382 economic development areas in 16 provinces have conducted regional environment assessments. Some local officials often ignore the environmental protection laws and regulations, and issue decisions to build polluting projects even in water-source areas or in natural

conservation zones. There are cases in which local authorities lowered the environmental standards for foreign investment creating "opposite" double standards[54].

104. The problems related to the negative impacts of flexibility of policies and regulations is exacerbated by the lack of appropriate institutional framework for co-ordinating respective policies. The landscape of institutional mechanisms to govern the environmental impacts of international trade and financial flows in China is currently characterised by significant gaps and discontinuities, and important "responsibility vacuums" exist at various levels. The ability of environmental agencies to exert influence over the environmental impacts of foreign trade and investment is constrained by lack of mechanisms to discuss and address conflicts between the goals of economic growth and environmental protection. As it was presented before, the SEPA's and EPB's influence on the sectoral decisions is weak, as the capacity and legitimacy of these agencies are limited. In particular, there is lack of inter-ministerial body which would ensure the integration of environmental consideration into trade and investment policies and decisions. One of the institutions which was aiding to co-ordinate cross-sectoral issues was the State Environmental Protection Commission (SEPC) under the State Council but it was abolished in 1998 as part of the reorganisation of the governmental structures.

5.2. Examples of Environmental Impacts of FDI and Trade Flows in China

105. Due to the lack of systematic empirical evidence and a sound analytical framework, it is difficult to provide a comprehensive quantitative analysis of either positive or negative effects of FDI and trade liberalisation on the environment in China. It is equally difficult to determine whether foreign affiliates' environmental performance is better or worse than that of comparable local firms as the degree of importance attached to environmental impact of FDI and trade by local governments and the society varies from one area to another in China. In the coastal areas, which are more economically developed, the desire for environment protection is stronger as a result of the higher level and density of economic development and the existence of higher awareness of environmental pressures resulting from the rapid industrial and urban growth. In such cases it has been easier to act to limit environmental consequences of industrial development in these areas, and the implementation of environmental policies is more rigorous and effective. In the Central and Western part of the country, where the development is slower, local governments may have greater interest in attracting FDI than in protecting the environment. Economic development is often considered of utmost importance and environmental protection is given a low priority. This leads to the situation that environmental measures are frequently remedial rather than preventive.

106. Over the past two decades, industries such as chemical, petrochemical, leather, printing and dyeing, electroplating, pesticide, pulp and paper, mining and metallurgy, rubber, plastic, construction material as well as pharmaceutical production have been among the most attractive for foreign investment in China. They are often referred to as pollution-intensive industries, as they usually rank high in emissions intensities of pollutants. A study based on a survey of industrial sectors carried out in 1995 showed that about 30 per cent of FDI in China was located in pollution-intensive industries, out of which 13 percent were in highly-pollution-intensive industries[55].

107. The patterns related to the origins of these investments follow the overall patterns of sources of FDI. The high share of developing Asian economies investing into pollution-intensive industries is

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54 *Policy Research on Interactions between China's Foreign Trade and Environmental Protection*, Ye R. et al., 1999

55 *The Interface between Foreign Direct Investment and the Environment: The Case of China*, Xian G. et al., 1999

consistent with its overall higher share of their FDI stock in China. This is possibly due to the rapid change in locational advantage for pollution-intensive industries. An increasing tightening of regulations in the home countries, a lower level of environmental standards and weak monitoring mechanisms in China could be the main reasons for inducing FDI into those industries.

108. Very often an increased focus of FDI on pollution-intensive industries in China is associated with negative implications for China's environment. The relocation of production into pollution-intensive industries need, however, to be differentiated from the transfer of pollution itself and a large scale FDI into these industries has been determined primarily by such factors as labour costs and skills as well as infrastructure and not low environmental standards. In many cases the investments helped to reduce environmental pressures from this highly polluting sector as a number of enterprises with FDI applied environmentally-sound technologies, introduced better management practices and increased pollution control. This has been particularly the case in the pharmaceutical industry, where multinational companies facilitated the transformation of that industry into significantly more environmentally friendly.

109. As it was mentioned earlier, China's environmental standards are, in general, lower than those in the OECD countries. As about 75 percent of the foreign direct investment comes in the form of production equipment there are cases where foreign investors have transferred to China technological processes that do not meet environmental standards elsewhere. The transfer of production lines that have negative effects on the ozone layer can be a case in point. Although there has been strict control over such production lines, around 1,500 foreign-investment firms were established between 1985-1994, most of which producing foaming and rinse products. The majority of the investment in this sector (about 60 percent) came from Hong Kong and Korea. As the concerns regarding these operations were growing administrative decrees relating to the screening and monitoring of environmental aspects of FDI came into effect and helped to strengthening control over this type of investment.

110. Some foreign firms do not pay adequate attention to pollution prevention and adequate and effective measures to treat pollution are not applied as enforcement by local environmental authorities is weak or lacking. In July 1997, the NEPA and MOFTEC examined jointly environmental performance of enterprises with foreign capital lower than US$ 5 million in six provinces (Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi). The examination showed that the performance rate of complying with the EIA procedures was 61% on average and compliance with "three simultaneous steps" was 83.5 percent. These figures for compliance with EIA varied from 28 percent in Guanxi autonomous region to 96 percent in Tianjin province.

111. There are cases of foreign investors setting up enterprises to decompose, renovate and process waste, including metals, electronic appliances, tires, and chemicals. Usually these activities have recycling as the main objective though most of them result in serious environmental pollution. For example, Chinese Taipei used to be an important location for recycling hazardous materials from abroad. In 1993, its environment authorities banned trading in these materials. As a result, a number of Taipei investors relocated their production facilities to the eastern coastal areas in China, such as Shenzhen, Zhuhai and Changzhou. These enterprises continue importing used cells, vehicle plates, computers, adapters and other electrical and electronic components for recycling into China. Most of the incidents happened in the projects financed by medium and small-scale foreign firms some with serious environmental consequences (Box 5).

112. On the other hand, there is a growing number of evidence that FDI, especially by major multinational companies, has contributed positively to China's environmental protection. Apart from the advantages of technology and management, these investments are usually large compared with domestic firms. They bring significant resources for investment in research and development (R&D), as well as environmental management systems. Some foreign companies have been actively involved in the

development of environmental goods and services sector, including waste management and clean-up technologies; others use environmentally friendly technologies in their production. They also generate demonstrative impacts on domestic companies in implementing ISO 14000 standards on other environmental management systems (Box 6).

Box. 5 Examples of Negative Environmental Impacts Involving FDI and Trade

A Hong Kong affiliate invested 16 million dollars in plastic toys production operations in Shenzhen. The firm used a process of adding a large amount of plasticizer, such as dibutyl phthalate (DBP) to polyvinyl chloride (PVC). Substantial amount of foul and toxic gases, which were produced when the PVC was heated and shaped, was discharged resulting in severe pollution of the surrounding area. Besides, the noise of its production facilities reached 60 db, far above the national standard. The case was brought to court and the firm was fined HK$ 20,000 as well as had to pay investigation and lawsuit fees

A Sino-Korean leather manufacturer, due to ineffective sewage draining facility, discharged sewage surpassing the national standards over 750 times. Many nearby residents complained about severe damage to the surrounding environment. Although the company was amerced three times, it did not take any measures to control the pollution until the case was exposed on a China State TV.

In north-east China, a well-known joint venture was set up in 1992 by a Thai company and a local partner. However, the company started its operation without undergoing appropriate environmental administrative procedures. It was estimated that 30 million tons of highly polluted sewage was discharged through the Yinma river into Songhua river.

A large-scale foreign affiliate located along Shaxi river in Xianyou county launched the production of leather products without paying attention to controlling environmental pollution. Polluted water affected the living and working conditions of tens of thousands of inhabitants in the lower reaches of the river. After discovering these impacts, the factory had to invest a large amount of money to improve its processing facilities. Another foreign leather manufacturer located along Mulan river in Putian city, started its business without any environment protection measures. The firm discharged a large amount of wastewater directly into Mulan river without proper disposal. This caused strong discontentment of residents in nearby areas. Five months later unknown individuals destroyed the factory draining conduit and the production had to be terminated.

Import and export patterns may also result in negative environmental impacts. For example, uncontrolled exports of non-ferrous and rare metals, such as wolfram, tin, molybdenum, antimony, have led to rampant exploitation of such deposits in the Jiangxi Province. Such a development was driven by the rising prices of these minerals on the international market. Some local small-size enterprises and TVIEs have undertaken exploitation without essential mining technologies and supervision. The rate of mineral resources recovery was only 20% which has resulted in loss of 12,000 tons of wolfram, which was equal to one fourth of the world's wolfram output per year. In addition, a large quantity of hazardous or radioactive substances was discharged from the traditional process of selecting and melting of these minerals, resulting in serious environmental pollution.

The import of old vessels for disassembling scrap steel for sale has been very popular in many Chinese coastal provinces. These old ships were imported mainly from the US, Western Europe as well as Japan, Hong Kong and some other economies in the Asian region. Ship disassembling activities in China are dominated by TVIEs. They are usually operated in coastal or bay areas and discharge oily substances, iron and electric welding directly into beaches and seas. This has not only caused heavy pollution but also has brought harm to aqua-farming.

Each year, China imports 1.5 to 3 million tonnes of scrap steel, 1 million tons of aluminum, 1.8 million tons of scrap copper and 2 million tons of paper waste. The import of waste as raw materials has some positive aspects in China's economy development providing input for processing and reusing waste materials which are usually labour-intensive activities. However, waste imports can also bring environmental pollution as in several cases they have been imported for final disposal purposes and not recycling.

Source: *The Interface between Foreign Direct Investment and the Environment: The Case of China*, Xian G. et al., 1999

113. The OECD Guidelines on Multinational Enterprises[56] may provide a useful reference in considering promoting corporate environmental responsibility in order to disseminate best environmental practices introduced by domestic and foreign investors. The Guidelines (originally developed in 1976 as part of the Declaration on International Investment and Multinational Enterprises and revised in 2000) are recommendations addressed by governments to multinational enterprises operating in or from adhering countries (the OECD members as well as Argentina, Brazil and Chile). They provide voluntary principles and standards for responsible business conduct, in a variety of areas including employment and industrial relations, human rights, environment, information disclosure, competition, taxation, and science and technology. The environment section now encourages enterprises to raise their environmental performance, through such measures as improved internal environmental management, stronger disclosure of environmental information, and better contingency planning for environmental impacts. Although many business codes of conduct are now publicly available, the Guidelines are the only multilaterally endorsed and comprehensive code that governments are committed to promoting. They aim to promote the positive contributions multinationals can make to economic, environmental and social progress.

Box 6. Examples of Positive Environmental Impacts Involving FDI and Trade

Several local and foreign companies actively participate in adopting international environmental standards. For example, Shanghai Gao Qiao BASF Dispersions Ltd. Co. was the first chemical firm to obtain ISO14000 certificate in China. BASF has also set up R&D fund for innovation projects in the fields of organic pigment, dyestuff chemistry, and polymer chemistry, as well as new design of chemical engineering and factory construction. Shanghai Squipp Co., a Sino-American joint venture was the first pharmaceutical manufacturer in China to obtain ISO14000 certificate.

Since 1994, when China embarked on environmental labelling certification, 40 out of the 86 firms that obtained such certificates were foreign affiliates.

Liebherr Co. is another example of a foreign company which produce environmentally friendly products. Over the years it has been co-operating with the Chinese manufacturer Haier to produce fluorine-free refrigerators. In the pharmaceutical industry, a large number of major domestic producers have formed joint ventures with foreign companies, and pollution by this industry is now greatly reduced owing to advanced technology and a sound environmental management system.

In the agriculture sector foreign investments helped to increase the production of pesticides that are more effective and less toxic. For example, a joint venture between DuPont and Shanghai Pesticide Factory resulted in production of a new patented herbicide, which is highly popular for its higher effectiveness and low toxicity.

Some multinational companies operating in China, particularly large ones, have introduced new types of fertilizers which contributed to the improvement of the product structure of fertilizers in China. For example, Aigefu's affiliate in Tianjin produces highly effective and safer insecticide "deltamethrin". The availability of this product on the market has exerted pressure on domestic firms to apply high environment standards in their production.

Source: *The Interface between Foreign Direct Investment and the Environment: The Case of China*, Xian G. et al., 1999

56. *The OECD Guidelines for Multinational Enterprises. Revision 2000,* OECD, 2000

6. Environmental Impacts of China's Accession to WTO

114. In general, the main effects of WTO accession should be to continue and probably accelerate changes in the structure of economy and the patterns and forms of production. Further restructuring of China's economy and its adherence to international trade regimes would lead to expansion of sectors where China may have comparative advantage, including labour-intensive industries, such as manufacturing, livestock, fruits and vegetables, aqua-culture, non-timber forest products and highly transformed timber products such as furniture and handcraft. Knowledge-based and capital-based industries such as telecommunications, electronics, information technology, community services, banking, insurance, tourism are also likely to expand.

115. Very few analyses have been carried out to assess the overall environmental impacts of China's accession to WTO. One of the most recent (Box 7) presents a qualitative analysis of these impacts on the environment. The study predicts that if appropriate policy measures are applied to facilitate rational industrial and agriculture restructuring and effectively address environmental problems, the volume of wastewater discharges to the environment will probably be reduced due to more and better treatment being applied. Although environmental pressure on air quality will also be reduced in general, air quality in urban areas will likely worsen. There is a possibility that the import and export of wastes will grow and the trend in ecosystem degradation probably slow down and even be reversed.

Box 7. Possible Impacts of WTO Accession on the Environment

Impacts on Water Quality

Wastewater discharges from different sectors will vary along with the changes in the structure of economy after China's WTO accession. Some preliminary qualitative estimates of overall impacts on water show that total discharge of contaminated water into the environment would slightly decrease following a decrease of pollution from the agriculture sector as pollution from grain production accounts for a fairly large proportion of the total load of contaminated water. For example Lake Taihu receives wastewater from agriculture production which contains 40 percent of nitrogen and phosphorus. Some most recent studies suggest that water quality will be affected as follows:

- *The grain production sector* will see reduction in use of chemical fertilizers and pesticides and therefore a reduction of non-point source pollution (presumably, substantial domestic production of rice, wheat, maize and bean, etc. will be replaced by foreign exports due to price disadvantages);
- *The iron and steel industry* will experience a decrease of wastewater discharges as this sector is likely to reduce outputs;
- *The livestock industry* is likely to increase pollution loads following an increase with livestock production;
- *The textile industry* will see an increase of wastewater discharges;
- *The tertiary industry and residential consumption* will likely increase its use of water thus increasing discharges of wastewater.

Impacts on Air Quality

After accessing to the WTO, China is likely to increase its imports of cleaner fuels such as oil and natural gas, which would enlarge the proportion of such fuels in energy production and reduce the proportion of coal in China's energy structure. Therefore, environmental pressure resulting from energy consumption on air quality is likely to decline.

However, pressures in the urban air quality will increase. Given the tariff reduction for automobiles, the import of cars will increase following price reductions. Therefore, the rate of motor vehicles in urban areas is likely to increase at an estimated rate between 5 and 10 percent per year. Meanwhile, without stricter enforcement related to old cars their emissions will continue to influence air quality. Moreover, there are other major sources influencing urban air quality such as domestic heating and industrial emissions. Without taking adequate measures to enhance pollution control, particularly pollution caused by the increase of automobiles in urban areas, air pollution will increase.

Changes in waste generation trends

Given the probable shrinking of the secondary industry and the growth in the tertiary industry after China becomes a WTO member, industrial solid wastes are likely to decrease. This has to be accompanied by appropriate control measures combined with the promotion of cleaner technologies. However, with urban expansion municipal waste generation will grow. Meanwhile, with the increase of trade volumes and opportunities, there is a possibility of increasing the import of wastes from developed countries if no adequate control procedures are in place. There is also the likelihood that waste would be exported from China to poorer countries.

Impacts on ecosystems

After accession to the WTO, China could greatly increase its import of timber and timber products to protect its forest resources, and to use both international and domestic markets to maintain food security for its population. With WTO membership, average tariffs for agricultural products will be reduced from 31.5 percent to 14.5-15 percent within five years and a tariff-rate quota system will be applied for products such as wheat, rice and cotton, the import of these products (mainly land-intensive products) will greatly increase as they lose competitive advantages.

From the environmental protection perspective, the increased import of land-intensive agricultural products, such as grain, should lead to reducing land utilization, lower and more effective application of chemical fertilizers and pesticides. These developments will allow to carry out reforestation and afforestation projects. This would help China greatly reduce environmental pressure in rural areas and fundamentally halt the trend of ecological degradation. Meanwhile, appropriately guided use of foreign investment would help carry out ecological reconstruction projects, if the Chinese government formulates appropriate incentive policies to encourage the investments.

Source: *Environmental and Trade Implications of China's WTO Accession – A Preliminary Analysis*, Hu T., Wanhua Y., 2000

7. Assessing the Environmental Effects of Trade and Investment Policies and Agreements Liberalisation in OECD Countries and in Non-Members

116. Over the years several methods to assess environmental impacts of national economic development policies and the ways to address them through policy reform have been developed. Environmental impact assessment, valuation of natural and environmental resources, integrated environmental and economic accounting, and selection, design and implementation of economic instruments to sustainable manage natural resources are examples of the methods used to assess and address impacts of economic and environmental policies in a number of countries, including China.

117. With the increased trade liberalisation, governments, international organizations, non-governmental organizations and academic institutions have directed their attention to developing methods and conducting various assessments of trade-related policies. These assessments have mainly been concerned with the environmental impact of trade policy, although there has been some investigation of impacts of environmental policies on trade regimes and also broader social issues. These studies have produced numerous insights into the relationships between trade, the environment and development, as well as highlighting the key factors to consider when examining such relationships.

118. Similar analyses are being launched in China. They should allow to provide more insights into the relations between trade, investment and environment and understand impacts of the economic and social development on the country's environment. Such analysis can also contribute to the development of the credible and comprehensive approaches to analyzing the linkages between trade and the environment also taking account of the development issues.

7.1 Environmental Reviews of Trade Policies in OECD Countries

119. Since the early 1990's, the environmental effects of trade liberalisation have figured prominently in OECD work on trade and environment. At its June 1993 meeting at the Ministerial level, the OECD Council recommended that Member governments "examine or review trade and environmental policies and agreements with potentially significant effects on the other policy area early in their development to assess the implications for the other policy areas and to identify alternative policy options for addressing concerns. It further recommended that governments "follow up as appropriate: to implement policy options, to re-examine policies, agreements and any measures in place and to address any concerns identified in the conclusion of such re-examinations."

120. That year, the Ministerial Council also endorsed four Procedural Guidelines on trade and environment. The second guideline recommended that OECD governments undertake environmental and trade reviews and follow-up. In the following year the OECD developed a document outlining general methodologies for concluding such reviews. The document, entitled "Methodologies for Environmental and Trade Reviews"[57], presents a menu of options from which countries select when conducting environmental reviews of different types of trade policies and agreements. The choice of which trade policies and agreements should be subject to environmental reviews is left to countries individually or jointly. The nature and scope of these environmental reviews differ according to the country or countries conducting the review and according to the type of trade policy or agreement.

57 . *Methodologies for Environmental and Trade Reviews* [OCDE/GD(94)103]

121. The reviews are intended to focus on a country's domestic trade policies, including their policy approach to international trade agreements. The general purpose of environmental reviews is to inform policy-makers of the environmental consequences of different trade policy measures. The reviews aim to bring broad expertise and perspectives to bear in the interest of further trade-environment policy integration. The reviews are also aimed to aid in the elaboration of options for addressing the environmental concerns identified, either through the provisions of the trade policy or agreement itself or through complementary mechanisms, including environmental measures and policies.

Box 8. Experience from Applying Methodologies for Environmental Assessment of Trade Liberalisation Agreements

Over the years significant experience accumulated from several environmental reviews of trade agreements. The main finding of the stock taking carried out by OECD in 1999 were that high political commitment to decide upon and carry out effectively environmental assessment of trade liberalisation agreements was a necessary condition for a successful assessment. In particular, it was found that an assessment process which was to occur during the negotiation of a trade agreement would need considerable political backing. At the same time, however, it was important to ensure the political independence of the assessment, in order to retain its credibility. Another lesson learned was that the precise purpose of the assessment must be clearly born in mind when designing and carrying out the assessment. With hindsight, it was apparent that assessments carried out in the past contained two major substantive gaps, by not covering trade in services, especially as regards sub-sectors that have effects on the environment, and investment aspects of trade agreements. At the same time, the need for assessments to examine issues relating to scale, technology, composition and regulatory effects, as noted by the OECD in 1994, was reaffirmed.

The experiences showed that no assessment was a purely technical exercise -- there has always been an element of policy assumptions and value judgements. This was considered legitimate, as long as these assumptions and value judgements were transparent. In particular, it was suggested that a set of clear hypotheses be developed that would be tested by the assessment, in order to provide a focus for the exercise. At the same time, it was noted that the assessments would reveal the necessity of trade-offs. It was not considered the task of the assessor to deal with these trade-offs; rather the results of the assessment should be an input into a transparent political process.

Carrying out assessments in developing countries faced special challenges. Firstly, developing countries may not consider it a priority to devote the resources to undertake such analysis. For example, as countries move along the Kuznets curve (whereby environmental conditions get worse before they get better) some may actually "choose to be dirtier". Secondly, even if that was to be a priority, the possibility was real that the resources and information necessary for the assessment would be lacking. As such, the need for capacity building in this regard in developing countries was emphasised. Thirdly, methodologies that took into account the realities and perspectives of developing countries needed to be improved. Fourthly, it was argued that the willingness of developing countries to undertake these assessments would increase, to the extent that the general North-South divide on trade and environment issues was lessened.

Source: *Assessing the Environmental Effects of Trade Liberalisation Agreements: Methodologies*, OECD, 2000

122. A number of such reviews have been carried out in OECD countries as well as in other regions. For example, the governments of Canada and the US carried out reviews of NAFTA and the Uruguay Round, the European Commission carried our the review of the EU single market and sponsored a Sustainability Impact Assessment based on EU negotiating proposals for the Millenium Round. In addition some independent studies have been conducted by the World Wide Fund for Nature (WWF) and the North American Commission for Environmental Cooperation (NACEC). The major stock taking from several environmental reviews of trade agreements was carried out by OECD in 1999[58] (Box 8).

[58] *Assessing the Environmental Effects of Trade Liberalisation Agreements: Methodologies*, OECD, 2000

7.2 Assessment of the Impacts of Trade Policies in Non-OECD Member Countries

123. Several non-OECD Member countries have started to develop their analytical capabilities to assess the impacts of trade policies, including environmental ones. This has been a reflection of an increasing concern over the potential negative impacts of trade liberalisation, particularly on the environmental and natural resources of developing countries and countries in transition where trade has grown most rapidly. These countries have found that economic activities supporting, or supported by, rapidly expanded trade can result in serious environmental degradation when complementary environmental policies are not in place.

124. Responding to the needs of developing countries to counteract these possible developments the United Nation Environment Programme (UNEP) launched in 1994 a programme to enhance institutional and human capacities of several governments in developing countries for examining the linkages between trade, environment and development (Box 9). The methodology developed by OECD has been an important reference in that work. In the context of developing countries, the emphasis has been placed on designing innovative approaches to assess and respond to environmental challenges posed by trade policies and relations around the world. In the first cycle UNEP has worked closely with six countries – Bangladesh, Chile, India, the Philippines, Romania and Uganda – on comprehensive projects to identify the impacts of trade liberalisation on national environmental resources and the use of economic instruments to sustainably manage these impacts.

Box 9. UNEP Work on the Development of an Integrated Assessment of Trade-related Policies

In September 1999, UNEP commissioned an International Expert Group on Integrated Assessment to develop the UNEP Reference Manual for the Integrated Assessment of Trade-related Policies. The manual is to be used as a primary reference tool in subsequent country projects supported by UNEP.

The Manual was designed to help to conduct integrated assessments of the economic, environmental and social impacts of trade policy and trade liberalization. This considers the economic, environmental and social effects of trade measures, the linkages between these effects, and aims to build upon this analysis by identifying ways in which the negative consequences can be avoided or mitigated, and ways in which positive effects can be enhanced.

The UNEP manual will also be used as the reference tool in a joint UNEP and UNCTAD's Capacity Building Task Force on Trade, Environment and Development (CBTF). This activity, which was launched in March 2000, provides a framework to help beneficiaries effectively address trade-environment-development issues at the national level and to participate in related deliberations at the international level. The CBTF aims to carry out thematic research and country projects, involving a 'learning by doing' process, directly enhance the capacities of practitioners to assess and manage policy integration challenges in beneficiary countries. Policy dialogue and networking which are additional elements of the project aim to allow CBTF beneficiaries to exchange ideas, experiences and perspectives and to develop partnerships which foster greater co-operation.

Source: *Reference Manual for the Integrated Assessment of Trade-Related Policies*, UNEP (2001)

125. Through each country project, UNEP sought to build institutional and human resource capacity for analysing alternatives for designing and implementing policies and measures that integrate trade, environment and development. Towards this objective, UNEP assisted countries in designing specific mechanisms for managing environmental impacts of macro-economic reforms, as well as instruments for environmental management in the context of national priorities.

126. In July 2000 UNEP, together with the Chinese authorities supported by the Agricultural Economics Research Institute (AERI) in Nanjing, launched a study aimed to assess, *ex-ante,* the social, economic and environmental impacts of trade liberalisation in the Chinese cotton production and processing sector and to identify policy directions for improved resource allocations and less input-

intensive production in the sector. The project, which is currently underway, will provide policy advice for a transition to sustainable development of the cotton sector given the prospect of China's entry into the WTO, and to strengthen China's negotiation capacity in subsequent rounds of trade talks relating to cotton. Additional studies could concentrate on other priority sectors or products.

8. Conclusions and Recommendations

127. Since the inception of its “open-door” policy in 1978, China has achieved remarkable progress at a sustained high economic growth rate, rising incomes that have eased poverty, reduced infant mortality, and lengthened life expectancy. However, China entered this period with already heavy pollution loads. Rapid industrialisation and urbanisation have reinforced, and in many cases exacerbated, environmental problems. Serious burdens are imposed on surface and ground waters, air quality in urban areas as well as land and natural resources, including forestry. Rural environmental quality has been deteriorating as a result of expansion of TVIEs and intensive farming practices. Evidence suggests that the economic growth in China was not environmentally sustainable. As the state of environment is still worsening the potential for maintaining fast economic growth may be affected.

128. The most important pressures on the environment came from heavy reliance on low quality coal for energy generation, development of the industrial structure based on pollution intensive industries which was combined with slow technological progress, agriculture practices imposing high pressure on water and land resources and subsequently on human health. Unsustainable use of natural resources, particularly water and forests have also been pursued.

129. Recent changes in the structure of the economy, including in the rural sector, as well as environmental policies applied in the last decade, have led to some significant reduction of environmental impacts. The gross value of industrial output doubled between 1991 and 1998 while total discharge of major pollutants increased only slightly. Water pollution, especially from small enterprises and TVIEs, decreased significantly, emissions of particulates and other pollutants have been curbed, pressures on water quality from the use of pesticides and fertilisers in agriculture have also decreased.

130. In many cases, however, the positive changes have been offset by emerging new problems stemming from the fast growing market economy and continuous population growth. Rapid growth of motor vehicles added to already low air quality in urban areas. Fast urbanisation leads to additional pressures on drinking water resources and increased discharges of untreated wastewater. Urban encroachment has lead to the loss of cultivated land. These developments have occurred in the context of weak, or in many cases lack of, adequate environmental policies. It is expected, however, that the continuation of structural changes of the Chinese economy and increased investment with the parallel application of appropriate policies will lead to gradual reductions of these pressures in the long-term perspective.

131. Promotion of trade and attraction of foreign investment have been central to the country’s efforts to modernise its economy. Many examples from several OECD and non-OECD countries, including China, show that trade and investment liberalisation do promote growth, stimulate competition and facilitate the international diffusion of technologies. By improving resource allocation, liberalised trade and investment regimes can also directly enhance environmental protection, including better use of natural resources, as well as indirectly promote demand for better quality of ambient air, water and other media. However, in the absence of adequate environmental policies, investment liberalisation may lead to an increased production and consumption of polluting goods, or to a non-sustainable use of natural resources, both of which can exacerbate the negative (scale, structural, technology, product, or regulatory) effects of economic activity on the environment.

132. China's policies and institutional setting for environmental protection has undergone several transformation over the past decades, reflecting different stages of government restructuring and an increasing emphasis placed by the Government on environmental issues. Starting from 1973 protection of the environment has been receiving growing attention. Initial steps to create environmental laws have been modest and spread over time but they were an important precondition to subsequent development of a comprehensive regulatory and institutional framework for environmental management in China. Experience, which has accumulated over the years, allowed to increase the effectiveness of environmental regulation and environmental agencies and to develop additional instruments to promote better compliance with environmental requirements. They, in turn, contributed to the reduction of environmental stress in many areas.

133. Although trade and investment liberalisation can have significant positive and negative environmental impacts environmental policies in China do not seem to have influenced trade and investment decision-making. In reality production costs, market access, and resource availability have been more important considerations in making trade and investment decisions. China has encouraged foreign companies to invest to finance its development goals and to open up its markets. Environmental requirements have been, in many cases, compromised by local leaders. As a consequence, trade and investment liberalisation has resulted in a number of negative effects on the environment. Some foreign firms, mostly small and medium-size enterprises, facilitated imports of outdated technologies and polluting or toxic substances, taking advantage of the lower level of environmental standards in China.

134. Over time, however, as experience from implementing environmental policies has accumulated environmental institutions have become more mature in understanding the environmental impacts of investments and trade and in designing the ways to influence them. A number of positive examples show that FDI and trade liberalisation can result in transferring advanced technologies which improve the performance of polluting industries and reduced energy and resources consumption. With a growing number of such cases, especially from operations of multinational enterprises, the trade and investment liberalisation - environment interface has recently received greater attention in China. New policies and instruments have been put in place to promote environmentally friendly investment, and counteract negative impacts on the environment. For example, China has revised guiding principles for foreign investment, which include a principle to ensure commitments to meet national regulations and international environmental conventions in attracting foreign investment. "Environmentally friendly" production of food is starting to create a basis for sustainable agriculture. China has promoted certification using ISO 14000 environmental management system and opening up the markets for the development of an environmental goods and services industry. These instruments are, at least in theory, applied to both domestic and foreign investors.

135. In practice, however non-compliance with environmental requirements is widespread. Vagueness of standards in many laws and regulations combined with lack of strong impartial judiciary to interpret the laws and arbitrate legal and regulatory disputes are important factors. The problems are further magnified by contradictions related to vertical responsibility in environmental administration, lack of technical capacity and resources available to SEPA and EPBs to carry out their duties.

136. Furthermore, the institutional mechanisms to assess and manage the environmental impacts of international trade and financial flows in China are currently characterised by significant gaps and discontinuities, and important "responsibility vacuums" exist at various levels. The government's ability to exert influence over the environmental character of foreign trade and investment is often constrained by conflicting goals of economic growth and environmental protection, capacity and legitimacy effects, particularly with respect to the integration of economic growth and environmental policies, and in adjusting to more stringent "green" requirements in regional and global contexts.

137. China's entry to the WTO would promote further liberalisation of trade and investment and is likely to reinforce the process of restructuring in which the proportion of the tertiary industry will increase and the share of the primary and secondary industries will decrease. As a consequence, the overall pollution in China is likely to decrease gradually. In some cases, however, increased trade and investment will lead to situations in which the reduction of pollution per unit of output will be offset by an increase in output volume (i.e., scale effect) or increases of pollution in new sectors, such as transport (i.e., structural effect).

138. The analyses of linkages between trade, investment and environmental issues have received growing attention throughout the world, including in OECD countries. The studies focused, in particular, on designing necessary policies to promote positive impacts of trade and investment liberalisation on the environment and reducing the negative ones. Such assessments should be carried out in China using approaches developed in OECD countries, and those applied more recently within the context of the UNEP programme. Such assessments will inform policy-makers in advance of the environmental consequences of different trade policy measures, evaluate trade-related effects on the environment such as product, technology, scale, structural and regulatory effects and suggest the ways for reforming domestic trade and environmental policies, including country policy approaches to international trade and environmental agreements.

139. As shown above, China's further liberalisation of trade and investment regimes can serve as an opportunity to support processes of strengthening environmental legislation and upgrading environmental standards. At the same time, China faces risks associated with increased trade and investment. In order to minimize negative impacts and promote positive impacts of trade and investment liberalisation the following tasks should be pursued:

- environmental laws and regulations have to be consistent, transparent and non-discriminatory so that investors, both domestic and foreign, can make their decisions taking account of what is expected over the medium or long-term perspective. If efforts are not made to ensure the clarity and stability of regulations as well as their consistent enforcement China may be challenged in the international fora over unfair competition or discriminatory practices which may lead to losing valuable investment. Moreover, environmental regulatory risks may discourage investment. Striking the balance between consistent national environmental requirements and the circumstances that pertain at the local level is a challenge in all large countries and Chinese policy makers may wish to examine relevant experience from OECD countries.

- institutional capacity building is essential. This will be required not only to develop, implement and enforce the environmental policy framework at national and local levels, but also to strengthen analytical capacities, including investment analysis, in environmental agencies. More effective and consistent enforcement has to be accompanied by strengthening capacities and powers of environmental agencies at the national and sub-national level as well as courts to interpret environmental laws and to adjudicate disputes between legal and regulatory provisions.

- the assessment of the potential environmental impacts of investment activities has to be consistently applied at various levels. Environmental Impact Assessment procedures at the project level are well understood and should be applied consistently. However, they will not necessarily be adequate to identify and redress potentially harmful scale impacts. Thus, Environmental Impact Assessment procedures should be complemented by applying Strategic Environmental Assessment for priority sectors as well as analysing the potential environmental impacts of FDI and trade patterns. Various methodologies and models have

been developed in OECD countries and elsewhere which could be adapted to the Chinese context. There is also a need to establish co-ordination mechanisms among government agencies to redress the significant gaps and 'responsibility vacuums' in integrating environmental, investment and trade policies.

- there is a significant demand in many markets for "environmentally friendly" products. In order to utilise this opportunity corporate environmental responsibility should be promoted, and best practices disseminated, especially among small and medium size enterprises. Several steps have already been undertaken in China that can help to respond to such demands, including, the introduction of environmental management systems (such as ISO 14000), certification schemes and environmental labelling. More generally China may wish to consider other approaches for promoting corporate environmental responsibility in order to disseminate best environmental practices introduced by domestic and foreign investors. The OECD Guidelines on Multinational Enterprises may provide a useful reference in this regard. Information-based instruments, such as public disclosure or pollutant release registers, also could be used to a greater extent.

- subsidies, and other market-based mechanisms can provide incentives which encourage pollution and inefficient energy use. China should continue its efforts to reduce such distortions and internalise environmental costs in the price system; otherwise trade and investment liberalisation may amplify environmental problems related to such market failures. Similarly China should continue to move towards full cost-recovery for environmental services. This could provide an opportunity for foreign investors to participate in infrastructure development and operation, for example in the urban water or solid waste disposal sectors. This could release high pressures on the public budgets which so far have to bear the lion's share of costs of providing those services, as well as introduce more efficient management practices and know-how.

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