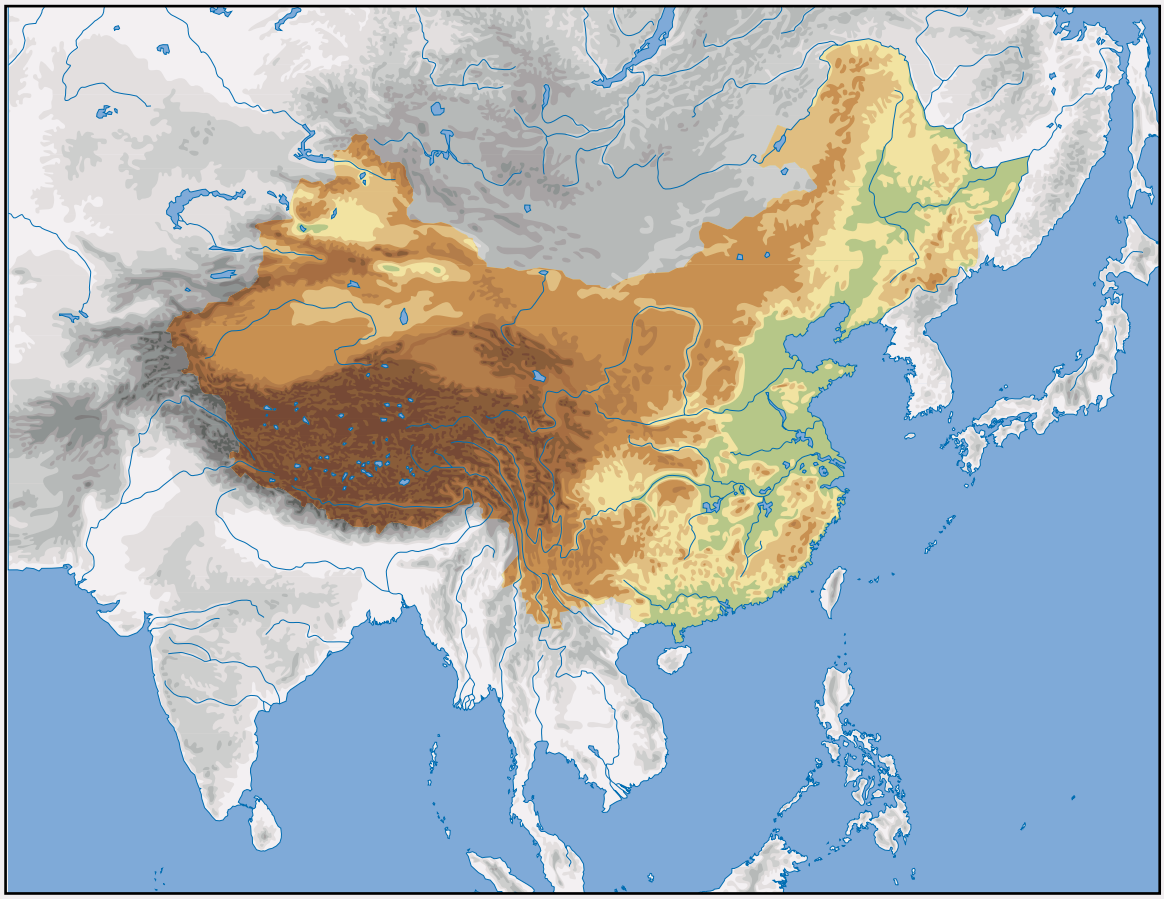
China and Sustainable Development

SWEDISH ENVIRONMENTAL DEVELOPMENT CO-OPERATION WITH CHINA



Sida

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Preface

It is not an easy task to present a comprehensive picture of China's environmental situation. The country is vast, the environmental situation varies tremendously, the driving forces behind environmental change vary equally, but most important of all, the perceptions of the environmental problems are undergoing rapid changes. Therefore, when it comes to solutions and conclusions they become part of an effort to hit a moving target.

The environmental situation in China is very serious in many respects. The report tries to summarise this. The links to economy, social and political developments are obvious. The environmental deterioration is most certainly a limiting factor when it comes to development prospects.

It is important to understand the economic and social costs of environmental destruction in China and to try to capture the limitations for development. But it is equally important to understand the changes in perceptions of the problems and their root causes. It is interesting to compare with the report on Environment and Development in China that we produced five years ago. As is described in the report there is a clear tendency to 'move upstream'– away from focusing almost entirely on technological solutions towards considerations of underlying causes. This is encouraging and provides for new possibilities with regard to international co-operation.

This Report has been adapted from the Strategic Environmental Analysis (SEA) for China that provided input to Sida's China Country Strategy Paper, which was approved by the Swedish Government in February 2001. It has been prepared by Karl Hallding at the Stockholm Environment Institute in close collaboration with us at Sida's Environmental Policy Division. During the preparation of the original SEA a two week mission to China was conducted, primarily with the aim to interview individuals knowledgeable about China's environmental situation. Ms. Åsa Hedén of the Embassy of Sweden in Beijing was part of the mission and has contributed extensively to the SEA through reading and commenting. We are grateful to the Embassy staff for their hospitality and skilful organisation of the mission. Other Sida Divisions have contributed to the SEA through workshops and consultations. Two informal seminars were arranged at Sida with participants from ministries and government agencies, the research society, and media. We are most grateful for their input.

Stockholm October, 2001
Mats Segnestam
Head of Sida's Environment Policy Division

Acronyms and Abbreviations

Chinese Organisations

NPC	National Peoples Congress
SEPC	State Environmental Protection Commission
SDPC	State Development Planning Commission
SETC	State Economic and Trade Commission
ACCA21	Administrative Centre for China's Agenda 21
MOFTEC	Ministry of Foreign Trade and Economic Cooperation
SEPA	State Environmental Protection Administration (former NEPA–National Environmental Protection Agency)
CRAES	Chinese Research Academy of Environmental Sciences
MoW	Ministry of Water Resources
MoC	Ministry of Construction
MoP	Ministry of Power
MOST	Ministry of Science and Technology
the China Council	China Council for International Co-operation on Environment and Development (CCICED)
CAEPI	Chinese Association for Environmental Protection Industries
EPB	Environmental Protection Bureau

Swedish Organisations

Sida	Swedish International Development Co-operation Agency
INEC	Sida's Department for Infrastructure and Economic Co-operation
NATUR	Sida's Department for Natural Resources and the Environment
ASIEN	Sida's Department for Asia and the Middle East
BITS	Swedish Board for Investment and Technical Support (since 1 July 1995 incorporated under Sida)
the Embassy	Swedish Embassy in Beijing

International Organisations and Institutions

UNDP	United Nations Development Programme
UNCED	United Nations Conference on Environment and Development
IPCC	Intentional Panel on Climate Change
IBRD	International Bank of Reconstruction and Development (World Bank group facility for long term lending on commercial conditions)
the Montreal Protocol	Montreal Protocol and Its Subsequent Amendments and Adjustments (international agreement on reduction of ozone depleting substances)
the Climate Convention	The UN Framework Convention on Climate Change (UNFCCC)
GEF	Global Environmental Facility

Sorts and Units

CO_2	carbon dioxide
CH_4	methane
COD	Chemical Oxygen Demand – a standard for measuring organic content in waste water
N_2O	nitrous oxide
CFC	chlorofluorocarbons
TCE	metric tons of coal equivalents (unit used for comparing different kinds of energy sources)

M	Mega, million (10^6)
TWh	Terra (10^{12}) Watt Hours (energy unit, usually used for electric power consumption)
ha	hectare (100 ha = 1 km^2)
rmb	*renminbi*, the Chinese currency, rmb 1 yuan ≈ SEK 1 kr

Other Abbreviations

GNP	Gross National Product
NGO	Non governmental organisation
TVE	Township and Village Enterprise

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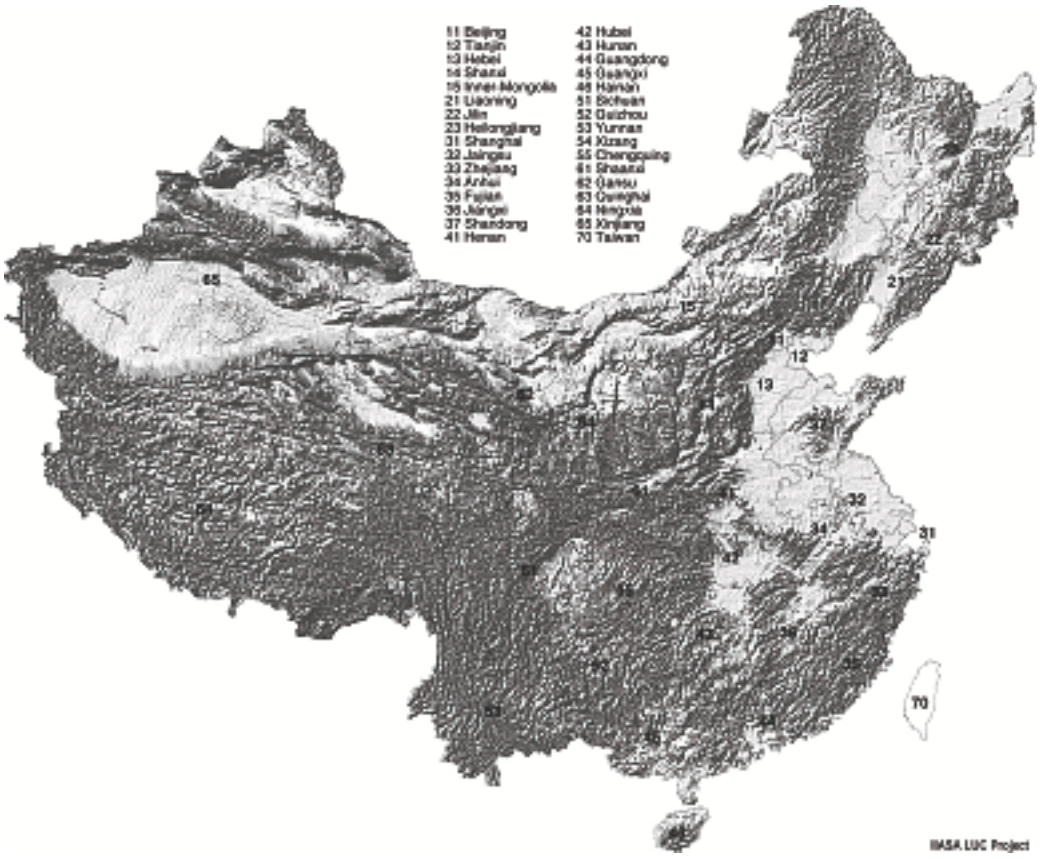
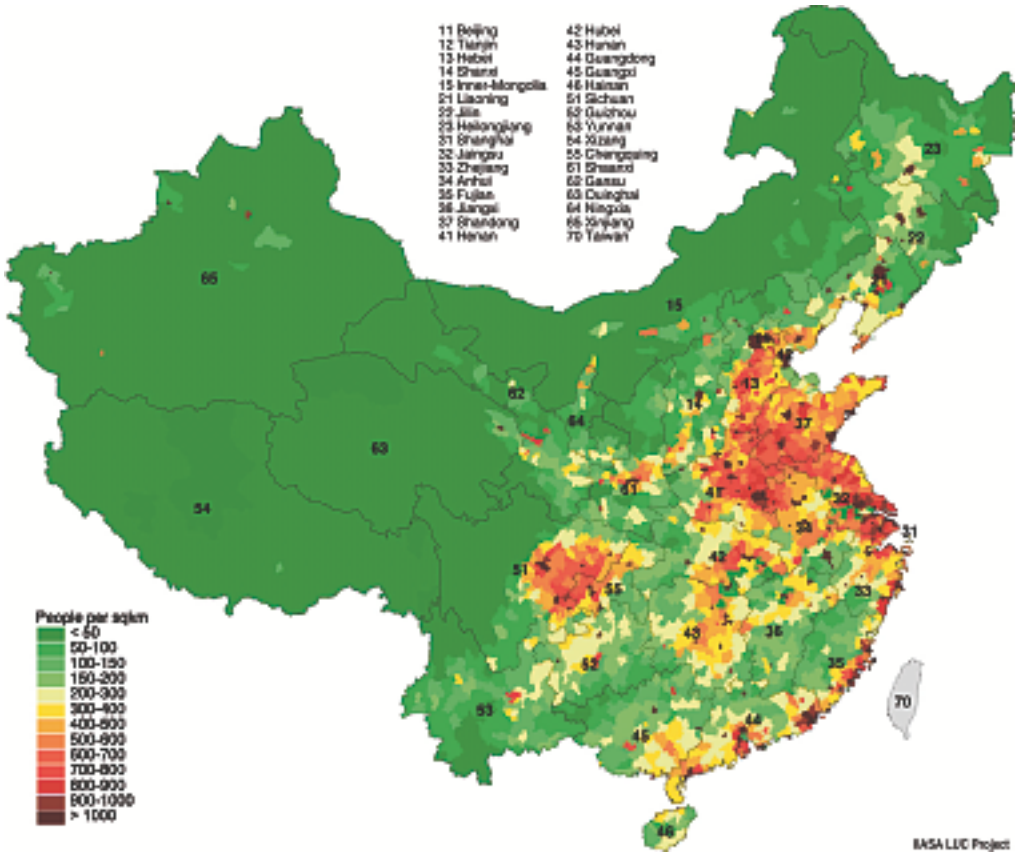
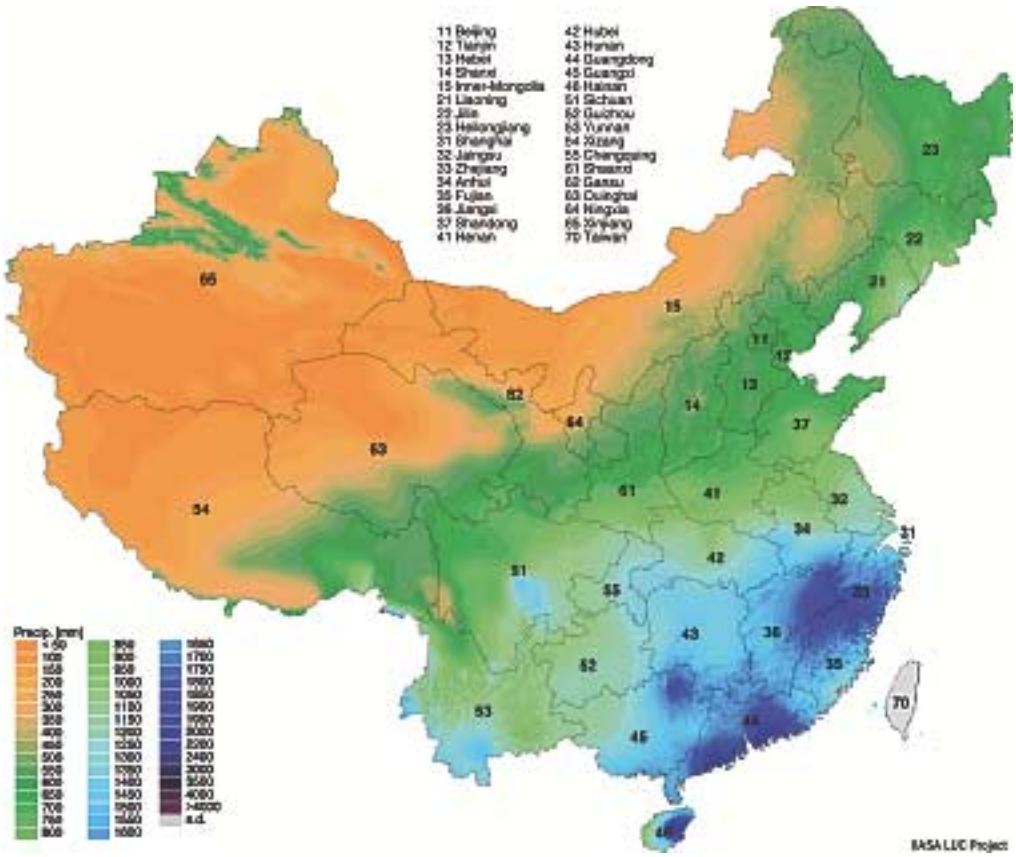


Map 1: Shaded relief of China



Map 2: Population density



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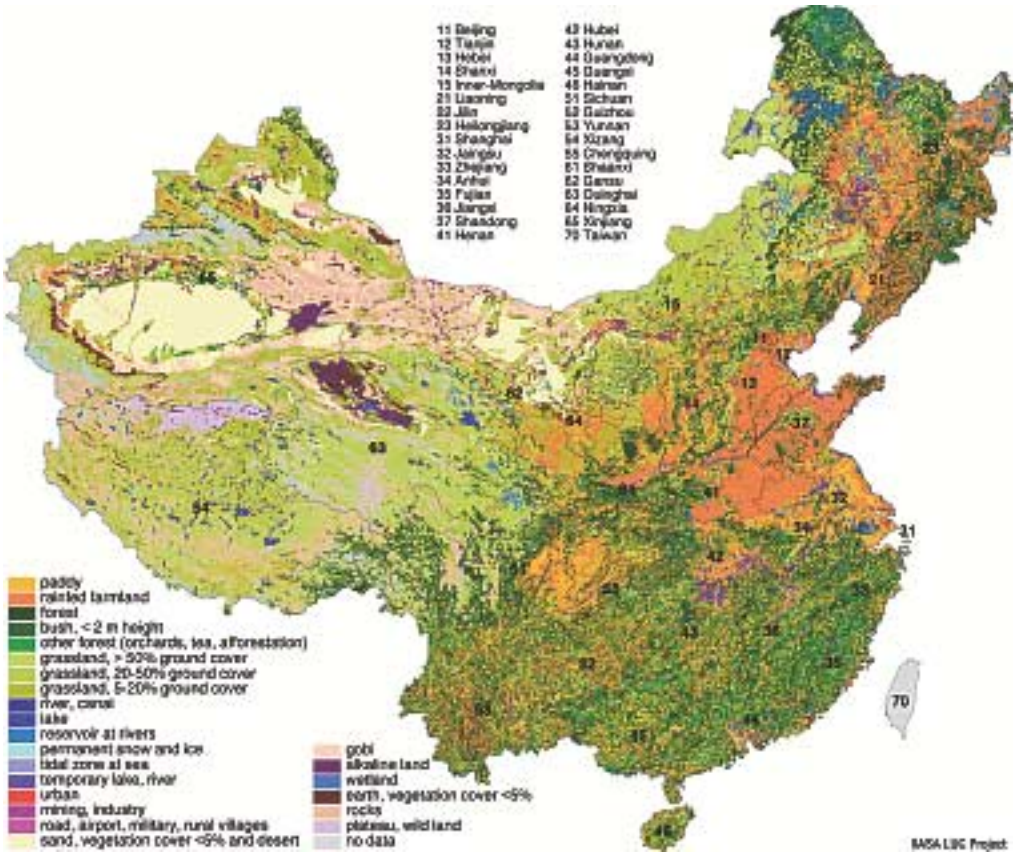


Map 4: Land Use

1. To Understand China's Environmental Situation

In many aspects China is more like a continent than an individual country. Hemmed in by major mountain ranges in the southwest and west, with deserts and steppes to the north and the Pacific Ocean to the east, China's heartland is very much an enclosed geographical entity. Nevertheless, the ecological stress created by a population that is approaching 1.3 billion, in combination with the pressures generated by the country's rapid economic development, make China's environment a global concern.

China covers almost 10 million square kilometres – the same size as the United States, or as Europe to the Urals – and its physical conditions, climate, preconditions for human settlements, and culture vary tremendously across the vast territory. In order to understand China's environmental situation, one must explore the whole spectrum of environmental problems – from global issues to local problems – while taking into account the preconditions and the limitations set by its natural endowments in interplay with human development.

This Report attempts to give a broad picture of China's environmental situation that goes beyond national level aggregate statistics. The Report will provide an overview of the state of China's environment focusing the most critical issues; it will place the environmental situation into a broader context of development issues; and it will review what China does to redirect development towards a sustainable path. Finally, the Report accounts for the Swedish environmental co-operation with China through Sida.

Before turning to the various aspects of China's environmental state, however, it is useful to get acquainted with a few fundamental features that set the context for much of the environmental dilemma to be dealt with in this Report.

China's environmental situation is closely connected to a high population pressure on scarce resources. Population density averages 120 people per sq. km. Although this figure is slightly higher than Europe's 96, it does not, in itself, reveal the full severity of the situation.

Being mountainous and with a harsh and very dry climate, the major part of China's western half – the Tibet-Qinghai plateau, and the Gobi and Taklamakan deserts – can support only limited populations. Instead, it is the river valleys and fertile river plains in the eastern parts of China that have offered favourable climatic and physical conditions for human settlements, and this is where the first Chinese civilisations developed. Today, some of the world's most densely populated and intensively utilised environments are located in the eastern parts of China. Cumulative calculations of the distribution of China's land area and population density show that:

- nearly 115 million people – 10% of the population – inhabit a total area of only 50,000 square kilometres, a mere 0.5% of China's total landmass. This area comprises the most densely populated counties and cities, with an average population density approaching 2,500 people per sq. km;
- half of China's population occupy less than one tenth of the country's total landmass. This area has an average population density of 740 people per sq. km;
- more than 90% of China's population is concentrated to less than one-third of the country, where the average population density of 350 people per sq. km equals that of the most densely populated countries in Europe.

The maps on pages xii and xiii illustrate how the combination of available arable land and precipitation sufficient to support agriculture equal the regions that show the highest population pressure. In these densely populated eastern areas we find regions of interwoven urban, suburban, industrial and agricultural areas large as European countries, where the population pressure has grown to levels where the per capita availability of most resources – including basic necessities such as water – are among the lowest in the world, and where unchecked pollution from industry and agriculture is

reflected in the mortality statistics over pollution related diseases. Simple calculations show that the present size of the population cannot be supported indefinitely if nothing is done to alleviate the situation.

2. The State of China's Environment

2.1. Land Resources

China belongs to the most mountainous countries in the world, with steep mountains (see Map 1), stony deserts, or dry grasslands (see Map 4) covering a major part of the landmass.

Arable Land

Arable land is scarce, with only 13% of the total land area – about 135 million hectares – being used for agriculture. (Heilig, 1999) With only 0.1 ha of arable land per capita, China's population pressure on agricultural land is among the highest in the world, to be compared with a world average of 0.24 and the European Union allotment of 0.22 ha per capita (World Bank, 1999).

Forests

Forest coverage equals that of arable land – a mere 13% of the total land area – but the quality of existing forests is alarmingly low. Smil (1993) concludes that there is very little mature forest left in China at all, and that the wood mass volume per sq. km is only one third of that of natural forests. Aggregate county level data may give the impression that deforestation has been slowed down (0.1% annual loss 1990–95), but this figure hides the fact that China loses 866,000 sq. km of mostly mature forests annually, without much efforts of reforestation (World Bank, 1999). Yet, large reforestation programmes are being implemented, with 9,700,000 sq. km planted between 1988 and 1995 (an annual average of 1,386,000 sq. km) (Heilig, 1999).

A large part of the reforestation campaigns has been carried out to protect against erosion, and has mainly been directed to marginal, agricultural land in hilly, desiccated areas such as Shaanxi, Inner Mongolia and Yunnan. Also, the large, ambitious reforestation programmes launched in succession since the 1970s have reaped poor results. This is partly due to the lack of resources and an understanding of the need to care for the saplings once planted. Another important issue that has been raised more recently concerns the lack of attention to biodiversity issues when carrying out large-scale reforestation.

Soil Degradation and Pollution

China suffers severe problems of soil degradation, with serious water erosion in the Loess Plateau, significant wind erosion in northern China, and aridification and salinisation on the North China Plain. However, much of this degradation occurs outside cultivated areas or affects crop production only indirectly. Water erosion in the Loess Plateau, for example, leads to massive siltation in the lower reaches of the Yellow River, increasing the risk of flooding and thus threatening food production. (Heilig, 1999)

Soils are also degraded by the depletion of nutrients and organic matter that results from agricultural practices that do not sufficiently recycle nutrients and organic matter. These substances are instead accumulated in and around urban areas, and in connection to large-scale meat farms, where they cause increasing problems of eutrophication and organic waste pollution.

Finally, there are numerous examples of polluted soils, in most cases resulting from the habit of using wastewater for irrigation, and from the overuse of pesticides. Soils are also to an increasing extent being polluted by leaching solid waste dumps.

Changing Land Use Patterns

China's land resources are not a static, given natural resource stock, but the result of a range of dynamic and simultaneous processes of increase and decline, in which agricultural restructuring is the main factor (see figure 1). A slight decrease in total arable

land has occurred, but the areas affected are small compared with the total cultivated area. The main reason for changes in land-use is the greater market orientation of Chinese farmers, who have restructured their cultivated areas for more profitable products. Some cultivated land has also been reforested in order to protect against erosion. The losses of cultivated land to construction and infrastructure expansion are less than 1%, but in some areas of rapid economic growth, such as Shanghai, they are higher. Compared with the excessive conversion of natural and agricultural land due to urban sprawl and infrastructure construction in North America and Europe, loss of cultivated land in China is minimal. (Heilig, 1999)

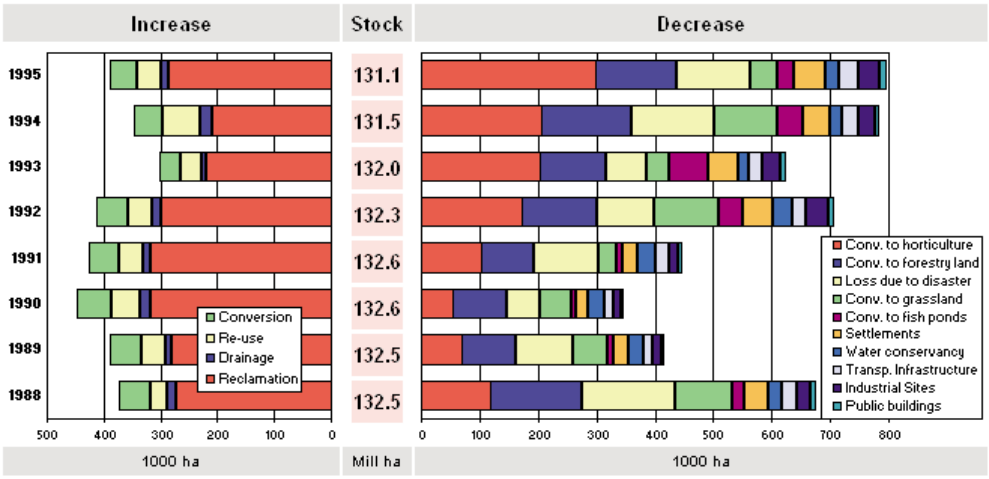


Figure 1: Land use patterns 1988 – 1995

2.2. Biodiversity and Ecological Services

China's flora and fauna are among the richest in the world; yet biodiversity is under severe pressure from population growth and economic development.

The World Resources Institute (1998) states that 75 of China's almost 400 mammal species are threatened; other sources refer to analyses showing the number to be almost 70%, with the primary reason being over-hunting and habitat destruction. (CCICED, 1999)

Biodiversity in China is threatened not only by population growth and economic development, but also by the traditional use of rare animals and plants in medicine and as food. Over 90% of restaurants in Guangxi province have had wild and/or rare species on the menu, many of which were endangered species illegally caught and traded. 28 out of the 426 medicinal plants that appear in the 1995 Chinese Encyclopaedia of Medicine are listed in the Chinese red list of endangered plants. The development of the economy has increased the demand for wild/exotic produce, putting further pressure on already endangered species and reducing populations of non-listed species. (CCICED, 1999)

In a broader perspective, recent, long-term changes in different parts of China reflect how the loss of biodiversity has reduced the ability of ecosystems to support human society. For example, the flooding that afflicted large parts of eastern China in 1998 may be partly explained by the loss of the ecological services of forest biotopes to moderate the impact of heavy rainfall; the silting up of reservoirs may partly be explained by the successive destruction of a naturally diverse vegetative cover to protect soils from eroding; and reduced fish catches in coastal areas are possibly due to the impact of pollution on marine habitats and spawning areas.

2.3. Water Resources

Water is China's most critically stressed resource. A per capita renewable water resource of 2,282 cubic meters per year puts China at the lower end among the world's nations, on a level comparable with continental Europe (Germany – 2,084; France – 3,029) and India (2,167). Figures in this range indicate that water is a precious and limited resource, but fail to disclose the distressing fact that China suffers some of the most extreme water shortages in the world.

Northern China – the drainage basins of the Heilong, Songhua, Liao, Hai, Huai, and Huang (Yellow River) rivers – has an average of only 750 cubic meters per capita and year, and is the home of 570 million people, or a little less than half of China's total population. At the same time, this is where most of the arable land is located (58%), with a corresponding need for irrigation. An even closer look reveals that the 130 million people living in the Hai river basin (including Beijing and Tianjin), and the 200 million in the Huai river basin, share a mere 355 and 515 cubic meters per capita respectively. This is comparable to the situation in the Jordan river basin, the difference being that in northern China there are several hundreds of millions facing absolute water scarcity. (World Bank, 1997b, 1999)

The northern water scarcity is the result of a monsoon climate that produces most precipitation in the south-east part of the country, where 2,000 mm per year is not unusual, with a decreasing gradient towards north-west, where there are parts that do not receive any rain at all over several years (see Map 3). Another feature of the monsoon is that virtually the entire annual rainfall transpires during summer, leading to repeated occurrences of floods, such as the critical situation that developed over large areas of China during the summer of 1998. Large inter-annual fluctuations exacerbate the problem – areas subjected to flooding one year may suffer draught during the next, and water shortages may occasionally afflict areas even in China's less water scarce southern regions.

A peculiar aspect of China's water resource situation is the fact that the western half of China lacks drainage to the sea. This interior drainage basin coincides roughly with the area with less than 400 mm annual precipitation, where rainfed agriculture is virtually impossible (see maps on page xiii). This lack of drainage in combination with low precipitation and high evaporation make water resources in the west even more fragile and susceptible to pollution.

China has one of the world's longest coastlines – 18,000 kilometres – a fact that is often forgotten in the debate over China's environmental situation. The coastal waters are important resources for fisheries, an industry that has exploded along China's coast over the last decade. Yet, estuaries and coastlines are threatened by over-fishing, red tides, and pollution from inland sources transported by the rivers to the sea. Recent reports reveal sharply reduced fish catches in coastal waters.

Water Usage

There is a battle in progress that no one can win – that between increasing water demands and limited available water resources. Groundwater levels over large parts of the North China plain have fallen due to over-extraction of water for irrigation and urban supply; water tables in northern towns and cities are falling in the order of one meter per year, and 300 out of 640 major cities face water shortages – in 100 cities the situation is severe (WRI, 1999). Many rivers in the North typically run dry during several months of the year. As a consequence, competition for water is increasing, particularly in the northern river basins, between urban, industrial, and agricultural consumption, and between upstream and downstream users.

Most of the water is used for agriculture, which consumes almost 80% of the total withdrawals, mainly for irrigation. Yet, the increase in agricultural water consumption has been remarkably low – less than 4% between 1980 and 1993. Industry is the second largest water user and accounts for just under 20% of total withdrawals. However,

between 1980 and 1993, water use in industry almost doubled; in Southern China it more than tripled. Urban supply accounts for some 5% of the total. Yet, the urban sector shows the highest increase, with a 250% increase between 1980 and 1993. (Heilig, 1999)

China is wasting large amounts of water. Water-use efficiency is very low in all sectors – particularly in irrigation. Experts have estimated that up to 60% of the water evaporates from open canals and from fields with traditional flooding irrigation. There are also significant water losses due to outdated water supply infrastructure, bad maintenance, and poor management.

Water Pollution

What goes in must come out. The major part of industrial and municipal withdrawals is discharged back into rivers and lakes – polluted with bacteria, organic matter, nutrients, and toxic substances. Agricultural withdrawals are consumed largely by biomass production, but the remaining agricultural drainage water contains ever-higher amounts of pollutants such as fertilisers and pesticides.

The combination of scarce water resources and high pollution pressure is lethal – for ecological systems, for the economy, and for human health. More than 90% of urban river sections are polluted to the extent that the water is unsuitable for human contact; more than half of the river sections do not meet the lowest Chinese surface water standard, which means that the water is not even suitable for irrigation. Northern rivers show the most troublesome situation. (See figure 2)

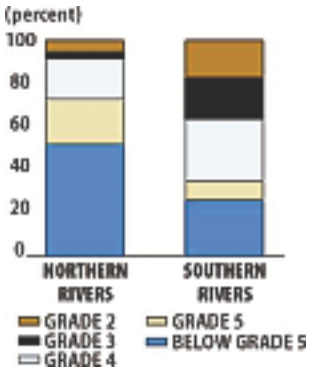


Figure 2: Water quality in urban river sections (grade 4 and 5 not suitable for human contact) (WRI. 1999)

Industry is the biggest source of water pollution in China, accounting for about 60% of total wastewater discharge, unmonitored township and village enterprises (TVEs) and smaller industries not included. About 80% of industrial wastewater is untreated. Facilities for treating industrial wastewater are poorly maintained, often operating with outdated technology, and the recycling of process water is minimal. Statistics show a slight decrease in pollution discharges from regulated industry starting from the mid 1980s – a figure, however, that conceals the substantial increase in pollution discharges from TVEs that has accompanied the booming countryside industry. There are also large regional differences. Some of the eastern provinces such as Tianjin, Shanghai, Liaoning, and Zhejiang show considerable improvements, while other provinces such as Shandong, Guangxi, Xinjiang, and Shaanxi have experienced large increases in pollution discharges. (World Bank, 1997b)

Only 7% of municipal wastewater is subject to any kind of treatment, while three quarters of all urban areas lack adequate water supply systems. (World Bank, 1997b; Heilig, 1999) Municipal discharges tripled from 1981 to 1995 – a 7% annual increase. In 1995 there existed only 100 modern municipal wastewater treatment plants (World Resources Institute, 1999), located exclusively in the larger cities. Roughly 200 million

people live in 20,000 small towns without any sanitation other than perhaps pipes that lead wastewater to the nearest ditch.

Agricultural sources are not captured by the statistics referred to above – neither pollution from crop production and animal husbandry, nor discharges from numerous countryside point sources such as TVEs. Agricultural pollution varies across the country, but a study of the Hangzhou bay shows that agricultural sources were responsible for some 88% of the total organic pollution load to the bay in 1994 (World Bank 1997b).

The use of fertilisers and pesticides has doubled since economic reforms started. Fertiliser application is now among the highest in the world, with 273 kilos per hectare – three times the world average and higher than the European Union's 234 kilos. (World Bank, 1999) Yet, the effectiveness of fertilisers is low, mainly due to the overuse of low quality, fast ammonia bicarbonate (ABC) fertilisers that are cheap and easy to apply, but just as easily washed away.

Livestock production has tripled since reforms started in the beginning of the 1980s – faster than almost any other country – and much of the manure finds its way into streams and waters instead of being utilised as a much needed fertiliser and soil improvement agent.

2.4. Air Quality

Chinese cities are embedded in foul air. 16 of the world's 20 most polluted cities are Chinese, and China is unchallenged as the world leader in inferior urban air quality, with pollution levels regularly and continuously exceeding both Chinese and World Health Organisation (WHO) standards by up to ten times (figure 3). (World Bank, 1997b, 1999)

China is responsible also for the world's highest CO_2 and SO_2 emissions.

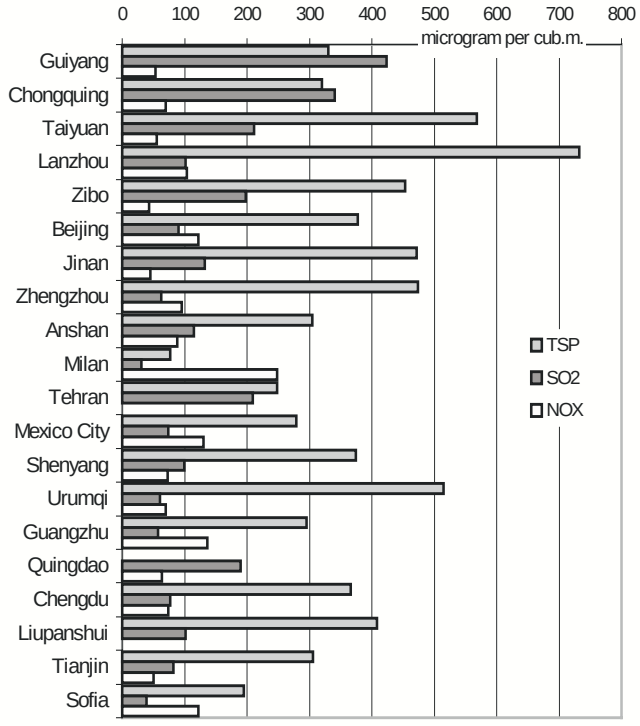


Figure 3: 16 of the world's 20 most polluted cities are Chinese (World Bank, 1999). Ranking based on normalised aggregation of TSP, SO_2, and NO_X.

By examining routine air quality data, in particular total suspended particles (TSP) – the most common indicator of air quality in China – one could be lead to believe that

urban air quality has actually improved somewhat over the last decade. But if one instead looks at the parameters that are of main interest as indicators of the impact on health or agricultural production, a different picture emerges. Increasing levels of nitrous oxides (NO_X), mainly from traffic, in combination with continuing high SO_2 levels indicate that urban air quality has in fact deteriorated even further, particularly in combination with high humidity and solar radiation during summers when city skies get yellowish grey from small pollution particles. However, parameters to measure these types of very unhealthy small particles are not monitored on a routine basis.

A combination of factors makes the situation worst in the northern parts. Due to the cold climate, the need for heating and energy is larger in the north. Winters in northern China are characterised by stable climatic conditions, leading to inversion – a kind of atmospheric lid – that can cover northern cities for weeks and causing extreme air pollution levels.

Air Pollution

Chinese cities are engulfed in smog from both high particulate and SO_2 emissions from coal burning, and increasing NO_X emissions from vehicle traffic.

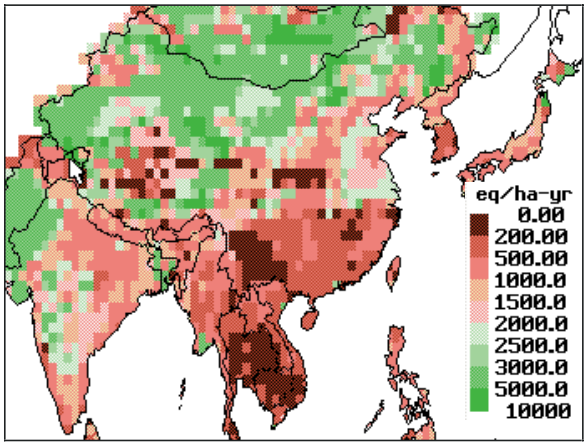
Seven of the ten cities in the world most polluted by particles, measured as TSP, are Chinese. Lanzhou tops the list with 732g/m^3, or about 8 times the WHO guideline (World Bank, 1999). Particles originate from coal combustion and local burning of coal for heating, but also as dust from construction sites, and from winds that bring dust and sand from the deserts into northern cities during the spring. The total amount of particles has decreased over the last decade, mainly as a result of improved dust removal from smoke stacks and the extension of city gas systems for heating and cooking.

Not surprisingly, seven of the ten most SO_2 polluted cities in the world are also in China, where Guiyang tops the list with 424g/m^3 – 8 times over WHO guidelines (World Bank, 1999). The SO_2 emissions reflect China's dependence on domestic coal for power and heating. China is rich in coal, but most of the deposits have high sulphur content – in the southwest up towards 7%. Ambient urban SO_2 concentrations have been stable, or even decreased somewhat, although twice as much coal was burnt in 1996 as compared to 1980 (World Bank, 1999). This reflects improvements in coal washing and sulphur removal from coal combustion, a shift towards low sulphur coal, and the relocation of power plants and heavy industries away from downtown areas.

More unexpectedly, Chinese cities occupy six of the world top ten positions with regard to NO_X concentrations. Guangzhou is second with 136g/m^3, exceeding WHO guidelines by 2.5 times (World Bank, 1999). NO_X is associated mainly with emissions from vehicle traffic, and the high concentrations in Chinese cities indicate that traffic pollution is already reason for major concern.

It shall be noted, however, that the very high representation of Chinese cities in the World Bank statistics over most polluted cities that have been used in this Report is partly the result of an impressive effort by Chinese authorities to increase and improve monitoring and reporting of routine air quality data. It could nevertheless be concluded that Chinese cities belong the most air-polluted places on earth.

While TSP and SO_2 emissions seem to have levelled out or even in some cases even decreased – largely a result of energy sector improvements where energy efficiency has increased from USD 0.3 per kg oil equivalent in 1980 to USD 0.7 in 1996 – emissions from vehicle traffic are likely to increase considerably in the years to come, with the result that urban air quality will continue to deteriorate.



Map 5: Vulnerability to acidification and critical loads of acid deposition. Dark red areas are most sensitive to acidification. (IIASA, RAINS Asia)

Acidification

Acidification is resulting from the combination of both acid rain, and the soils' capacity to neutralise the acidity. Map 5 shows how China's southern half, and in particular the Southwest, suffers from soils that have low capacity to buffer acid rain, with the implication that south China is critically vulnerable to acid deposition. At the same time, the intensive and increasing reliance on coal for energy, to a large extent high sulphur coal, and growing volumes of road traffic both increase the concentrations of SO_2 and NO_X in the atmosphere, with the implication that acid rains are bound to get worse.

SO_2 emissions are at present the major cause of acid precipitation, but the increasing NO_X emissions are exacerbating the situation. Deposition of sulphur compounds in the most polluted areas of China is even higher than in the well-known problem areas in parts of eastern and central Europe. Soils and soil waters are acidified in many areas of southern China. Pollution has affected the vitality of forests and other vegetation particularly in and close to urban areas. Surface water acidification is not likely to become a major regional problem in the near future, but streams in some areas that currently receive little acid deposition appear to be sensitive to acidification.

Since coal consumption is likely to increase and so will China's vehicle fleet, the only way to mitigate a future accelerating acidification of China's south is to improve and extend technologies that reduces SO_2 and NO_X emissions, such as coal washing, filters, and catalyst techniques.

2.5. Solid Waste

Chinese people live their life increasingly surrounded by garbage. Smelly dumps litter riversides, back streets and commons, with suburban areas being worst hit. Piles of industrial waste leach toxic substances into surface and ground waters.

Municipal Waste

Municipal solid waste reached almost 150 million tonnes in 1998, corresponding to a daily waste generation of about 1 kg per urban citizen – a figure comparable to cities in developed countries, with Stockholm at 1.2 kg, and somewhat higher than Indian cities. (State Environmental Protection Administration, 1999, World Resources Institute, 1998a) Yet, the generation of waste in large Chinese cities is growing by the order of 10% annually (Li Shichao, 2000), much faster than the urban population growth of 3% (projections for the period 2000–2005 in World Resource Institute, 1998a).

Today, less than half the total amount of municipal waste is reported to be treated – a figure that has risen from a few percentages in the mid 1980s. A third of this waste is defined as landfilled, but given the fact that China has only a handful of decent standard landfills, one may conclude that the garbage is dumped at a site that has been allocated for the purpose, but not actually designed to be a landfill. Some 10% of the waste is composted, but the low quality of the composting process and the corresponding high risk for toxic pollution make this compost difficult to sell on the market.

Industrial Waste

Chinese industry generates five times as much waste as its municipalities, or about 800 million tonnes in 1998, of which less than 10% was reported as 'discharged' (State Environmental Protection Administration, 1999). The remaining 90% are categorised as 'treated', 'recycled', or 'stored'. The area occupied by industrial waste storage alone totals 557 sq. km, including 30 sq. km of arable land in 1994 (Zhang Lijun, 1996). Information on the reality behind the figures is scarce, but it is reasonable to believe that these categories include a considerable amount of uncontrolled industrial waste dumping, leading to pollution of the land as well as adjacent surface and ground water sources, the air, and sceneries.

Hazardous Solid Waste

SEPA (1999) gives a figure of approximately 10 million tonnes of hazardous waste generated in 1998, or roughly 1% of the total industrial wastes; other sources mention 20 – 40 million tons. Beijing authorities estimate that less than 50% of the municipality's hazardous waste is treated to a reasonable degree or re-used – the rest joins the uncertain fate of other industrial solid waste streams. (Stover, 2000)

2.6. Regional Perspectives on China's Environment

In order to reach a deeper understanding for China's environmental situation, a cursory examination of national level indicators is far from sufficient. Environmental constraints and conditions vary widely across China's vast territory, causing certain regions to be more vulnerable to environmental problems than other. The following regional summary highlights the key regional dimensions of China's predicament.

Environmental Constraints – Limiting Factors

Availability of usable water – the most critical resource for China's future development – depends on precipitation and population pressure. The large river basins in China's northern part – the home for nearly half of China's population – are among the most water scarce areas in the world, which sharply constrains the potential for development.

Rich land resources – limited by mountains that cover more than half of China – are concentrated to the agricultural areas on the North Eastern, North China, and Lower Yangtze River Plains, the Pearl River delta, and in the Sichuan Red Basin; and to the forests that remain in the north-eastern provinces and in along the Himalayan foothills Yunnan, Sichuan and Tibet. Three quarters of the landmass is barren and have capacity to support but small populations.

Air quality – the most conspicuous problem on arriving in a Chinese city from abroad – depends on coal powered energy production, traffic management, and of course population pressure. Chinese cities belong to the most polluted in the world in terms of air quality, and the worst problems are found in large cities, mostly in the northern half of the country.

The combination of high population pressure, numerous large cities, cold climate with insufficient and unstable precipitation, heavy industry with ample deposits of coal and iron ore, and intensive, irrigation dependent agriculture, make the overall environmental situation worst in northern and north-eastern China.

Still, the ongoing land degradation that occurs over large areas of China's interior are rapidly increasing the vulnerability to further environmental stresses in areas with poverty and lack of alternative development opportunities.

Coast and Inland

Another important dividing line for understanding some of the dynamics behind China's environmental situation today, and the constraints of tomorrow, is that between the coastal areas and the inland.

The coastal areas and the lower parts of the eastern rivers have the highest population pressure and most severe pollution related environmental problems. This is also where the economy has developed the fastest. To turn the argument around: rapid development of the east has been possible only with the blessing of favourable environmental conditions. China's east has benefited from a favourable geography. The proximity to the sea has been utilised as a sink for unwanted waste products; environmental pressures from the upstream inland areas have been limited or at least manageable. Most of China's environmental model cities are also located on the coast. There is nothing like a fresh sea breeze to clear out the sky.

Yet, the coastal areas are facing environmental pressures that hamper development and may lead to absolute constraints, mostly the lack of usable water. Development of inland areas and the extension of irrigated agriculture upstream leaves less water for downstream users. Huanghe – the Yellow River – does not reach the sea at all during about half the year, leaving farmers in Shandong province without precious irrigation water, and making cities like Jinan – located on the lower part of the Huanghe – a dusty place to live. The situation is similar in all the northern river basins. In addition, the industrialisation and economic development of the inland provinces make the water that still reaches the downstream and coastal areas more and more polluted. Attempts from coastal cities to solve the problem have led to problems of land subsiding due to over-pumping of ground water.

The picture painted of China's environmental conditions and constraints is just a snapshot of the present environmental situation, outlining some of the most important trends. The larger problem of sustainable development, however, contains a number of underlying factors. In order to understand the prospects for China's development process, the examination shall be expanded in the next chapter to embrace other aspects of the development concept.

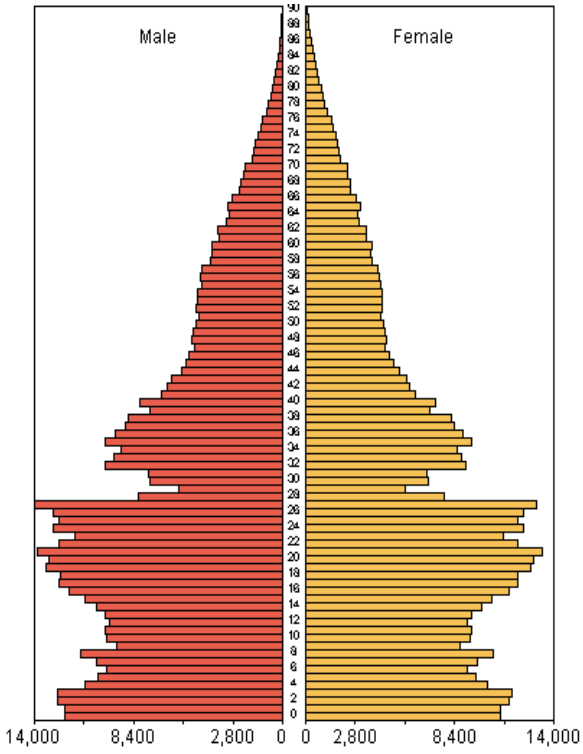


Figure 4: China's Population pyramid, 1990 census (1000 births per cohort) (Heilig, 1999).

3. The Dialectics of Environment and Development

The fate of China's environment is intimately connected to the thoroughgoing development process that the country is engulfed in. Is China's modernisation sustainable, and how do the environmental problems relate to other central development themes? This chapter shall place the environmental situation in a context of a number of other central development issues; basic problems that together profoundly affect China's future development.

3.1. Population

Population pressure on conspicuously scarce resources is one of the main driving forces behind China's environmental predicament. Population growth adds more pressure to an already vulnerable situation.

When the People's Republic of China was founded in 1949, the country had a population of about 540 million. Only three decades later its population was more than 800 million. This unprecedented population increase from the 1950s to the early 1970s created a strong population momentum that is now driving China's population growth despite already low levels of fertility. Most projections assume that China's population will increase to the order of one and a half billion before the total population may begin to decrease.

However, given the massive size of China's population, even small modifications in fertility assumptions have a far-reaching impact, and the high variant of the 1994 UN projection foresaw a population of almost two billion by 2050. The most recent (1998) medium variant UN projection assumes that the average Total Fertility Rate increases only slightly from 1.8 children per woman in 1995 to 1.9 children in 2010 and then

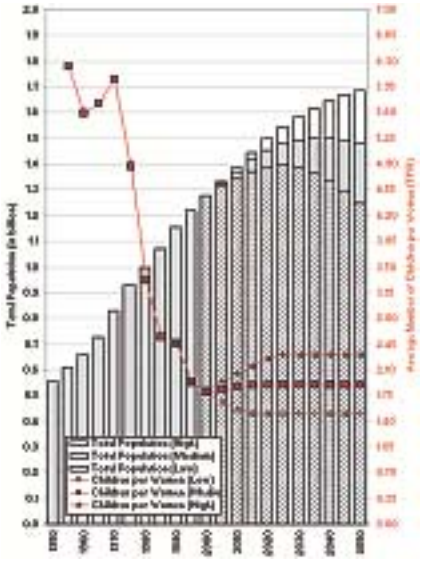


Figure 5: UN population growth projections (Heilig, 1999)

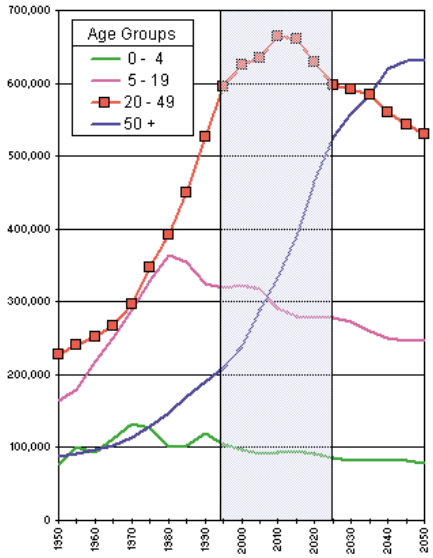


Figure 6: Population in reproductive age (Heilig, 1999)

remains at that level. In other words, the current UN projection is based on the assumption that fertility in China remains below replacement level for the next 50 years.

It is the Cultural Revolution baby boom that drives population growth, with the number of young adults of reproductive age (20 – 49) reaching its maximum of more than 660 million around 2010. The period up to 2025 is therefore crucial to China's future development. Only with a low average fertility will China manage to stabilise its population below 1.5 billion before mid 21st century. Still, the first 25 years of this century will see China's population increase by another 250 million people – an addition equalling the entire population of the United States (Heilig, 1999).

With per capita figures for the most important natural resources already perilously low, the pressure on environment and resources will increase even further. A growing overall population pressure will cause different effects in different parts of the country, and must be viewed in relation to other ongoing societal changes. Population growth superimposed with migration and urbanisation is already pushing the limits for ecosystem collapses in vulnerable areas throughout the country in general, and in the densely populated areas in the east in particular. Increasing population pressure in conjunction with changing consumption patterns is leading to higher per capita pollutant discharges, which already affect life expectancy in Chinese cities.

When Resources Cease to be Enough

So, can China support another quarter of a billion in just a quarter of a century?

Food supply is crucial and has been discussed intensively over the last years, starting with Lester Brown's (1995) Malthusian report of China's food demands draining world food markets. The latest contribution to this ongoing debate is IIASA's CD-ROM and Internet based report "Can China Feed Itself?" (Heilig, 1999) which arrives at the more positive conclusion that, yes, China can feed itself. However, there are a few prerequisites. Family planning must be effective in keeping population development down; water needs to be utilised more efficiently; large-scale water transfer from the Yangtze to the north is necessary; and better flood control must be implemented.

Apart from the problem of food security and its possible solutions, it seems relevant to reverse the question and ask if there is a risk that adverse impacts from environmental problems will affect the population development? There are a number of what-ifs that refer to Heilig's (1999) conditions, the most important of which are related to the water

issue. What if water efficiency is not enough? What if the south-north water transfer is not realised? What if precipitation decreases – due to natural fluctuations or greenhouse effect?

With almost half of China's population living under conditions of severe water scarcity in the northern river basins, even less water per capita may affect people's livelihood, if not survival. Worsening environmental conditions, and an emerging awareness of this reality, are factors that may push fertility rates downwards. The proof that an evil combination of ignorant policies, bad governance, and water scarcity may have dramatic demographic – and human – consequences is

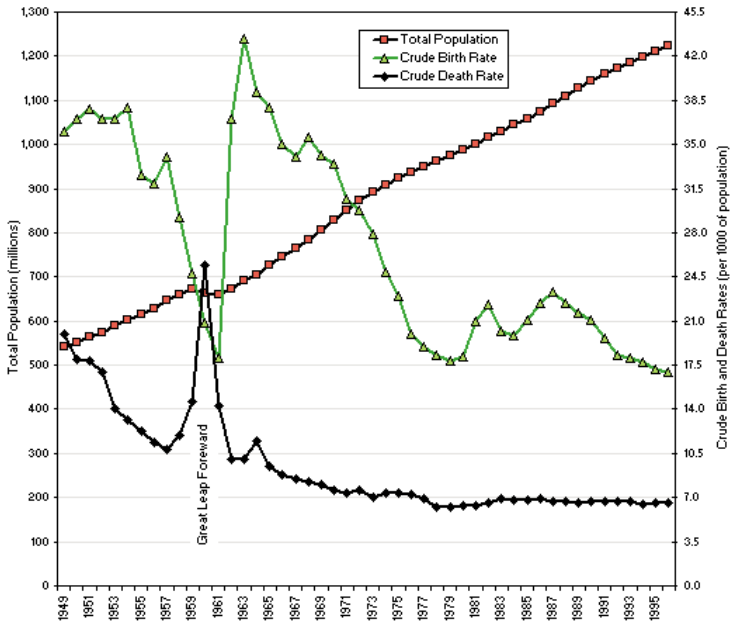


Figure 7: Demographic footprint of China's modern history (Heilig, 1999)

not further away in Chinese history than the Great Leap Forward, 1958 – 60, as is very well illustrated in Figure 7.

3.2. Poverty and Migration

China is still a poor, developing country with low per capita usage of most natural resources, and low per capita discharges of most pollutants. China accounts for about one quarter of Asia's 900 million poor. Most of the poor reside in the inland provinces and remote areas, particularly in southwest and central China – areas inhabited by large number of minority groups. Today less than 50 million people live in absolute poverty in rural areas, defined as an annual income of less than CNY635 (about USD75) – a number that has declined from 260 million when reforms were started in 1978.

In the past, poverty was predominantly a rural problem. Since the mid 1990s, however, as a result of enterprise reform, rural migration and government downsizing, urban employment has been increasing and with it urban poverty. Urban unemployed account for 12% of the total labour force. Based on an urban poverty line set at an annual income of about CNY2000 (about USD240), or roughly one third of the per capita annual urban average income, the incidence of urban poverty is estimated at 12 million, or 5% of the urban population. The majority of urban poor are workers whose family members have all been laid off. Schemes to support poor and unemployed covered 110 million people in 1999, up by 26 million from the previous year. (Asian Development Bank, 2000)

Development Strive Creates Environmental Pressures

Development means lifting the more than hundred million people that still live in absolute poverty to minimum subsistence levels. Development means increasing food supply, providing more energy, improving public transportation and communications, and much more, in areas where Chinese per capita consumption is but a fraction of western levels, and considerably lower than the world average. Development also means yet higher pressure on resources and on the environment.

It is not an easy task for local governments to find new sources of employment and income – neither for poor counties with excess agricultural population, nor for urban areas faced with increasing numbers of laid off workers – and there is a strong pressure on county leaderships to find income opportunities. One of the government's main strategies to mitigate this time bomb for social unrest is to promote small and medium size enterprises, and to allow the informal sector to grow. This strategy, in combination with a general lack of environmental awareness and a particular want for know-how and trained people, often leads to the setting up of resource inefficient and highly polluting enterprises, with indoor environmental conditions that diminish workers' life expectancy by years. Migrant workers, who are forced to take these jobs out of lack of other opportunities, are found in the worst positions.

Urbanisation Increases Pressures on Eastern Areas

Three factors will drive urbanisation in China: the huge 'excess population' in rural areas, the income gap between rural and urban employment, and the growing labour demand of urban industries and service sectors. Shortages of resources in rural areas, including access to good land and water, lead to poverty and unemployment, which propels the migration. With population mobility strictly controlled since the 1950s, a migration pressure have been built up over the years, and increased further with the rapid economic development over the past two decades.

The pace of urbanisation is bound to increase considerably over the coming years, as the rural population moves towards urban areas in search of a better life. Two general and growing migration trends can be seen, which super-impose on the population challenge. First, as in most countries, there is the move from rural to urban areas, including both temporary and permanent migrants. Second, there is a general move down the slopes from west China to the generally richer eastern areas. These trends combine to result in large migrations from rural western areas towards the coastal cities.

Booming urban areas in the special development zones and coastal provinces require additional labour – especially the construction industry and the service sector. Already, a so-called 'floating population' of well over 100 million migrant workers live in the cities outside the control of the authorities. While an individual's official place of residence is still strictly controlled through a household registration system, it is obvious that controls have been loosened, and there is a debate within the Chinese administration on whether it is time to abolish the strict controls in favour of a market-oriented and active regional policy to evolve.

The combination of increasing population pressure and environmental stress, particularly in the northern and eastern coastal cities, is one of the most difficult challenges for the future, with high risks for social unrest to occur. Urbanisation levels grew from 19% to 30% between 1980 and 1998 – a net movement of well over 100 million people. The level of urbanisation is forecasted to grow to 45% by 2010. Thus, within the next 10 years, over 200 million people will move to the already stretched urban areas, mostly in China's coastal areas.

At the same time, the present system, where an 'illegal' migrant labour force that counts almost 10% of the total population is overlooked, creates another type of unsustainability, where new social patterns that have the potential of being more sustainable and equitable are prevented from developing.

3.3. Economic Development

China is not alone in facing pressing environmental problems, nor is it the only country that must deal with these problems in relative poverty and with limited knowledge. Yet, the combination of a high and increasing population pressure on scarce resources, an already critical environmental situation, and a bold push for economic development creates an extraordinarily complex and difficult situation.

China has been experiencing double-digit growth over two decades now. This economic development was initiated by increased agricultural output when collective farming was dissolved, and by industrial productivity gains in return for allowing capital and labour to flow into low-end production. In other words, all it took to unleash a surge of entrepreneurial spirit and industriousness was for the government to keep out of the way. What followed, however, was unrestrained growth. On one hand, under-priced natural resources led to inefficient and often polluting production. On the other hand neither command and control, nor market-based instruments, were in place as checks against the overexploitation of resources and pollution discharges.

China's Growth is Not Sustainable

China suffers from an adverse socialist heritage of under-priced natural resources and a near free-of-charge right to pollute. Yet, with the present unrestrained embrace of the market economy led by Deng Xiaoping's dictum that 'it is glorious to be rich', China has got the worst out of two worlds.

Notwithstanding the blizzard of laws, regulations, and standards – in themselves laudable – that have been passed through China's burgeoning environmental administration, China's economic system has not yet reached the point where the developed market economies were when they began to worry about pollution. Since prices still do not reflect scarcity, there is little incentive for anyone or any organisation to save on resources. In other words, one of the most important foundations for the realisation of a sustainable development is simply not there.

This does not mean, however, that efficiency has not gradually improved. China's GDP has increased faster than major emissions (World Bank, 1997b), which reflects some positive side effects from market forces. Still, it does mean that a considerable part of the country's economic development has been generated in an economic environment where entrepreneurs have benefited from cheap inputs of materials and labour, without having to pay for discharges or workers health. This growth model is simply not sustainable, and carries with it enormous social costs.

The 'Get Rich – Then Clean Up' Strategy

There is a tendency among leaders on different levels in China to see environmental problems as a side effect of economic development, a necessary evil that one has to live through for a couple of decades, during which the nation grows rich enough to start thinking about cleaning up.

At least four objections may be raised against this strategy. First, it ignores the progress that has taken place in environmental management and pollution control technology since now developed countries faced the same problem some 30 years ago.

Second, even if there are countries for which it might, in a narrow sense, be possible to spur economic development for a few years by freeing capital that would otherwise have been earmarked for pollution control, this kind of development model, in itself dubious, could only be carried out in countries endowed with a 'quick clean' geography. China, with its vast territory and long river systems has the opposite characteristics – China's geography is 'non-forgiving'.

Third, the people in favour of this strategy are usually not those who will suffer directly from pollution and environmental degradations, such as health effects, genetic effects, and loss of livelihood.

Objection number four is that the pollution and depletion of a natural resource in itself constitutes a potential limit to further economic development. You never quite know when you reach that limit, and when you do, it might be too late.

Thus, there is a considerable risk that the 'get rich – then clean up' strategy instead becomes a 'get dirty – stay dirty' reality.

The Unsustainability Bill

Pollution, natural resource depletion and ecosystem destruction are costly. Polluted air and water cause health problems that lead to hospital bills, reduced productivity of workers, and other adverse socio-economic effects. Polluted or depleted water sources increase the cost for producing potable water. Ground level ozone and other air pollutants have negative impact on biomass growth and lead to lower harvests. In addition to the nuisance, suffering, and higher mortality rates caused by such pollution, all these problems lead to higher costs for society as a whole.

But there are also irreversible effects, or environmental problems that cause irreparable damage on invaluable assets – assets for which there is no substitution available, or for which alternatives are extraordinarily costly. These include, for example, microclimates that are destroyed by deforestation and subsequent desertification to the point where these areas become uninhabitable, or, on a global scale, the hazard to the ozone layer.

To calculate a total bill for unsustainability is nearly impossible. But to make no attempt would be like saying that there is no cost of pollution and environmental degradation. Therefore, the efforts from international organisations, and increasingly also from Chinese environmental economists, to make visible and quantify the costs associated with environmental problems are commendable.

The World Bank (1997b) has made estimates for the cost of environmental pollution and degradation to Chinese society. By applying two different methods for valuing excess mortality due to pollution – willingness to pay and human capital – the World Bank concludes that air and water pollution costs Chinese society 8% of GDP based on willingness to pay estimates and 3.5% based on human capital estimates. The largest impacts were from health losses due to air pollution; health losses from indoor air pollution; chronic disease from water pollution; crop and forest damage from acid rain; and nervous system damage on children exposed to high levels of lead. Yet, the estimates lack a number of high cost candidates, such as damage on crops from ground level ozone, loss of agricultural production due to draught, flooding and chronic water shortages, and the World Bank admits the estimates are conservative. Nevertheless, based on these estimates the unsustainability bill ends up in the same range as GDP growth, making environmental protection look like a good investment.

Thus, with the World Bank (1997b) estimate that pollution costs the Chinese society in the range of 4 – 8% of GDP, and the knowledge that resource depletion adds to this figure, an educated guess puts China's growth, when adjusted for pollution and resource depletion, close to zero.

Further Reform Positive for Environment

Until 1979, China's economy was centrally planned and supply driven. Prices of most commodities and many products were fixed, there was little competition, and little trade. The economy was characterised by low output and high consumption as efficiency in resource use was not an issue. It was also characterised by heavy, highly polluting industries. Resources were severely under-priced, and there was little regulation on pollution. The result was a widescale and very significant environmental degradation.

And although environmental degradation has no doubt accelerated with economic development, the market-oriented reforms over the last two decades, which were set off to spur economic growth, have actually had many positive impacts on the environment. First, the freeing of prices means that the costs of goods begin reflecting the scarcity of resources and production costs – leading to more care in resource utilisation. Second,

many state-owned enterprises have been corporatised and/or privatised, and there has been a growth of a large private sector. Corporatised and private enterprises tend to be more profit oriented, and therefore more efficient. This effect has been reinforced by the opening-up of internal and external trade, leading to increased competition and some increases in efficiency.

Finally, the demand for the production from the heavy supply side industries are diminishing. There has been a corresponding macro-level economic restructuring, as these polluting industries have been to some extent closed and replaced by higher-tech and service industries – albeit situated in other parts of the country. From the late 1970s to 1998, the service sector increased its share of GDP from one fifth to roughly one third. These new sectors consume fewer resources, and emit fewer pollutants per unit of GDP.

3.4. Legacy and Awareness

Population pressure and the negative impacts of economic growth put enormous pressure on the Chinese environment. A legacy of low environmental awareness and few incentives for saving resources exacerbate the situation.

There are no indications that the Chinese culture as such should be particularly wasteful. On the contrary, the relation between man and nature in the Chinese cultural heritage is founded on the concept that the human society is closely interlinked with nature and that disturbances in the one will cause disturbances in the other. Yet, the development of Chinese society through history has had far reaching impacts on the environmental preconditions of today. Firstly, it may be argued that it is the intensity in the man – nature relationship that has laid the ground for the extreme population pressures of today. Secondly, the lack of forest cover is at least partly a heritage from the continuous pressure on forest resources over several millennia.

Instead, the environmental legacy rests more heavily on the country's modern history. By the mid 20th century, after a century of turmoil, China was a very poor and underdeveloped nation. This poverty and low level of education explain why a broader environmental awareness has not developed. In addition, many of the campaigns and policies during the Mao era established models for development that were not at all sustainable. These include ignorance of basic laws of nature such as the linkage between population pressure and the carrying capacity of an area, traditional socialist imperfections such as distorted price mechanisms leading to an overuse of natural resources, as well as industrial and bureaucratic structures that are not easy to reform.

Weak Environmental Awareness

The unlucky combination of structural changes and imperfect price mechanisms previously mentioned is not the only reason for wastefulness. Environmental awareness in a deeper sense is scarce. Experience shows that pressure from a well informed, articulate population is an essential condition for environmental improvements. Although there is a common awareness that the environment is disturbed, and although the political leadership undoubtedly has a sense of the seriousness of the situation, there is a tendency to view environmental problems as temporary imperfections during a period of high-speed economic development.

An environmental awareness is, however, developing, partly because few people in China have escaped the negative impacts of environmental degradation, but also due to the attention on environmental issues in Chinese media. Yet, most reports in media concern progress – which is a good thing indeed – while less is said about health impacts, economic impacts, or environmental risks.

Environmental Expertise in Short Supply

A problem closely related to the lack of environmental awareness is the short supply of skilled personnel. Led by the slogan 'better red than expert', respect for learning suffered heavily under the Mao years, and changes since 1979 are still insufficient in view of the

immense needs. Primary education is just average compared to other populous nations, while post secondary studies, with 190 students per 100,000 – less than a third of Indian, less than half of Pakistani and Bangladeshi, and less than Nigerian and Vietnamese rates – are decidedly inferior (Smil, 1993).

In particular the shortage of personnel that has undergone training in, and adopted the concepts of environmental economics is a problem, when reform towards environmentally and economically sustainable habits rests with the ability to internalise environmental costs in the environmental policy. SEPA officials are still heard talking about market-oriented solutions with Chinese characteristics, where enterprises in return for making environmental investments should receive subsidies on the water and energy tariffs...

Management of the environment towards sustainability requires a broad environmental knowledge, primarily among personnel responsible for environmental issues in industries and institutions, but also among the population at large. A real change begins with the building of environmental awareness, and the improvement of training and education in environmental economics, management and technology.

3.5. Environment and Health

A Chinese Academy of Preventive Medicine study of 26 large cities conducted 1976 – 1980 found a strong correlation between air pollution concentrations and mortality in lung cancer. During the late 1980s health studies in polluted districts of Shenyang City with a population of 2.2 millions found 3,000 early deaths, 20% of chronic illness and 35% of acute illness due to severe air pollution. An early 1980s study of 1.28 million fishermen and nearby farmers in northern China found markedly higher mercury, cadmium and lead levels as well as a higher death rate among the fishermen. (US Embassy, Beijing, 1999) Mercury levels in the Songhua river in Jilin province downstream from the industrial city of Jilin were reported to have been at levels similar to those measured in the Mina Mata catastrophe.

These are all anecdotal evidence of severe adverse impact on health due to a polluted environment. Yet, travelling in China, you seldom hear local officials admit that environmental problems within their own jurisdiction may have a health effect. Neither are reports on health effects frequent in Chinese media. Chinese people in general, although often aware that the environment is polluted, still do not quite comprehend what a tremendous impact an inferior environment often has on health and life expectancy. Apart from scattered epidemiological studies, it seems as if more comprehensive approaches to map the eventuality of environmental health effects are largely absent.

Although solid scientific data are scarce, the Chinese government has nevertheless identified environmental problems as one main reason for ill health and early death in China.

Urban Air Pollution the Worst Killer

Although few epidemiological studies have been conducted, it is clear from dose-response estimates based on typical Chinese urban air quality that air pollution is a major cause of both mortality and morbidity in China. But it is not only the inferior outdoor air quality that causes harm – low quality coal for cooking and heating produces indoor air quality that is excessively unhealthy, with women and children being prime victims.

Statistics compiled by the World Bank (1997b) on mortality and disease burden relating to water and air pollution shows a clear preponderance towards air pollution related causes for death, with chronic obstructive pulmonary disease and lower respiratory tract infection being the diagnosis of no less than 20% of total deaths in China. Dose-response estimates based on typical urban air quality situations tell the same story.

Water Pollution Health Effects are Largely Unknown

By the same statistics, water pollution related causes of death accounts for 1.5% of total deaths. Yet, these statistics are based on diarrhoea, hepatitis, trachoma, and intestinal nematodes – diseases that all relates mainly to faecal pollution. The big unknown, however, is the health impacts from decades of unchecked industrial wastewater discharges – let alone the habit of using industrial effluents for irrigation. Recent epidemiological studies suggest that chemicals found in drinking water contributes significantly to chronic disease, including incidence and mortality of liver and stomach cancer – the leading causes of cancer mortality in rural China. Liver cancer mortality has doubled since the 1970s, and China has now the highest liver cancer death rate in the world. Although it is difficult to prove that wastewater cause disease and premature death, several Chinese studies show roughly twice as many cancer incidents in areas irrigated with wastewater as compared to reference areas. Also significantly increased incidence of birth defects was found in the areas relying on wastewater irrigation. (World Resources Institute, 1998b)

Occupational Health in the Complete Dark

Anyone who has made a few visits to Chinese factories can bear witness to the unhealthy, often dangerous work environments. Occupational health problems that have been observed make up a sample sheet of every possible violation of even the most basic protection, including chemical factories where the air is so acid that someone with normal lung function cannot breath, but where protection is limited to rubber gloves and boots; cement works with suspended dust level that produce high risk for silicosis; unshielded transmissions, transports, motor clutches and gears; noise levels far beyond what causes hearing disabilities but where no ear-muffs are supplied; monotone work positions; and exposure to all sorts of chemicals and other potentially toxic substances.

Yet, there is little information about occupational health problems in China, and as is the case with health aspects of outdoor environmental problems, occupational health issues have been largely absent from international development co-operation programmes.

3.6. The Environmental Dimension of Human Rights and Gender Issues

Human rights and environmental issues are closely related to one another. The sort of issues that link the human rights and environmental agendas – largely involving unfair distribution of the costs of ecological damage and inequitable access to ecological benefits – are often referred to as environmental injustices. Though difficult to quantify or even document in some cases, because they are often associated with illegal activities, environmental injustices arise at all levels of society, affecting individuals, communities, and entire countries. To a large extent also the gender dimension of environmental issues could be viewed as a case of environmental injustice.

Environmental Justice – Human Rights and the Environment

There are many aspects of how environmental issues in general and environmental injustices in particular link up with human rights. Human rights activists inside and outside of China have traditionally been preoccupied with issues that are normally associated with human rights, such as prisoners of conscience, the freedom of speech, and the death penalty. Whereas these are often clear-cut issues, environmental injustices are often far more difficult, particularly since the rights of different groups of people frequently conflict with each other.

The most well known human rights issue relating to the environment is the relocation of people in connection to the Three Gorges Dam project. In itself, this issue illustrates the difficulties to define what is a human right and what is not, and whose rights that are at stake.

There are two fundamental kinds of 'human eco-rights': the protection from pollution, and the access to natural resources. The Three Gorges Dam case involves the forced relocation of a couple of million people that live in the areas that are to be submerged by the dam. This denies them the right to ecosystems that have served as their primary source of livelihood. At the same time, with a designed installed capacity of 18,200 MW of clean energy, the Three Gorges Dam will improve other people's rights to breath reasonably fresh air.

Setting the technical and engineering questions aside for a moment, the Three Gorges Dam project clearly involves questions of environmental justice. These questions, however, are not as clear cut as usually portrayed by advocates for and opponents against the project. The issue highlights China's weak legislative framework for dealing with the balancing of conflicting interests, particularly the lack of channels for various groups or individuals to voice their view.

There are other, more obvious examples of environmental injustices in China, where some people profit from activities that cause ecological damage, at the expense of others who are subjected to the environmental costs of this damage. One expressive example is the large scale, unchecked, and often illegal felling of forests, which destroys ecosystems that for hundreds of years have provided people with hunting grounds and sustainable services such as the regulation of micro climate, and, downstream, crucial flood protection. Other examples involve factories' pollution of water sources, upstream water users withdrawals at the expense of downstream users, to mention only a few cases of environmental injustices.

Gender – a Case for Environmental Injustice

At primary school age there is no difference in enrolment between boys and girls, and with more than three quarters of women belonging to the labour force, China has one of the highest female labour participation rates in the world. Still, men earn about 10% higher salaries than women for the same work. Although more Chinese women participate in manual labor than in other countries, the Chinese labour market is still highly segregated, with typical male and female jobs. The situation among the migrant work force highlights a trend towards further gender separation, with the largest migrant group being men of working age that can no longer find jobs in the agricultural sector, and instead take low-end jobs in the booming urban construction sector. Another big group is made up of younger women, usually of pre-marriage age, who find employment in light industry, the service sector, or in offices. Thus, a simple calculation shows that rural China increasingly must rely on women in working age that care for the home, raise the children and perform the agricultural work. This trend is supported by reports that up to three quarters of the agricultural labour force is made up of women.

Men and women's divergent occupational paths also mean different levels of exposure to environmental risks, a fact that may entail considerable consequences given China's dismal occupational health situation. There are, however, few statistics available today to explore this further. But work environment is not the only cause of gender different exposure to environmental risks. For example, women and children are more exposed to high levels of indoor air pollution due to the fact that they spend more time at home.

The other side of the coin concerns women's and men's different interests in, and opportunities to behave in an environmentally friendly way. With agriculture increasingly dominated by women, it seems likely to believe that women are also more concerned with the sustainability of agriculture – one of the largest issues of sustainable development in the years to come. Here, strong patriarchal traditions may prove counterproductive to a positive development, with recent reports in the Chinese media indicating that women farmers are being denied equal rights to contract land (Asian Development Bank, 2000).

3.7. International and Global Dimensions

With a fifth of the world's population, China constitutes a global concern by its sheer size. Notwithstanding a still relatively low per capita consumption of most resources, China is rapidly becoming a major source of global pollutants.

Global Environmental Issues

With 3.4 billion metric tons discharged in 1996, China accounts for 15% of world CO_2 emissions – second only to the US.

China's consumption of ozone depleting substances (ODS) in the late 1980s amounted to 4% of the world total. With a consumption that has grown 12 – 15% annually since 1986, China belongs to the world's fastest growing consumers and producers of ODS.

China's share of these two global environmental threats is increasing at an alarming rate, and will continue to do so as its currently low per capita consumption increases.

Regional Concerns

On a regional level China is a main source of SO_2 pollution, contributing acid rain on the Korean peninsula and in Japan.

There are a number of, non-degradable toxic substances, including pesticides, fungicides, DDT, heavy metals, chlororganic compounds, and flame retardants, which are being discharged to air and water, or leaching from waste dumps. Although the most severe effects, e.g. genetic disturbances and cancer, are suffered locally, these often highly toxic compounds are accumulated in the food chain and spread around the globe.

4. In Pursuit of Sustainable Development – What China Does to Improve the Situation

A reverence for nature runs through the long span of Chinese history. In the traditional view the individual as well as the human society were seen as integral parts of a cosmos dominated by nature – a notion that emerged as central concepts in Chinese moral and philosophical systems such as Confucianism, Daoism and Buddhism. Mountains, rivers and lakes were seen as sacred items. Imperial decrees from the 11th century BC forbad destroying buildings, filling up wells, felling trees, or hurting domestic animals. In order to make farmland production sustainable, the Farmland Law of the Qin dynasty (2nd century BC) prohibited felling trees, filling up dams, burning grasses or catching fish before and during the reproductive period in the spring and early summer (Zhang, 1999).

Still, as is evident from the above account of China's environmental predicament, somewhere, something went wrong. Now, China is struggling to find a new path to sustainability, a very difficult task that involves raising environmental awareness, finding an institutional structure and market based mechanisms that promote sustainable behaviour, and improving efficiency and environmental performance by introducing modern technologies.

This chapter outlines China's work in pursuit of sustainable development.

4.1. The Emergence of an Environmental Administration

The two United Nations environmental conferences have both constituted milestones for the advancement of environmental administration and management in China. After the 1972 Stockholm Conference, China set up its first Leading Group of Environmental Protection under the State Council. During the 1970s, local level environmental administrations were gradually set up. Their efforts were focused on controlling the 'three wastes' meaning wastewater, exhaust gas, and solid wastes.

A Legislative Framework Takes Form

The first piece of comprehensive legislation was promulgated with the Environmental Protection Law in 1979. Among the provisions, it was stipulated that an environmental impact report be submitted prior to project implementation. Subsequently, an environmental levy system was enacted, requiring polluters to pay for emissions exceeding national standards. (The function of the system is discussed further on page 31).

During the 1980s and 1990s, the NPC has enacted a number of environmental laws, beginning with an ocean law, and water and air pollution control laws. Today the framework has grown into a veritable jungle of laws, regulations, and standards discussed further on page 30.

Environmental Protection becomes Basic National Policy

In 1983 the State Council declared environmental protection one of China's basic national policies, meaning that protection of the environment received the same formal attention as the control of population development.

Throughout the 1980s and 1990s, the elaboration of various policies, principles, strategies and plans have continued, including the precautionary principle, the polluters pay principle, enforcement of environmental management, environmental impact assessment, pollution levy system, discharge permits, and mandatory pollution control. As described earlier, however, much of the efforts have been formulated in a command and control context.

From Environmental Protection to Sustainable Development

During the 1980s it became more and more obvious that China was facing a critical environmental situation. Studies carried out by the Chinese Academy of Sciences (CAS)

highlighted the need for China to follow a new development path, one that relied on low resource consumption, and where sustained economic growth was seen as possible only if basic conditions such as protecting the environment and preserving natural resources were fulfilled.

China took an active position in the preparations for the 1992 UN Conference on Environment and Development in Rio, and with the 1994 China's Agenda 21, China was the first country to present a national Agenda 21. Two years earlier, in the wake of the Rio Conference, the Chinese government had issued the China's Ten Policies of Environment and Development described below. In 1996 the NPC approved the long-term targets of environmental protection for the years 2000 and 2010.

4.2. Basic Policies, Plans and Strategies

Since 1983, protection of the environment is one of China's basic national policies, and provides a starting point for environmental protection on the very highest level. Only in recent years, major strategies, proposals and plans that relate to environmental protection and sustainable development number more than 20. The most central themes are outlined below.

China's Ten Policies of Environment and Development

The Chinese Government developed in connection to the Rio Conference 'China's Ten Policies of Environment and Development', which set the tone for much of the subsequent work:

1. To implement the strategy of sustainable development;
2. To adopt effective measures to prevent and control industrial pollution;
3. To conduct comprehensive treatment of urban environment and eliminate the 'four harmful elements' (smog, sewage, garbage and noise);
4. To increase energy consumption efficiency and improve the energy consumption structure;
5. To introduce eco-farming, sustainable forestry and strengthen biodiversity protection;
6. To strengthen environmental research and develop the environmental protection industry;
7. To apply economic means to protect the environment;
8. To strengthen environmental education and consistently raise the environmental consciousness of the whole nation;
9. To perfect the environmental legal system and intensify environmental management;
10. To formulate China's action plans in the spirit of UNCED.
    (Zhang Lijun, 1995)

Sustainable Development and China's Agenda 21

China did its homework well after the UNCED, putting forth one of the world's first national Agenda 21 – an impressive work led by the SDPC and the Ministry of Science and Technology (MOST). With benign support from UNDP, a white paper on China's Agenda 21 was published in March 1994 and a Priority Programme for China's Agenda 21 consisting of 62 projects of demonstration character, building heavily on foreign soft financial support.

The Administrative Centre of China's Agenda 21 (ACCA21) was set up by the SDPC and the MOST for handling day-to-day work with regard to Agenda 21 implementation.

After the reconstruction of the ministerial structure in 1998 a new leading group for sustainable development has been set up under the leadership of SDPC, and sustainable development is now a key national strategy. ACCA21 serve as a secretariat for China's sustainable development, with the task to draft documents, draft plans and strategies, as well as review and develop new strategies for China's Agenda 21.

China's Agenda 21 work during the 1990s has been characterised by a top-down approach, but with experiences from a number of experimental community based projects, the aim now is to localise future Agenda 21 activities and bring in citizens and NGOs in the work on the community level.

Total Amounts Control of Major Pollutants

In order to meet environmental goals and control further pollution and ecological degradation, 12 major pollutants have been identified. The first target was to limit the total discharge of these pollutants to 1995 levels by year 2000. New targets are expected to be set for the 10th Five Year Plan period.

Attention on the Ecological Environment

An increased attention to protection of the natural environment have followed in the wake of the 1998 floodings. Two central plans have been approved by the State Council – the National Construction Plan for Ecological Environment and the Development Plan for National Nature Reserves – listing the construction and protection of the ecological environment. There is also a programme for protection of natural forests.

The Ninth Five Year Plan (9FYP) and the Trans-century Green Programme

The 'Trans-century Green programme' for so called green engineering projects was taken as the central environmental feature of the 9FYP, 1996 – 2000. In its first phase during the 9FYP 1,500 projects were initiated, focusing on interventions in the three northern river basins – Huaihe, Haihe, and Liaohe; the three lakes – Taihu, Dianchi, and Chaohu; the two zones – the acid rain and the sulphur dioxide protection zones; one mega city – Beijing; and one marine area – the Bohai Gulf. The original investment estimate for phase 1 of the plan amounted to CNY180 billion (~USD22 billion).

According to the SEPA industrial pollution sources within the Huaihe river basin and the lake Taihu catchment have basically met discharge standards. The projects to be implemented in the Haihe and Liaohe river basins during the tenth Five Year Plan have been decided, and an action plan for the Bohai Gulf has been initiated.

The Tenth Five Year Plan (10FYP)

The 10FYP covers the period 2001 – 2005. The priority regions from the 9FYP will be extended into the 10FYP with the addition for the Yangtze River and the Yellow River (Huang He). The focus for main activities will shift from the river basin of Huaihe to Haihe, the river basin where Beijing, Tianjin and large parts of the North China Plain are located. This section reviews the justification, targets and components of the 10FYP as presented by SEPA (2000).

According to the targets set up by SEPA for the end of the 10FYP period – and with, as SEPA puts it, the utmost effort – the pollution situation will be changed to the better, with ecological destruction alleviated and environmental quality in key cities and regions improved. A group of cities and regions with rapid economic development, beautiful environment and a sound ecological system will also be built up. Moreover, an environmental legislation that builds on the socialist market mechanism shall be preliminary formulated.

4.3. Present Environmental Administration

The National Peoples Congress (NPC)

The National Peoples Congress is China's legislative body and the highest level of political authority. The NPC Environmental and Resources Protection Committee (ERPC), is responsible for the drafting of legislation and the supervision of government performance. The NPC and the ERPC are far from the rubber stamp institutions they

used to be, and have during the 1990s developed into a forum for debate, with environmental issues being of particular concern during NPC sessions.

The State Council

The State Council is responsible for the implementation of laws and policies laid down by the NPC. The council consists of four vice premieres, the chairmen of the co-ordinating government commissions, and the ministers that lead full-fledged line ministries. One of the vice premieres is responsible for environmental issues in the State Council.

The State Environmental Protection Administration (SEPA)

The highest environmental executive body, the State Environmental Protection Administration (SEPA) has the level of a semi-ministry and minister Xie Zhenhua, the head of SEPA, is not a regular Council member, but sits in when environmental issues are discussed.

SEPA succeeded the former National Environmental Protection Agency (NEPA) when this agency during the big 1998 government reform was elevated from 'government agency' level to the somewhat ambiguous status of 'state administration' – half a step up to the ministerial level. At the same time, the State Environmental Protection Commission was abolished and SEPA took over some of its co-ordinating duties. Despite this elevation of its environmental authority, however, SEPA saw dramatic staff reductions.

SEPA is outspoken about the environmental predicament that China faces and lists the following six major challenges for the future work.

- The development level varies between different areas, and while the situation might be expected to improve in the more developed parts – particularly with regard to industrial problems – pollution loads and other environmental problems resulting from activities in less developed areas may increase.
- China ranks first in the world in terms of coal consumption, greenhouse gas, sulphur dioxide, smoke and dust emissions. Energy demand will continue to increase and there are few opportunities for a radical shift away from coal-powered energy development. There is a great risk that discharges from the energy sector will continue to grow and with it areas affected by acid rain and sulphur dioxide pollution.
- China's ecological environment is fragile – the middle and western parts not the least. If environmental concerns are not better integrated in the model for economic growth, plans to advance development of the middle and western parts may cause severe damage to the ecological system.
- With rapid migration and urbanisation pressures, particularly towards the eastern areas, organic and toxic pollution of urban river sections may reach even more serious levels, at the same time as urban ambient air will be under pressure from both coal powered energy and increasing vehicle emissions. Urban solid waste is another mounting problem.
- A major impediment to improvements is the insufficient financial input to environmental improvements, and the low capacity, both in quantity and quality, of environmental management.
- Finally there is a global dimension to China's environmental problems, including the greenhouse effect, ozone depletion, and biodiversity issues.

Commissions, Ministries and State Agencies with Environmental Responsibilities

There are a number of other state commissions and ministries that have considerable responsibilities within the broad field of environment and sustainable development, among them the

- State Development Planning Commission (SDPC), which assumes the main responsibility for sustainable development and the implementation of China's Agenda 21, regional co-ordination, and plays a central role in formulating China's position in international negotiations on climate change;
- State Economic and Trade Commission, which has responsibilities in the area of environmental technology development, including clean technologies, and energy efficiency;
- Ministry of Water Resources, with responsibilities in the water arena that overlaps both SEPA and SDPC;
- Ministry of Construction, with strong influence and responsibilities in urban infrastructure development, including waste water treatment and solid waste management;
- Ministry of Agriculture, which assumes the overall responsibility for most of what happens on the countryside, including township and village enterprise regulation;
- Ministry of Science and Technology (formerly State Science and Technology Commission), which used to have a strong say on environmental technology, but which has seen part of it's former 'commission' level influence vanish;
- State Forestry Administration, which used to be a ministry that have seen a lot of its influence disappear, have still considerable responsibilities in wetlands and biodiversity that overlaps with SEPA;
- State Meteorological Administration, with influence in regional air quality management;
- Ministry of Communications, which share responsibilities with SEPA on vehicle emissions control, the implementation of which falls on the Public Security Bureaus.

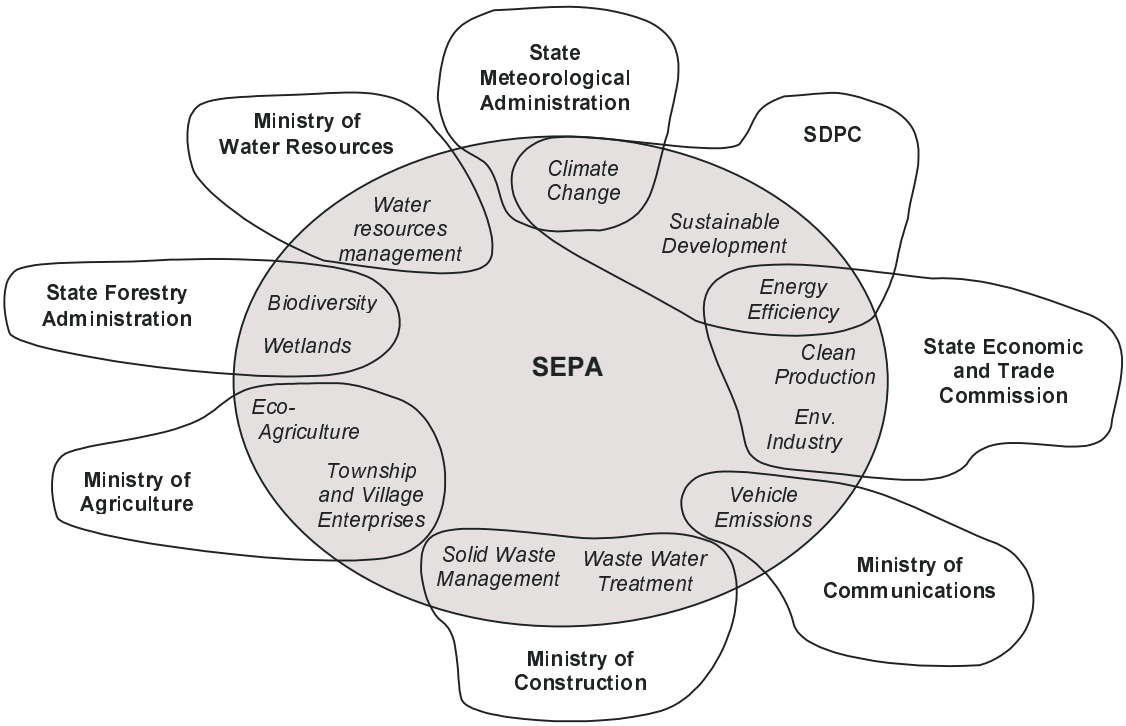


Figure 8: Who does what in China's environment?

Environmental Administration on Provincial and Local Levels

There are environmental protection bureaus (EPBs) on provincial, municipal and local levels. EPBs do not take order from, nor do they answer to, SEPA. Instead, they belong to the administrative level government. SEPA therefore has limited powers to make sure

new polices and laws are implemented. Still, SEPA has the right to appoint key environmental administrators at the provincial and city level EPBs.

4.4. Other Environmental Institutions and Organisations

China Council on Environment and Development (CCICED)

Since its start in 1992, the CCICED – or the China Council as it is usually referred to – has consolidated its position as the most important forum for policy dialogue on sustainable development issues between China and the rest of the world. It is an advisory group consisting of national and international policy-makers with the mandate to strengthen the co-operation and exchange regarding environment and development between China and the international community.

The Council, which meets annually, is composed of approximately 50 Chinese and international members. The Chinese members are of Ministerial or Vice Ministerial rank, as well as several eminent Chinese experts. The international members are of comparable stature. Members participate as experts in their personal capacities, at the invitation of the Chinese Government. They have been chosen for their expert knowledge and experience and come from different fields of expertise: environment, economics, science, technology, energy policy, agriculture, industry, business, finance, and education.

Expert Working Groups (WG) have been established by the Council, each jointly chaired and staffed by Chinese and international experts.

The working groups analyse important problems that China faces in the field of environment and development, propose strategies based on international experience and China's needs, conduct demonstration projects, and prepare preliminary recommendations for the Council. The Council then decides what recommendations to forward to the Chinese Government.

Academic Research and Expert Institutions

Chinese environmental research of the passed have been concerned mainly with natural science and technology issues, conducted in academic seclusion within universities or Chinese Academy of Sciences Institutes all over China. Given China's isolationist background and the language barrier, exchange with international academic communities has also been very limited. More applied environmental research, particularly policy relevant research, have been carried out in research institutes that belonged to government ministries and agencies. Still, there has been very limited room for independent research, and a particular want of environmental research and studies based on social sciences.

Slowly, however, these institutions are gaining capacity and ability to influence. Most do not play an official role in determining environmental policy, but they are assuming a stronger role in advising the public, the government and private sectors. The formation that we see today of independent or semi-independent research institutions and think-tanks is partly the result of the increasing demand for independent expert services that has been generated by a sharpened environmental policy and legislation, such as environmental impact assessments. But the explosion of international academic exchange, and involvement of Chinese experts in environmental development co-operation projects have also played a decisive role in creating an atmosphere of independent, critical thinking.

For example, the *Rural Development Institute* of the *People's University* in Beijing is one of many educational institutions that combine academic research and rural development project experience in China's interior. The *Beijing Environment and Development Institute* (BEDI) was established in 1995 by Ma Zhong, a professor of economics, with institutional support from the People's University. BEDI focuses on applied research on environmental issues and seeks to encourage market-based tools to tackle environmental

problems. BEDI was instrumental in the re-evaluation of development plans in Heilongjiang's Three Rivers Plain region where wetland preservation and agricultural development come into direct conflict.

Regionally-based institutions, such as the *Chinese Academy of Sciences' Institute of Geography* and the *Northeast Normal University's Institute of Environmental Sciences*, both based in Changchun, Jilin Province, also have impressive research and training agendas and have been quite responsive to the specific regional needs.

Lastly, the government restructuring of 1998, when central government ministries and agencies were downsized by half, was largely a matter of detaching the numerous ministerial research institutes from the government payroll, with the result that these institutions have to learn to survive on the same conditions that similar policy think-tanks do around the world by selling their expert services. Now, these government centres are becoming increasingly independent from government support and control. Many of them have gained something akin to NGO status. For instance, the Beijing-based *South North Institute for Sustainable Development* has been very successful in conducting small demonstration projects on biogas energy for small farmers in the Baima Snow Mountain in Sichuan Province.

Particularly environmental and energy policy research tends to be conducted by these government affiliated research institutions, but also institutes concerned with capacity development, training, education, and outreach.

The prestigious Energy Research Institute under the SDPC umbrella is an example of a think-tank that has gained a lot of influence in developing China's future energy policies, including its dynamic Centre for Renewable Energy Development (CRED), institutions which nowadays work mainly on a consultancy basis, partly for government, international donors, and private sector.

Affiliated with SEPA but 'independent without challenging government' the Centre for Environmental Education and Communications is an example of a young and dynamic institution working with activities such as training of mayors of key cities, environmental medial training for journalists, teachers training within the GLOBE programme, and production of environmental school books.

There are also a number of institutions that play an important role in building and extending environmental management systems within Chinese industry, the China National Cleaner Production Centre, under SEPA's Chinese Research Academy of Environmental Sciences, being one example of an institution that make consultancy business in the field of environmental auditing, clean production, and setting up of ISO 14000 systems.

NGOs

The 1990s has seen a gradual emergence of grassroots involvement in, and a remarkably open debate on, environmental issues. Several non-governmental organisations (NGOs) have been formed by concerned citizens, while environmental organisations with government affiliation – so called GONGOs (governmental non-governmental organisations) – have received an increasingly independent status, in particular since the government reform that stared at central levels in 1998. In addition, a number of international environmental NGOs are present in China, among them the World Wide Fund for Nature, Oxfam, LEAD, and others.

Real environmental NGOs, as we are used to see them, are very few. The two NGOs mostly heard of are the Friends of Nature and Global Village – both based in Beijing. The Friends of Nature was formed in 1994 as a social welfare organisation and is something of a club of nature lovers and citizens concerned with the protection of the environment. The organisation counts about 1,000 members. Other than arranging excursions for members, Friends of Nature focus their work on environmental education and awareness raising, and have been particularly active in campaigning for the protection of wild animals under the threat of extinction. The Global Village is more of a campaign-oriented, slim organisation that was set up in 1996 in the form of a private

business. The Global Village has been more engaged with brown sector issues, including solid waste recycling and the concept of responsible business.

The real NGOs, and increasingly also the liberated GONGOs, do not receive Chinese government support – the real NGOs would not even take it if offered – but finance their activities through modest membership fees and international support. The financial basis for real NGOs to live and thrive is an important issue for future international co-operation.

At the present, the NGOs, GONGOs and government ministries and agencies seem to co-exist for mutual benefit – NGOs and GONGOs put the spotlight on issues that may be too sensitive or inappropriate for the environmental authorities to raise, while the government at its end does not interfere with the relative freedom that environmental organisations enjoy. In a more subtle way, however, the government does control NGOs, in the sense that NGOs know the invisible but nevertheless very much present line between voicing environmental concern on the one hand, and questioning political power on the other.

Thus, there is something of a status quo built into the present constellation. Given the magnitude of China's environmental predicament, let alone its health impacts, and with the development of a middle class of educated, articulate urban population, there is definitely growth potential for environmentally concerned NGOs. Yet, the present NGOs do not consider it as their mission to question political power, but rather to work in support for gradual reform, with the result that they are confined to trying to improve the environment, but without making too much impact on society as a whole. An NGO member gives a good account for this ambiguous situation when referring to the relationship between NGOs and the media. On the one hand, the media is an ally to the environmental NGOs, on the other hand the NGOs experience difficulties in reaching out through the very same media.

Despite rapid growth in membership, there is one thing that the NGOs seem particularly concerned about – not to make the Party uneasy by growing too big. For the time being, it also seems unlikely that the government would allow any truly non-governmental organisation to set up a nationwide network of sister organisations. Yet, environmental NGOs, or other more loosely organised groups working for local environmental protection, are being formed all over China, and out of these a web of informal networks is growing.

Environmental NGOs that operate within limits acceptable to the Chinese government are likely to be allowed more freedom and access to the political process, especially locally active NGOs that promote public awareness and serve as watchdogs for the central government, the policies of which have problems in penetrating to the local level. For the time being, the existing and upcoming NGOs are dependent on financial support from international organisations, and need contacts with NGOs outside China in order to make ideas and trends from the rest of the world available in China.

4.5. Legislation, Regulation and Policies

China's environmental legislation reflects the country's political context. Environmental laws in the West typically aim at regulating the polluter, usually with a strong link to the rights and responsibilities associated with property rights and ownership. On the contrary, Chinese environmental regulations, although impressive at first glance, are saturated with sweeping, vague expressions, which seem intended to give the planning official room for manoeuvre rather than to provide explicit rules for the polluter.

Blizzard of Legislation

Chinese legislation still suffers from the legacy of arbitrary and ideologically coloured implementation of law that prevailed in China until the end of the Mao era. The consequence in the environmental domain is that issues, which would have been settled by rules or in court in the West, are resolved through negotiation. If everything is negotiable, and when there are other concerns – political or economical – that may

override environmental regulation, then pollution control is likely on the losing end. With the rule-of-law still immature, and environmental impacts not monetarily valued, production always wins out over protection – and this is the context in which most decisions with environmental implications are taken in China today.

The Chinese constitution declares that the State protects and improves the environment, but clear definitions of responsibilities and who-does-what are largely absent.

Evaluating the environmental legislation on the basis of the number of laws, regulations and standards may also lead one to the conclusion that China has indeed promulgated an impressive environmental legislation over the passed two decades. But a closer look reveals that many pieces of regulation are contradictory. On an overall level, the present legislation fails to sort out the administrative line of command between the central authority, SEPA, and the provincial and local level environmental authorities.

There is also an obvious gap between standards for ambient environmental quality, which are, if not overly strict, at least in line with WHO guidelines, and the regulatory tools provided to control emissions and conserve natural resources, which are insufficient to make polluters reduce emissions to the level needed to reach the ambient standards.

Environmental Management

It may seem as if China is developing its environmental management along lines similar to those of western countries one or two decades ago. That is: from a command and control approach to one increasingly relying on market based instruments. Foreign environmental experts on a brief visit to China are often impressed with the polluter-pays-principle implemented through a pollution levy system that has been in service since the early 1980s.

But the fact is that the attempts to impose a thought-to-be market-oriented approach to environmental management take place in an economic context that differs in many ways from the basic conditions prevailing in the West. As already noted above, the emergence of environmental management in the West took place in an economic context where a basic level of resource efficiency was already imposed by market forces. Therefore, the implementation of both command and control instruments, as well as market based tools, cannot be expected to have the same impact in China as it had in the West. China must find its own path through the application of both command and control and market based instruments in order to come to grips with its severe situation.

Raufer and Wang (1999) compare the Liaoning province city of Benxi with Pittsburgh, Pennsylvania – two iron and steel cities involved in a twinning arrangement through a UNDP air quality management programme – and conclude that a transfer of experiences from Pittsburgh to Benxi is limited by basic differences in economical conditions. Raufer and Wang argue that Pittsburgh steel manufacturers made constant efficiency improvements and shut down bad performing units as a part of market based business decisions. Similarly they made pollution control decisions based on whether it was more cost efficient to invest in pollution control devices, or better to shut down the unit and build a new and more efficient one. When Benxi's state owned steel producers consider investments in control measures, these decisions are taken in a context where China's growth demands domestic iron and steel, the employment of hundreds of thousands of workers are at stake, and where other similar factors carry the same weight. Therefore, the Benxi response to regulation – whether of the command and control type or market based – cannot be the same as in Pittsburgh.

Supply Side Management

Government investments and subsidies have always been the backbone of planned economy management, and the principal way by which the state has controlled the supply of goods and services. This management approach is still practiced by the majority of Chinese planners and decision makers. The result is twofold.

First, the attempt to increase supply to meet an ever-increasing demand, particularly in a situation where basic goods such as water supply and energy is subsidised, is an inefficient and eventually impossible way to resolve the demand of a limited resource.

Second, the emphasis on investments causes operations and maintenance to be overlooked, with the result that these investments often fail to fulfil its intended function for as long as was originally intended. The combined result is large-scale capital destruction. Many reports describe pollution control facilities that, once invested and constructed, have been shut down in order to avoid operating costs. In some cases this may qualify them for pollution levies, but usually these are too low even to motivate polluters to run operations.

The Environmental Levy System

This problem sheds light on a quirky aspect of the pollution levy system: the environmental administration that collects the fee through its environmental inspection is also financed by the same fees. Today, the environmental fees are the main source of financing for the environmental authorities. The authorities keep 20 percent of the revenue and use the remaining 80 percent to subsidise environmental investments. Alas, the EPB may actually be pleased to receive higher fees, while the polluter is pleased to see operations costs reduced, and no higher level of environmental authority is responsible to demand compliance.

So, what on paper may look like polluter-pays-principle is more of an administrative mechanism that transfers some money from polluters to EPBs, which then distributes some of this money back to the polluters in the form of subsidies for environmental investments. As a demand side management tool, the levies are far too low to stimulate a change of behaviour. The World Bank noted in one study that the air pollution levy translates into a value of life of urban residents of USD270.

Lack of Integration

It has become increasingly apparent that lack of integration and rivalries between ministries and agencies constitute a major obstacle to the introduction of sustainable systems. Problems of integration and co-operation between bureaucracies exist on every level of the Chinese society, horizontally as well as vertically. Chinese bureaucracies and localities are strongholds for special interests, and are also suspicious of any change that does not appear to be to their advantage. This works against co-operation for the sake of the public good.

4.6. Sector Policies

Water Policy

Water shortages and the unequal distribution of the existing scarce resources belong to the most serious future challenges facing China. The absence of coherent water policies and integrated water based planning on river basin level, however, mean that little is actually being done to improve the situation.

The distribution of water resources in river basins spanning several provinces is solved through negotiation of quotas, but upstream provinces are allegedly withdrawing more than their allotment, which leaves downstream users without water. River basin authorities exist for the larger river basins, but are not supplied with the powers to act against violators, and since there is no other institutional arrangement to curb withdrawals above quotas, upstream users continue to take as much as they can afford, the only limit being the cost for pumps and piping.

Traditionally, water policies have emphasised supply side management, and even now the solution to northern China's water scarcity is believed to be a giant water transfer from the Yangtze river basin. At the same time, very little is done to promote water conservation in the north by increasing prices to reflect even the cost of water supply.

Reports from the United States Embassy in Beijing web site state that water consumption could be cut by at least one quarter, but with little incentive to save water, why bother?

Until recently, water was a free-of-charge public good. Now farmers pay, although not on the basis of consumption but according to the irrigated area. Experiences from northern China show that if farmers are instead charged by volume, water consumption falls by the order of 20%, also when prices are kept artificially low. A typical water price in north China as of 1998 was CNY 0.031 per cubic meter, or the equivalent of 3 öre (SEK 0.03), which constitutes about 1/10 of the actual cost to supply the water.

The same situation applies to urban water supply and wastewater treatment; water fees are usually flat rate estimates and do not even cover the cost of operations.

The consequence, of course, is that consumers have little interest in saving water. Thus, there are no driving forces for a market for water saving appliances or the commercial recycling of water to develop. Campaigns have been launched to encourage companies to use recycled water instead of municipal water supply, but this has proved to be a diffcult task, as recycled water that carries its own cost is much more expensive than the subsidised municipal supply.

The combination of government decrees to municipalities to invest in environmental infrastructure, for example wastewater treatment, and the lack of opportunity for the municipality to cover operations costs through fees, let alone to recover investment costs, lead to what have been reported again and again: When the investments have been made and the utilities inaugurated, repeat unannounced visits will show that, most of the time, the utility is out of operation due to one reason or another.

Finally, to complicate the picture further, the water sector is one example of where the well-cemented institutional conflicts of interest between the five different agencies involved in water supply – the five-headed water dragon – must be resolved before water sector policies can be reformed to promote the water conscientious behaviour that China needs.

Agricultural Policy

Ever since the Mao era, an agricultural policy of self-sufficiency has prevailed in China. Since the mid-1990s, the Chinese government has shown increasing concern that grain production may not keep up with demand, as farmers have turned to agricultural production, for example fruits and vegetables, fish farming and livestock production, which is more profitable than food crop cultivation at government-set procurement prices. In order to tighten control over agricultural production and increase local food grain production on a short-term basis, the government launched the so-called grain bag policy, where provincial leaders had to sign a contract with the central government to boost grain output. First of all, this policy is founded on the misconception that water is abundant, since water is the main limiting factor for higher food grain yields. Secondly, it relies on additional inputs of fertiliser, pesticides and anything else that could bolster yields. In conclusion, the entire agricultural policy runs in opposition to any systematic approach for promoting a more environmentally sustainable and water efficient agricultural structure.

Many Chinese researchers argue that a sharp change in agricultural policies is the key to future water security in northern China. They maintain that this change should begin with the promotion of sustainable practices by transferring land ownership from the state to the farmers in order to encourage a long-term interest in a economically as well as environmentally sustainable agricultural production. Says one Chinese agricultural expert: Give the land to the farmers and they will find out how to make the best out of it.

In economic terms – as well as in environmental – it might make more sense to import land-extensive crops (such as wheat and rice) and to save China's scarce cropland for high-value export products, such as fruits, nuts, or vegetables.

Forestry Policy

Likewise, forestry policy has been supply side driven, with an emphasis on quotas for planting saplings, but without the attention and management needed to improve the chances for these saplings to one day become mature forests. The management of existing forests has also been weak, which was evident when illegal clear-cutting along the upper reaches of Yangtze river was blamed for the 1998 flooding.

With the present, post-flooding attention given to forestry, the main question seems to be just how quick reforestation can be achieved. Given China's water scarcity, it is uncertain whether or not reforestation is advisable in every location. Also, reforestation needs to be carefully planned not only with regard to the water situation, but also bearing in mind biodiversity issues.

Biodiversity

Goods and services provided by biodiversity are worth hundreds of billions of yuan to the Chinese economy each year. One global estimate is that nature's services are worth USD 33 trillion per year, of which China's share could be as much as USD 6 trillion per year. These benefits include the direct provision of food, medicine, timber, and other products, as well as watershed protection, nutrient cycling, carbon sequestration, and the numerous other processes of life upon which the productivity of the Chinese economy is based. Despite the role of biodiversity in improving air quality, conserving water, reducing the incidence and impact of floods, providing food, enhancing the longevity of dams, and increasing agricultural yields, insufficient investments are being made to enable biodiversity to continue providing these benefits. Instead, many sectors of the economy – both public and private – are gaining substantial economic benefits without paying a fair price for them. (CCICED, 1999)

The Industrial Dilemma

While the massive structural changes of China's economy are characterised by a shift from a command and control system to one increasingly reliant on market forces, the state still controls prices of basic products, raw materials are still heavily subsidised, and pollution fees are kept at a fraction of the real cost of polluting the environment. As a result, economically rational choices at the level of individual enterprises lead to excessively wasteful and polluting behaviour. It is in this context that TVEs have mushroomed in suburban and countryside areas, on one hand providing the engine for China's booming economy, with industrial growth rates that locally reached towards 30% in the late 1990s; on the other hand pushing the environment towards local and regional catastrophes.

Chinese industries are twice to 10 times more polluting or resource intensive per unit of output than comparable industries in developed countries. Environmental performance varies from TVEs and smaller county level SOEs (state owned enterprises) that are the most polluting, to joint ventures and private companies that perform better. The lack of performance is largely the result of an evil chain of structural imperfections that hinders the introduction of practices that would save both money and the environment.

First, people in general, but also factory staff, are ignorant of the cause and effect of environmental problems. Moreover, most polluters in China lack knowledge of how to best pollute less. The last 10–20 years have seen a tremendous advance in environmentally friendly technologies, but the knowledge of these is scarce among Chinese industries, particularly the TVEs. Development co-operation financed projects that have provided free of charge extension services to TVEs on low cost options for clean production have shown that the fundamental lack of environmental awareness is at the root of most TVE managers' failure to take measures to reduce environmental impacts, even if this would arguably prove a profitable investment.

Second, the artificially low prices of raw materials, energy and water, in combination with pollution fees and penalties that are too low to make any notable difference, make it economically unjustifiable for any factory management to make the necessary investments, even if they did possess knowledge of the appropriate, environmentally friendly technology or practice.

Third, even if a factory were willing to take on the extra cost of making an environmentally proper investment, economically feasible or not, it is difficult for them to raise the funds needed. Credit is one of many resources in short supply in China. There is also – particularly among SOEs – a conflict between long-term goals, which may involve more efficient and thereby also more environmentally friendly production, and short-term priorities to raise funds to pay salaries.

Energy

China is the third largest country in terms of the energy consumption in the world at present. The continuing economic growth will inevitably increase future energy consumption. It is estimated that the primary energy demand by the middle of next century will rise to four-fold of the current level.

To fuel the rapid economic growth and improve the living standard of Chinese residents, China's energy consumption has more than doubled since 1980. It rose to 1.4 billion TCE in 1996, 230 per cent higher than that of 1980. China has replaced Russia as the world's second largest energy consumer, just behind the USA. From 1980 to 1996, per capita energy consumption nearly doubled and rose to 1.14 TCE. Though this level is much lower than in OECD countries, the rising trend will continue in the future.

The primary energy consumption structure remains coal dominated. From 1980 to 1996, coal accounted for more than 70 per cent of the total energy consumption. Oil dropped from 20.7 per cent to 17.5 per cent and natural gas declined from 3.1 per cent to 1.6 per cent. Hydroelectricity, however, rose from 4.0 per cent to 5.9 per cent. Rather than decline, the total share of coal in the primary energy consumption rose to 75 per cent in 1996, more than two per cent points higher than its 1980 share.

Transportation

China has had an under-dimensioned transportation system, with comparatively little road transport, and the Chinese travel on average one fortieth of the distance of Americans (Long, 1992). Under the slogan 'yao xiang fu, xian xiu lu' (meaning: in order to get rich, roads first have to be constructed) China is presently investing heavily in improving the road transportation network. Traffic planners cannot construct new roads fast enough to meet the demand from a constantly increasing vehicle fleet, at the same time as car exhausts are now challenging the energy sector as the major air quality problem in Chinese cities.

From 1986 to 1999 Beijing's fleet increased five times from 260,000 to 1.5 million, and although this is far below the number of vehicles in equal size mega cities in the West, traffic induced pollution in Beijing is even worse. China as a whole counts about ten times the number of vehicles in Beijing, up six times over the last 15 years. Despite central and local governments' attempts to stop the development of South-East Asia style motor-biking in China, there are today about 40 millions of motor-bikes, a number that is increasing fast, with 15 millions bikes produced every year, some of them, though, for export sale.

Again, transport policies show the same inclination towards supplying more roads in order to solve a traffic situation that is swamping Chinese cities with excessively polluting and honking cars, wrapping these cities in a congestion that is getting worse every month. Says a centrally positioned urban air pollution expert: The government thinks that it mitigates the air pollution situation by building more roads – it does not understand that this will only make things worse, let alone decrease transportation efficiency. What is needed are alternative transport strategies.

4.7. International Co-operation

The Government of China (GOC), which ratified the Montreal Protocol on Substances that Deplete the Ozone Layer in June 1991, aimed to cap ODS consumption at the 1991 levels by the end of 1996, with a gradual phase-out from that point until total elimination is achieved sometime between 2005 and 2010. With assistance from the Multilateral Fund for the Implementation of the Montreal Protocol (MFMP) and its implementing agencies, China has developed a broad country program for achieving such a phase-out, including a focus on policy initiatives, such as supply regulation and taxes, and an effective institutional framework for their implementation.

The issue of greenhouse gases is handled on the global level by the IPCC through the Climate Convention; and the issue of ozone-depleting substances by the Montreal Protocol – both with China as signing party and member.

4.8. Trends

Environmental Awareness and Public Participation on the Rise

Awareness of environmental problems and the notion that the present development path may not be sustainable are new concepts to the broader Chinese public. But the issue of environment and development has received more and more attention during the 1990s, driven, of course, by the reduced numbers of urban blue-sky days, waterways turning into stinking puddles, suburban garbage dumps, maddening day-and-night noise from construction sites, and a number of other all too visible expressions of a degraded environment. Complaints filed by the Chinese public to local EPBs are increasing, the most common reason being disturbing noise. Big, environmentally related issues, such as the floodings that hit large parts of eastern China in the summer of 1998, have helped to raise attention to the value of forests and biodiversity.

Yet, equally important has been a social climate where public debate is not only allowed, but even encouraged. Media has certainly sensed the conducive atmosphere, and one can hardly open a Chinese newspaper today without finding at least one article on an environmental issue. However, these articles more often describe the action that has been taken to curb pollution, rather than disclosing violation of environmental laws or environmental health risks. But this could be changing. Recent news stories in Beijing Science and Technology News, Xiamen Evening News, and the China Central Television all focus on the health impact of pollution. Other critical news reports during the last year have covered the emerging problem of sick houses that follow in the wake of the construction boom. In particular, the emergence of talk-shows on Chinese television, where a critical audience of common people debates with representatives for public authorities such as SEPA, indicate a trend in which the media is increasingly assuming the role of arbiter and protector of consumer and public rights.

Today, public participation is even beginning to be encouraged by the government as a way to allow the public develop their role as watchdogs. Qu Geping, the influential chairman of NPC's Environmental and Natural Resources Committee and former NEPA head, has stated that public participation in project approval, as well as consumer and investor preferences in favour of clean products and enterprises, will be promoted. One reason for this is that the central authorities have begun to view an articulate, knowledgeable population as a necessary and efficient regulatory tool to strengthen the government's reach into provinces and counties – the level where most violations of environmental laws and regulations actually takes place.

The Emergence of Environmentally Economic Behaviour

During the 1990s, a gradual change has steered China's course away from the planned economy's reliance on state investments as the main tool for development and growth, to one where market forces play an increasingly central role. This is not to say that China is a full-fledged market economy quite yet – the government still largely controls the prices

of important basic resources such as energy and water – but the notion that government should not control investments, but rather set the rules and care for their implementation, has come into focus, in particular after premiere Zhu Rongji initiated his far-reaching reforms of the central government in 1998.

At the same time, China has been reminded of the high cost for decades of negligence in caring for environment during its bold push for economic growth, a fact that became apparent during the 1998 floodings. That there are environmental constraints that may well reduce the potential for further economic development and even threaten social stability has been a major issue this spring, as the Miyun Reservoir – the main water supply for Beijing – has reached an all-time-low. At the same time, the capital has suffered a number of sandstorms that are explained partly by ecological destruction in the upland areas.

With extremely high, increasing pressures on air and water resources, particularly in the urbanisation process that is fundamentally changing Chinese society, there are still immense needs for investments in environmental public utilities such as water, sanitation, solid waste management, and environmentally friendly energy. Until recently, these kinds of utilities have been financed by the government, which explains the very slow pace of construction. There is now both an understanding and a readiness to move to a system where public utilities are financed through fees.

The Chinese leadership is increasingly aware that environmental problems cannot be solved by government investments and subsidies, but that an environmentally economic behaviour instead must be promoted by prices that reflect the scarcity of resources and the cost of environmental damage. This indicates an important shift of paradigm from supply side to demand side management. Now comes the hard part: translating the new formula into action.

This raises at least two important questions. The first is the challenge to develop institutional structures and governance to function in support of demand side management. New ideas such as a government that sets the rules and monitors compliance and implementation, in contrast to the direct involvement of the past, take some adjusting to for a system used to a government that ran just about everything. In addition, a change will mean that individual government officials, as well as departments and entire bureaucracies, are bound to lose power, influence and privilege.

The second question is how to do it. There are many theories about how to deal with market failures in an ideal world of a free and optimal market, where rational choices are based on unlimited information. But that place is not China, and will not be so for quite a number of years. So the question remains: how to do it, step by step. In this respect, one limiting factor is the lack of people trained in environmental economies. Another problem concerns the lack of access to solid information.

5. Sida Financed Environmental Co-operation with China

Sino-Swedish Environmental Co-operation with financial support from Sida starts from areas where China expresses a wish for co-operation and where Swedish firms, agencies, educational and research institutions, and NGOs have genuine and sound knowledge and capacity.

The Swedish development co-operation with China was initiated in 1979 and environment soon became one of its main components. Traditionally, environmental co-operation projects have focused on environmental technologies, mainly end-of-pipe solutions, such as wastewater treatment. Increasingly, however, the desire for sustainable development has been addressed in Chinese proposals for environmental co-operation.

What China needs is knowledge of how to build a sustainable society, and the understanding that proper environmental investments – in infrastructure as well as in business – are in fact profitable, not only in the very long perspective but mostly also in a perspective short enough to make private investors happy. China is confronted by questions of how to formulate effective environmental policies under market economy conditions, how to build long-term financing for environmental investments, and how cost-efficient environmental investments must be founded on a systems approach. And, of course, China needs environmental technology, the right kind of technology.

As a source of investment, Sweden's co-operation with China will never be anything but minute in relation to China's immense needs. Solutions to China's environmental problems have to develop in China based on indigenous initiative. What Swedish co-operation can contribute is capacity development – experience in, methods for, and approaches to sustainable development.

Sweden's co-operation with China should look for the acupuncture points--well-aimed activities of high demonstration value which may stimulate sustainable practices and their dissemination on a national level.

5.1. Impact of Co-operation 1997–2000

The Country Strategy Paper for the co-operation period 1997 – 2000 identified environment, human rights, and gender equality as principal areas of co-operation. Projects with environmental focus made up about one quarter of the total number of just over 100 projects during the period, accounting for SEK 40 million out of a total disbursement volume of SEK 167 million.

Several evaluations have been carried out during the period. However, no specific environmental impact assessment of the whole project portfolio has been made. With an absolute majority of the projects aiming at transfer of knowledge, direct environmental impacts are likely to have been minor, with travelling and transports accounting for the most obvious negative environmental impact. Yet, very few, if any, of the projects have had particular environmental conditions as part of the term of reference, and a lot can be done to improve contribution to sustainable development of the whole project portfolio.

The projects with a particular environmental focus have included knowledge transfer, concessionary credits, and dialogue on strategic environmental issues. By and large, Chinese parties have been very positive to the co-operation. During the period, Sida has financed a temporary environmental adviser position with the Embassy in Beijing, which has resulted in a deepened dialogue on environmental and sustainable development issues, and broadened contacts with organisations and individuals active in the field of environment and development in China.

Also, projects with environmental focus require environmental impact assessments as part of the project preparation process. A thorough evaluation of the soft credit support to the water and wastewater sector shows that most targets were met in all of the nine projects that were evaluated. At the same time, the evaluation reveals that the basic assumptions for these water and wastewater projects generally overstated the investment needs, with the result that money has been spent on unnecessary overcapacity. Other studies show how environmentally benign projects such as garbage collection and

wastewater treatment may have negative environmental impacts on the locations where waste residuals are disposed of, if issues that have an impact on the sustainability of projects are not considered early in the project cycle.

One major conclusion is that the systems context and policy implications of the evaluated projects need to be better considered during preparation and implementation. By using strategic environmental impact assessments to target specific sectors, such as solid waste management, a framework of general policy level criteria could be generated in order to avoid unintended negative impacts.

5.2. Future Environmental Co-operation with China

Sida proposes that the main objectives for the development co-operation with China during the period 2001–2005 shall be to support the introduction and dissemination in China of novel ideas that may expedite the reform process and promote

- human rights, legal development and democratisation;
- gender equality and social safety; and
- an environmentally sustainable development.

Why Environmental Co-operation with China?

China is a huge country with a large, fast growing population and a considerable economic potential. The environmental problems of China are enormous, and some of them are global in nature.

Many good pronouncements to the contrary, environmental concerns in China still take a back seat in relation to the overriding goal of economic growth. During recent years, however, political leaders have become increasingly aware of the economic cost of environmental degradation and its potentially destabilising effects.

The Swedish Asia Strategy constitutes the foundation for Sweden's future collaboration with the Asian countries, and identifies China as one of the most important co-operation countries. The Asia Strategy also recognises the environment as a central theme, in particular in the co-operation with China.

With reference to the Asia Strategy and the account of China's environmental predicament presented in this report, there are many good reasons for future Swedish environmental co-operation with China:

- China is a developing country in search of a formula for sustainable development, where Swedish knowledge and experience may provide momentum by supporting key strategic areas.
- Global repercussions from the Chinese environmental dilemma may not only be felt as pollution or impact from traded products. Instead secondary impacts from a deteriorating environmental situation within China may prove an even bigger global concern, for example, rising international food prices, or large-scale migration from a China that cannot support its population. Sweden, thus, has an environmental self-interest in helping to improve the Chinese environment, because of the role that China plays in the global environmental context.
- Development co-operation through Sida, although minute in relation to China's massive needs, still has the catalytic capacity of identifying strategic pathways to sustainable solutions that build on Swedish knowledge, and thereby help to lay the ground for market based co-operation by adding a strategic edge to Swedish solutions.
- Environmental co-operation provides a road to broader public participation in areas of common concern.
- In spite of the growing economy, funds are not always available in China for strategically important environmental projects. External finance will add important incremental capacity.

- Experience shows that assistance in strategic environmental issues, practices and policy, although still on the margin, can have a good multiplier effect. This is underlined by China's serious want of personnel with proper education and training.
- Projects are likely to have high success rate for all parties involved. Swedish and other donors' experiences give China high marks for efficiency in implementation of bi- and multilateral assistance.
- Sweden could learn from such co-operation since the two countries could mutually develop concepts and approaches to sustainable development.

Sida's Role in Sino-Swedish Environmental Co-operation

The role of Swedish environmental co-operation through Sida is that of a catalyst for fostering sustainable development practices in China, and for establishing long-term relations for sustainable development between Sweden and China.

In terms of environmental co-operation, Sida is concerned that projects, which receive Sida support, are strategically important, that projects are developed and managed with high qualitative standards, and that results are disseminated to ensure high long-term effectiveness. Moreover, Sida has to guarantee that all projects in themselves are environmentally sustainable, and promote human rights, gender equality, and an equitable development.

Impacts of environmental deterioration could be felt anywhere and by anyone, also far away from the source of the problem. Yet, it is the poor that are first and foremost subjected to its most adverse effects. Environmental degradation also leads to poverty. Sida's engagement to support sustainable development in China includes finding ways out of environmentally induced poverty.

Aware of the fact that development needs to be sustainable in terms of both economy and ecology, it is in Sida's interest to actively support co-ordination between government agencies, business, NGOs, and the research community in order to build networks of people and organisations that are working actively for China's sustainable development.

Moving Upstream towards the Source of the Problem

From preponderance on end-of-pipe solutions, Swedish environmental co-operation with China should move upstream towards addressing problems at the source.

The source of China's environmental predicament – population pressure that leads to over-utilisation of scarce resources and very limited room for more pollutants – will not be mitigated by ever so high investments. Sustainable development is not mainly about technology and investments; it is primarily about creating and promoting the conditions from which economically as well as ecologically sound communities may grow, firmly based on the principle that prevention is better than cure. Sound technology – for example investments in energy efficient technology – is, of course, needed, but it is the driving forces for a sustainable development that are paramount.

Moving upstream means also to introduce Swedish knowledge at an earlier stage in the Chinese process of identifying problems, designing solutions, and taking action. With an environmental co-operation where Sida supports the early stages in the process, a strategic edge is added and Swedish environmental knowledge will be well positioned to engage in commercially based co-operation.

Chinese Proposals Constitute the Basis for Co-operation

Swedish development co-operation with China is based on project proposals that Sida receives from Chinese organisations through the Swedish Embassy in Beijing. The Ministry of Foreign Trade and Economic Co-operation (MOFTEC) and the Ministry of Finance (MOF) are responsible for co-ordination and project appraisal on the Chinese side before proposals are submitted to the Swedish Embassy.

The reform process in China has allowed research institutes, which used to be closely connected to the central and provincial governments, a more independent position and

more freedom to express views and opinions on environmental issues. At the same time, the need for qualified environmental knowledge has created a market for environmental services. With growing environmental awareness, a locally based environmental movement is on the rise. This necessarily creates a somewhat new context for development co-operation with Chinese institutes and organisations, and Sida should as far as possible pursue a users perspective that builds on public participation.

Focus on Driving Forces for Sustainable Development

Swedish development co-operation with China emphasises prevention rather than clean up, with the driving forces for sustainable development at the centre of the co-operation strategy. The following strategic and subject matter areas should constitute priority areas for Swedish support.

Strategic areas of particular interest include:

- environmental awareness, education, and training, with special attention towards political and administrative leaders, and business community;
- development and demonstration of policies, laws and regulation that support sustainable development;
- promotion of environmental economic thinking;
- environmental journalism;
- environmental aspects of trade, (e.g. eco-labelling and consumers interests); and
- environmental health effects.

Initiatives that integrate environmental issues with aspects of human rights, equity and gender should receive special attention, for example as co-operation through NGOs.

Subject matter issues central to China's development process, rather than environmental technology areas, provide the core for projects selection. Priority subject matter areas for Swedish development co-operation with China are:

- development and demonstration of local Agenda 21 projects;
- environmental information, including indicator development, data quality, and information dissemination;
- integrated river basin management;
- integrated water and waste water solutions for towns and small cities focusing on easy, low cost operation, and demand side management;
- sustainable forestry, with particular attention to biodiversity;
- solid waste management with a systems approach focusing waste minimisation and recycling;
- promotion of renewable energy;
- energy efficiency with focus on demand side management;
- environmentally friendly public transport management.

Demonstration of Strategic Technology

Projects that build on environmental technology should always aim firstly at demonstrating a sustainable solution where the technology is one important component, rather than just demonstrating the technology itself. In addition, such projects should always take a systems approach, and put the technology into a sustainable development context by including an assessment of major obstacles for successful technology introduction, and by making proposals for how to improve the introduction.

Forms of Co-operation

It is the projects' criteria of and the nature of problems to be solved that constitute the starting point for identification of a suitable co-operation form. Different types of projects require different forms of co-operation.

Studies and investigations are typically used in the early phases of environmental undertakings to investigate problems and opportunities, to set targets and objectives, identify main components, and evaluate different options. For example, a Chinese party planning a study or investigation would like to strengthen the project by involving a Swedish party. In this case, Sida may offer the Chinese party support by carrying the costs for contracting a Swedish co-operation party. In addition to the works carried out by the Swedish party, support from Sida may cover also training of Chinese experts.

Training is a common component in development co-operation projects, such as capacity building, and studies, but training may also be implemented as separate projects. Sida's International Training Programme contains a number of courses in the field of environment and sustainable development. Sida may also support tailor made training programmes to be run in collaboration between Chinese and Swedish parties, such as academic institutions.

Sida does not maintain any special *research programmes* in China. Research activities where both parties cover their own costs may, however, be considered. Sida is also considering support to regional research initiatives in Asia, where Chinese institutions may take part.

Capacity development covers a wide area of different activities. The common purpose is to enable people to carry out development processes successfully by empowering them through, for example, strengthened institutions, reformed markets, and human resource development. Capacity development is usually built around a package of concerted activities, such as studies, training, and demonstration, and requires flexible use of co-operation forms. Initially, Sida may support project identification for capacity building by offering the Chinese party Swedish consultancy assistance.

CCICED is an important forum for *policy dialogue*. Sida may support policy demonstration projects within thematic priority areas channelled through the CCICED secretariat.

Sida may provide *concessionary credits* on various conditions to cover investment needs in projects that demonstrate innovative solutions for sustainable development. As a first step for credit financing, Sida may take a positive view to supply financing for pre-feasibility and feasibility level studies.

Sida may support minor projects for production of *environmental information and outreach*, arrangement of seminars, and conferences, particularly in connection with other Sino-Swedish co-operation.

Sida may support *environmental initiatives on a regional basis* that strengthens regional co-operation by involving participants from several countries in the region.

Sida may support projects under *international environmental conventions*.

Multilateral agencies such as the World Bank, the Asian Development Bank, and UNDP have access to Swedish funds that may be used to contract Swedish consultants in, for example, pre-feasibility and feasibility studies.

Improving Quality

Quality adheres to project implementation, but also to the Swedish co-operation with China as a whole. Sida pursues high quality in the selection of projects, as well as in the different steps of the project process.

The following criteria should guide the evaluation of project proposals:

- Projects should fall within the thematic areas described above.
- Projects should be of strategic importance for China's sustainable development.
- Sweden should have requisite expertise and a broad resource base in the problem area.
- Projects should have a preventive approach to environmental problems and priority should be given to projects that address irreversible environmental problems.
- Dissemination should be a central component.

- Cost sharing from Chinese financiers is required as a means to ensure that projects enjoy high priority from Chinese side.

Experience shows that the *Logical Framework Approach (LFA)* provides a good way to improve quality and success rate, save money, time and energy. LFA should be applied as a means to give a life cycle perspective on project management and support quality assurance of all projects, and LFA facilitation should be offered to Chinese parties to support development of Project Proposals. A Chinese translation of NORADs LFA handbook is obtainable through the Embassy of Sweden in Beijing.

As a financier, Sida is required to make sure that *Environmental Impact Assessment (EIA)* is performed of all projects, including environmental projects prior to a financing decision. In order to guide financing decisions for support to sectors, such as solid waste management, Sida may be well served by carrying out strategic environmental impact assessments.

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