CHAPTER 7:
North-East Asia

The North-East Asia subregion comprises China, the Democratic People's Republic of Korea, Japan, Mongolia, the Republic of Korea and the Russian Federation.[1] The area covers a rich array of diverse ecosystems, from permafrost deserts in Mongolia and the Russian Federation to subtropical islands in southern Japan. However, a large proportion of the land is still subject to desertification or lies in arid regions, substantially reducing its carrying capacity.

The North-East Asian countries have made some progress in protecting subregional environmental resources. Key environmental indicators have shown a reversal of forest losses, increased areas under protection for conservation purposes, and significant improvements in air quality in several cities. The consumption of ozone-depleting substances has also declined significantly. However, industrialization, urbanization, and unsustainable patterns of consumption are the source of significant environmental pressure. The wealthier countries and China are globally important buyers of several environmentally-sensitive commodities such as minerals, wood products, and agricultural and fishery products. The expanding use of energy for the processing of these commodities, in addition to its expanding use in the transport sector, have been cited as the source of pollution and greenhouse gas emissions. The economies of the Russian Federation and Mongolia are still significantly dependent on supplying environmentally-sensitive commodities. The Democratic People's Republic of Korea's environmental situation, as recently described by UNEP,[2] has shown that despite its limited economic activity and substantial resource base, the country still faces challenges common to other developing countries. Among these, aging and inadequate infrastructure are quoted as factors threatening human health in rapidly urbanizing Mongolia and the Democratic People's Republic of Korea.

Despite the high levels of environmental pressure and limited environmental carrying capacity that characterizes this subregion, there is strong justification for taking an optimistic view of North-East Asia's future. The subregion has distinguished itself by having established innovative policy frameworks to move beyond pollution control towards improving the environmental sustainability of production and consumption patterns. Japan, in its launch of the 3R initiative in March 2005 has extended the promise of a sustainable future to the world. Subregional cooperation, though centred very much around transboundary environmental issues such as protection of marine environments and air pollution, is strong and still growing. These cooperation frameworks have presented substantial scope for action to promote more environmentally sustainable patterns of economic growth.

7.1 The economy

The North-East Asian economies vary in size from among the smallest in the region, as in the case of Mongolia, to the largest, that is Japan. While Japan recorded some of the lowest economic growth rates in the subregion in the late 1990s, its per capita GDP is roughly 77 times higher than that of Mongolia. With annual GDP growth rates averaging 9.7 per cent from 1991 to 2003, China has become one of the largest and fastest-growing economies in the world. Three of the four "original" newly industrialized Asian economies, Hong Kong, China; Taiwan Province of China; and the Republic of Korea, are also in the subregion. The main economic indicators are shown in table 7.1.

China, Mongolia and the Russian Federation have been transitioning to market-based economies. The presence of China as an emerging industrial power helped facilitate a faster than expected recovery from the Asian financial crisis and global economic slowdowns of the late 1990s and early 2000s.

A large segment of the workforce in Japan, the Republic of Korea and the Russian Federation are employed by the services sector, which also contributes the highest proportion of GDP. In China, as in many countries of the region, agriculture employs the majority of the working population. FDI as a per cent of GDP has increased in the past decade, a trend spearheaded in China. While China attracts the largest amounts of FDI, Mongolia receives the highest FDI as a proportion of its GDP.

Growth in annual household consumption expenditure in China and the Republic of Korea averaged almost eight and nine per cent respectively in the 1990s; growth in world household consumption expenditure averaged only 3.3 per cent per annum during this period.[3] Expanding consumption in these countries fuelled the demand for energy, water, and raw and semi-processed materials, including environmentally-sensitive commodities and the growth in waste. In Mongolia and the Russian Federation, mineral products,

Table 7.1 Economic indicators: North-East Asia

		China	DPR Korea	Japan	Mongolia	Rep. of Korea	Russian Federation
GDP growth rate, % per annum (1999-2003)		8.3	-	0.9	2.8	5.6	6.8
GNI per capita US$ (2003)		1 086	494	34 396	472	10 976	2 999
Consumer Price Index change, % per annum (1999-2003)		0.3	-	-0.65	5.92	3.15	17.88
Unemployment rate, % (2003)		4.3	-	5.3	14.2	3.4	-
Merchandise trade, billion US$ (2003)	Exports	438.23	-	472	0.62	193.82	133.72
	Imports	412.76	-	383.45	0.8	178.83	57.42
Total debt/GNI (2003)		0.14	-	-	1.01	0.30	0.49[a]
ODA received, million US$ (2003)		1 324.59	167	-	247.14	-457.73	1 254.82
Foreign direct investment, net inflows, million US$ (2003)		53 510	-	6 238	132	100	7 958
Structure of GDP, % of GDP (2003)	Agriculture	15	-	1	28	3	5
	Industry	52	-	31	15	35	34
	Services	33	-	68	57	62	61

Source: Federal Service of State Statistics (2004). Russian Statistical Yearbook, 2003.
Other sources: See Annex V.

Notes:
[a] Data for 2001

including oil and gas, made up 64 and 44 per cent respectively of each country's total merchandise exports in 2002.[4] Energy use declined between 1990 and 2001 in the Democratic People's Republic of Korea and the Russian Federation in line with economic contraction in this period.[5]

China is one of the world's most important traders in wood products, with most wood imported for construction, wood pulp, or used by the furniture industry. In the past decades China's economic growth was supported by large-scale deforestation; the lower parts of the Yangtze watershed area lost most of its forest cover to intensive agriculture, timber and fuel supply activity, and the production of non-wood forest products. This loss has exacerbated the impact of annual floods. The value of forest product exports from the Russian Federation, consisting primarily of industrial round-wood and semi-processed material such as sawn-wood increased by almost 60 per cent between 1995 and 2004.[6] China has increasingly imported wood from the Russian Federation's Siberian forests for timber.

Agricultural intensification has allowed these countries to improve the nutritional status of their populations and boosted export earnings, but is also a source of significant environmental pressure. China, Japan and the Republic of Korea have among the highest rates of fertilizer applications per hectare of agricultural land in Asia and the Pacific. Improper use of agro-chemicals has been a crucial cause of pollution and land degradation. As in many countries, fertilizer use has been subsidized in both China and Japan. At the same time, both countries are recognized as global leaders in environmentally-sustainable agricultural innovation. In Mongolia, the environmental pressure comes from a different type of agricultural activity: the production of luxury fleece for high-income consumers. Overgrazed lands have become sites of accelerated desertification processes which have contributed to the increasing frequency and intensity of dust and sandstorms. Mongolia's ongoing transition to a market economy has been described as a framework for political and economic changes that "increased the utilization and exploitation of Mongolia's natural resources ... which in turn entailed negative consequences for the environment."[7] Despite its negligible contribution to the global agriculture market, Mongolia is currently the only net exporter of agricultural products. Most years, Japan has been self-sufficient in rice production, but highly dependent on imports of other foods. China and the Republic of Korea also depend on food imports, but to a lesser extent. Economic hardship and drought has affected the Democratic People's Republic of Korea, debilitating its agricultural sector.

The subregion is responsible for approximately 40 per cent of regional fish and fish product exports, yet it remains a net importer of these products, as a result of the importance of fish in the diet of North-East Asian people. China accounts for more than one-half of the global aquaculture production, and about one-eighth of global fish consumption. Conversion of agricultural land into aquaculture ponds has been restricted for environmental reasons.

7.2 Social development

The population of North-East Asian countries is predicted to increase from 1.6 billion in 2000 to 1.8 billion by 2030, peaking between 2025 and 2030.[8] Population growth in China has slowed. Preceded by Japan, China and the Republic of Korea are expected to face major challenges in the coming decades, due to their aging population. As elsewhere in the region, economic growth is supporting poverty reduction efforts. In China, the proportion of people living in poverty dropped from 33 to 16 per cent, and the total number of poor decreased by 186 million. However, indicators such as life expectancy at birth, under-five mortality rate and the proportion of the population with dietary energy supply below the minimum energy requirement, still leave considerable room for improvement in China, the Democratic People's Republic of Korea, Mongolia, and to some extent, the Russian Federation (Table 7.2).

Some 48 per cent of North-East Asia's population lives in cities. Urban population growth rates are exceeding overall population growth rates, and changing North-East Asian societies. The fastest growing urban populations are in China and

Mongolia with urban population growth rates of 3.2 and 1.4 per cent per year respectively.[9] Nowhere are the impacts of the urbanization phenomena more evident than in China, where labour migration linked to industrialization has become the driving force for urbanization processes. Infrastructure and housing development have been hard-pressed to keep up with urban population growth rates, and urban migrants have been forced to live in slums lacking access to improved water and sanitation facilities. Residents of Ulaanbaatar, Mongolia are facing similar problems.

The Gender-related Development Index and key indicators have shown improvement in gender equality in most countries. Reflecting the subregion's status as a global centre for ICT innovation, access to these technologies has been among the highest worldwide, in Japan and the Republic of Korea. This has contributed substantially to improved access to environmental information and by consequence, stakeholder participation in policy development and implementation.

7.3 Environmental and sustainable development conditions and trends

The North-East Asian countries have made some progress in protecting subregional environmental resources. Environmental indicators show a reversal of forest losses, increased areas under protection for conservation purposes, and significant improvements in air quality with respect to SO_2 concentrations in several cities. The consumption of ozone-depleting

Table 7.2 Social indicators: North-East Asia

		China	DPR Korea	Japan	Mongolia	Rep. of Korea	Russian Federation
Population	Total population, thousands (2005 estimate)	1 315 844	22 488	128 085	2 646	47 817	143 202
	Population growth, % (2004-2005)	0.6	0.5	0.1	1.2	0.5	-0.5
	Urban population, % of total (2003)	38.6	61.1	65.4	56.7	80.3	73.3
	Slum population, % of urban (2001)	37.8	0.7	6.3	64.9	37	5.6
Human Development Index (2002)		0.75	-	0.94	0.67	0.89	0.80
Primary school enrollment rate, % (2001)		94.6	-	100	86.6	99.9	-
Population below US$1 (1993 PPP) per day consumption, % (1990-2002)		17[b]	-	-	27[a]	2[a]	2[c]
Life expectancy at birth, years (2002)		70.9	-	81.5	63.7	75.4	66.7
Under-five mortality rate, per 1,000 live births (2003)		37	55	4	68	5	21
Population with dietary energy supply below minimum requirement, % (2000-2002)		11	36	-	28	<2.5	4
Access to an improved water source, % of population (2002)		77	100	100	62	92	96
Gender-related Development Index (2001)		0.74	-	0.93	0.66	0.88	0.79
Digital Access Index (2002)		0.43	0	0.75	0	0.82	0.5

Source: See Annex V.

Notes: [a] 1998
[b] 2001
[c] 2002

substances has declined significantly with CFC consumption down by almost 100 per cent from 1995, as compared with a global decrease of approximately 70 per cent in the same period.

Comprehensive environmental initiatives have included national strategies and action plans for sustainable development such as China's *Tenth Five-Year Plan for National Economic and Social Development (2001-2005)*, Mongolia's *National Action Programme for Sustainable Development for the 21st Century (MAP-21)* adopted in 1998 and the Republic of Korea's *Green Vision 21 (1995-2005)* and *National Environmental Vision for the New Millennium.* Japan amended the *Basic Environment Plan* in 2000 and has initiated several new policy frameworks aimed at reducing the resource-use intensity and waste production.

Institutional and legislative frameworks have also been augmented. The National Environmental Protection Agency of China was upgraded from a sub-ministry to a ministry and renamed the State Environmental Protection Administration in 1998. Similarly, the Environmental Agency of Japan was upgraded to the Ministry of the Environment in 2001. Laws and acts addressing a wide range of environmental issues have been adopted or strengthened in each country.

However, the push for economic growth, high and rising incomes, urbanization, changing lifestyles and relatively high energy intensities in some countries,[10] have been symptomatic of declining environmental sustainability and increasing pressure on the natural environment. The Democratic People's Republic of Korea, Mongolia and the Russian Federation have been additionally burdened with outdated technologies and narrow economic bases. This pressure has been reflected in the persistence of urban air pollution related to transportation emissions, acid rain, the increasing frequency of dust and sandstorms, stressed freshwater systems and biodiversity loss, and the impacts of climate change.

Table 7.3 Environmental indicators: North-East Asia

		China	DPR Korea	Japan	Mongolia	Rep. of Korea	Russian Federation
Protected areas, % of land area	2004	15	2	9	14	4	9
Forest area, % of land area	1990	15.6	68.2	63.9	7.2	63.8	50.3
	2000	17.5	68.2	64.0	6.8	63.3	50.4
Land use, % (2002)	Arable and permanent crops	17	22	13	1	19	7
	Permanent pasture	43	0	1	83	1	5
Renewable water resources, m^3/capita/year	2003-2007	2 142	3 387	3 365	13 232	1 454	31 653
Water withdrawal, m^3/capita/year	1998-2002	484	400	694	172	392	532
Threatened species, numbers (2004)	Animals	330	41	193	39	55	144
	Plants	443	3	12	0	0	7
Access to improved sanitation, % of population	1990	23	-	100	-	-	87
	2002	44	59	100	59	-	87
Energy intensity, energy supply (kg of oil equivalent) per US$1,000(PPP) GDP	2002	219	-	157	-	258	537

Source: See Annex V.

7.3.1 Energy and climate change

Total subregional energy use increased by over 10 per cent between 1990 and 2001, more than doubling in the Republic of Korea and increasing by some 31 per cent in China (Table 7.4). Energy intensities increased marginally in the Republic of Korea from 1990 to 2002, while China's energy intensity dropped by 50 per cent over the same time period. The Russian Federation's energy intensity in 2002 was one of the highest in the subregion, and was almost equivalent to China's 1990 energy intensity.

China, the Russian Federation, Japan, and the Republic of Korea have been ranked in the top 10 emitters of CO_2 among Annex I and non-Annex I Parties to the United Nations Framework Convention on Climate Change. Their total emissions accounted for approximately 26 per cent of the world total in 2001,[11] with more than half of total emissions being attributed to the generation of public electricity (Table 7.5). The producer of the most CO_2 in the subregion, China (Figure 7.1), has taken significant steps to increase use of natural gas and decrease economic reliance on heavy industry. These efforts have reduced CO_2 emissions from industry (Figure 7.2). Public electricity continues to be a major source of CO_2 emissions and the transportation sector's contribution to the total emissions of CO_2 is rapidly growing (Figure 7.3).

Apart from Japan and the Republic of Korea, the countries of the subregion suffer from energy supply shortages reflecting both economic and infrastructural limitations. Continued high dependence on imported fossil fuels, rising energy prices and relatively inefficient energy use have conspired to increase the vulnerability and decrease the environmental sustainability of these economies. A programme launched in China in June 2005 aims at reducing energy consumption by nearly 19 million tonnes of coal equivalent, in its first three-year phase. The US$80 million project is co-funded by the GEF, the Government of China and the private sector. While the most urgent priority of China, the Democratic People's Republic of Korea, Mongolia and the Russian Federation is improving the efficiency of energy use in the short term, renewable energy, in particular, new renewables such as solar and wind energy, are increasingly being explored as a long-term solution.

China has the highest diffusion of renewable energy use in the subregion (Figure 7.3), partly a reflection of an energy policy agenda which identifies a target of installed capacity of renewable energy (defined by its *Law of Renewable Energy* as including wind, solar, biomass, geothermal and oceanic energy) of 12 per cent of installed power generation capacity by 2020. The traditional use of biomass as a fuel source in rural areas of China also continues to account for a high share of renewable energy use compared to other countries in North-East Asia. China's direct investment in renewable energy promotion is about 2.5 billion RMB or US$300

Table 7.4 Total energy use: North-East Asia

	Energy use ('000 metric tons oil equivalent)		Energy use per capita (kg oil equivalent)	
	2001	% change 1990-2001	1990	2001
Mongolia	-	-	-	-
China	1 139 369	31	767	896
Japan	520 729	19	3 534	4 099
DPR Korea	20 440	-38	1 647	914
Rep. of Korea	194 780	110	2 160	4 114
Russian Fed.	621 349	-20	5 211	4 293
Total	2 496 667	13	-	-

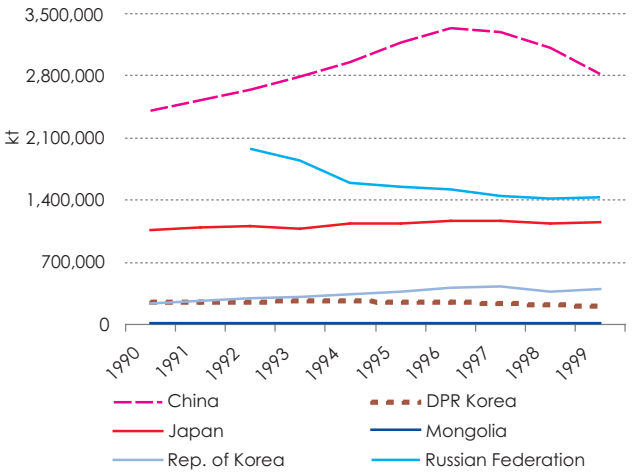
Source: World Bank (2004). *World Development Indicators* (Washington DC, World Bank).

Table 7.5 CO_2 emissions by sector: North-East Asia, 2001 (million metric tons)

	Industry	Residential	Road & Transport	Public electricity
China	924.24	219.32	104.92	1 349.23
DPR Korea	44.22	0.12	1.55	11.75
Japan	226.34	63.57	233.32	332.73
Republic of Korea	81.68	30.87	69.16	126.79
Russian Fed.	203.9	156.6	108.7	505.2
Totals	1 480.38	470.48	517.65	2 325.7

Source: IEA (2003). *CO_2 emissions from fuel combustion 1971 - 2001* (Paris, IEA/OECD).

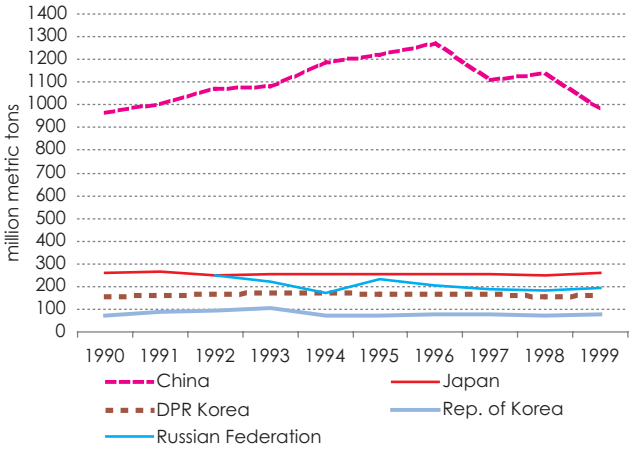
Figure 7.1 CO_2 emissions by country, North-East Asia



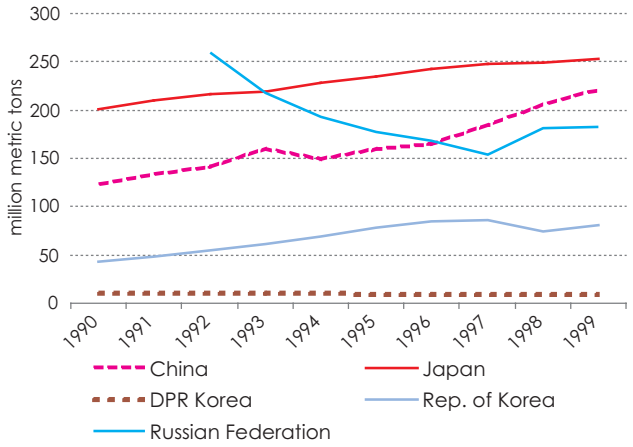
Source: IEA (2003). *CO_2 emissions from fuel combustion 1971-2001* (Paris, IEA/OECD).

Figure 7.2 CO_2 emissions by sector, North-East Asia

Industry and construction

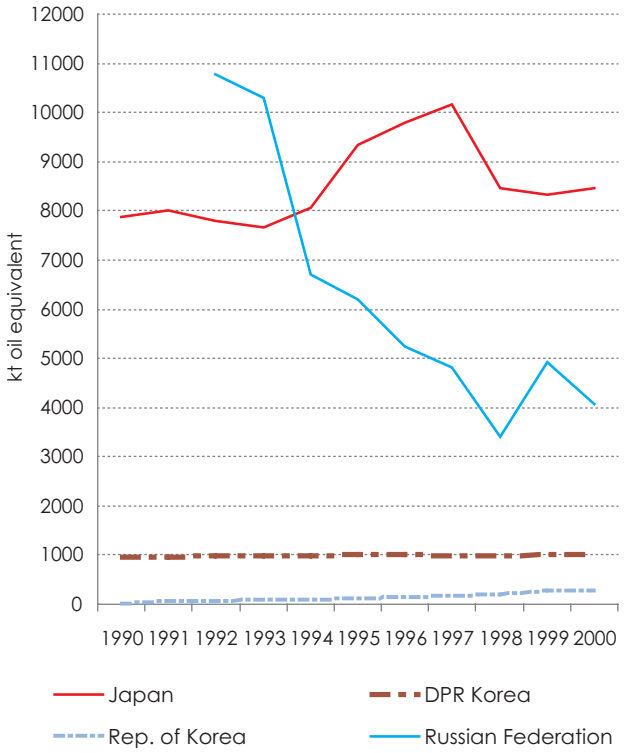


All transportation (internal)

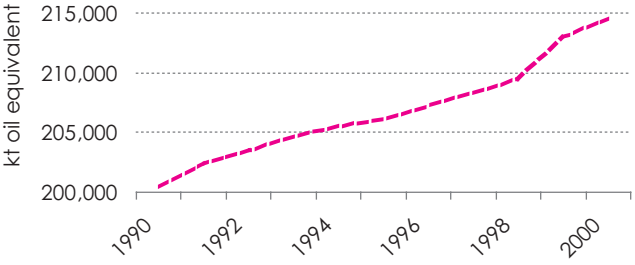


Source: IEA (2003). *CO_2 emissions from fuel combustion 1971-2001* (Paris, IEA/OECD).

Figure 7.3 Energy production from renewables, North-East Asia (excluding hydropower)



China



Source: OECD (2002). *Extended Energy Balances of OECD Countries (2002 Edition) and Extended Energy Balances of non-OECD Countries (2002 Edition)* (Paris, IEA/OECD). Electronic database accessed in November 2004 from <http://data.iea.org/ieastore/default.asp>.

million annually, two-thirds of this for biomass and small hydropower, with a substantial focus on distributed energy technologies such as household biogas and solar PV. Overseas development assistance is a substantial supporter of renewable energy technology deployment. The ADB's Renewable Energy Technical Assistance Project is partially supporting the deployment of 35 sets of wind turbines. The Clean Development Mechanism, from the total investment point of view is described as playing a limited role in the development of renewable energy projects. However, the income from the sale of certified emission reductions is estimated to potentially contribute to about 30 to 50 per cent of project profits, thereby playing an important role in project sustainability.[12]

In Japan, a policy encouraging the use of photovoltaic panels has created an environment in which solar power has become a feasible energy source for certain applications. Japan's wind energy capacity expanded from 8 MW to 84 MW in the period 1999 to 2001.

7.3.2 Pollution and waste

Economic growth based on rapid industrialization and resultant rising incomes has led to increasing production of pollution and waste. Japan and the Republic of Korea are making progress in pollution and waste control, while China, Mongolia and the Russian Federation are becoming increasingly challenged to strengthen and enforce waste and pollution regulations.

Air pollution

Continued reliance on coal and fossil fuels as the main sources of energy together with increased energy consumption make air pollution one of the most critical environmental challenges facing the region. Despite the declining emissions of two acidifying pollutants, SO_2 and NO_2 observed in the Democratic People's Republic of Korea, Mongolia and the Russian Federation and from 1990 to 2000 (Table 7.6) air pollution is still a significant issue in these countries. Particulate matter is the main air pollutant of concern. In China and other countries, efforts to minimize SO_2 and particulate emissions

Table 7.6 Anthropogenic emission of SO_2 and NO_2: North-East Asia (thousand metric tons)

	SO_2			NO_2		
	1990	2000	% change (1990-2000)	1990	2000	% change (1990-2000)
China	25 369	34 184	35	8 563	13 804	61
Japan	2 085 1 001[c]	2 597 857[c]	25 -14	2 587 2 052[c]	3 288 2 064[c]	27 1
Democratic People's Republic of Korea	1 364	866	-37	476	293	-38
Republic of Korea	2 430 1 611[c]	4 285 951[a,c]	76 -41	915 925[c]	2 140 1 136[a,c]	134 23
Mongolia	11	8.5	-23	46	9.6	-79
Russian Federation	17 516	9 685	-45	8 762	5 250	-40
Total	48 775 46 872[b]	51626 46 552[b]	6 -1[b]	21 348 20 824[b]	24 785 22 557[b]	16 8[b]

Sources: The Netherlands Organization for Applied Scientific Research (TNO) and the National Institute of Public Health and the Environment (RIVM), The Emission Database for Global Atmospheric Research (EDGAR) <http://www.mnp.nl/edgar/>;OECD (2004). *OECD Environmental Data Compendium* (Paris, OECD).

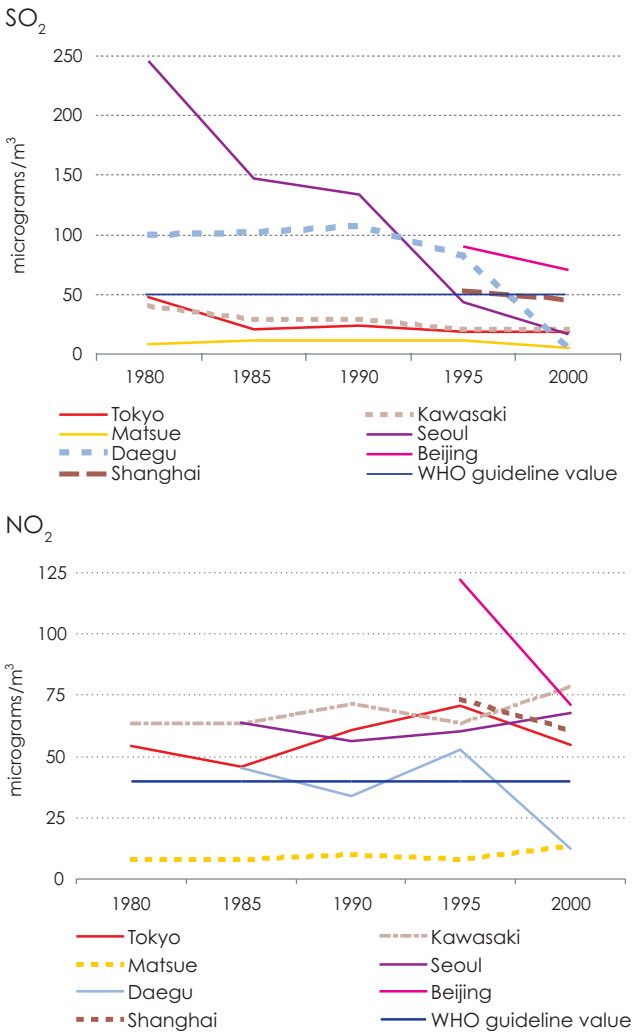
Note:
[a] Data for 1999.
[b] Using OECD data for Japan and the Republic of Korea.
[c] Data from OECD (2004). OECD Environmental Data Compendium (Paris, OECD).

focused on improving fuel quality and installation of scrubbers in electric power plants. With improving economic health, subregional emissions of SO_2 and NO_2 which, in total did not increase substantially from 1990 to 2000, can be expected to increase by greater amounts in the coming years (Table 7.6). Acid deposition resulting from emissions of these acidifying gases is therefore still a major problem in North-East Asia. Such air pollutants are a major component of transboundary air pollution.

China is the most important SO_2 emitter. The 2004 annual "Statement on the Environment" issued by the State Environmental Protection Administration (SEPA) noted that there had been significant declines in SO_2 emissions in recent years, but estimated that acid rain still occurred in 54.4 per cent of the total 487 cities monitored in 2002. Acid rain, it said, affected more than 30 per cent of China's territory and cost at least 110 billion Yuan (US$13.3 billion) annually.

Although acid rain persists, there have been improvements in SO_2 concentrations in many urban centres (Figure 7.4). The continued increases in NO_2 emissions have been largely attributed to fuel combustion for transportation. This trend has been reflected in the urban air concentrations of this pollutant, which exceeded the WHO guideline thresholds in many cities (Table 7.7 and Figure 7.4). There is some evidence, however that NO_2 concentrations may also be slowly declining in a few cities such as Shanghai, Taipei and Tokyo.[13] Once notorious for having one of the highest levels of air pollutants globally, Beijing has adopted multiple strategies to tackle the rising pollution from vehicles, including more stringent emissions standards for pollution from motor vehicles, vehicle inspection schemes, and setting higher fuel-quality standards. As of October 2004, vehicle emission standards were further strengthened by the adoption of the Euro II standard. As a result of these efforts, and despite a rapid increase in vehicle use in Beijing during the

Figure 7.4 Urban air pollution: SO_2 and NO_2, North-East Asia



Source: OECD (2003), *OECD Environmental Data Compendium 2002* (Paris, OECD); Bentai, Wan (2000). "Ambient Air Quality Monitoring in China," presented to the Better Air Quality in Asian and Pacific Rim Cities Conference, 16-18 December 2002.

Table 7.7 Air pollution in large cities: North-East Asia

		Annual mean ambient concentrations (µg/m³, 2003)		
		PM10	SO_2	NO_2
China	Beijing	141	61	122
	Shanghai	97	43	57
Republic of Korea	Seoul	69	13	71
	Busan	55	16	49
Japan	Tokyo	32	10	55
WHO guideline values[a]		20	50	40

Sources: Clean Air Asia Initiative Secretariat, February 2005; Ministry of Environment, Republic of Korea.

Notes:
[a] WHO guideline values for PM10 (2005), SO_2 (1999) and NO_2 (2005).

same period, the deterioration in air quality slowed after 1998. NO_2 and CO concentrations reportedly dropped by 16.4 and 21.2 per cent, respectively between 1998 and 2001. China went a step further to announce that it would give priority to the development of urban public transportation systems over a five-year period, starting 2004.

The health effects of dust and suspended particulate matter resulting from incompletely combusted fossil fuels and biomass, as well as other aerosols, are still a matter of serious concern. In urban areas, suspended particulate matter has had a serious impact on human health. Concentrations of PM10 in the large cities of Japan and the Republic of Korea in 2003 did not meet the most recently established WHO guideline value (Table 7.7). Many other large cities in the subregion, particularly in China, are still exposed to PM10 concentrations that are much higher than guideline values. Monitoring of air pollution in urban centres is still weak in the Democratic People's Republic of Korea and Mongolia. Air pollutant concentrations are known to be particularly high in the winter months in Mongolia. Dust and sandstorm events are discussed under "land degradation".

E-waste

One of the fastest-growing waste streams is e-waste, that is, discarded electronic appliances such as computers, refrigerators, televisions, air conditioners, cellular phones and stereos. Across Asia and the Pacific, rising household consumption and therefore expanding market sizes, rapid innovation and changing consumer preferences have all been responsible for the fast growth in this sector. However, in North-East Asia, this trend has been accelerated by the fact that China, the Republic of Korea and Japan are major producers of electronics, and that Japan and the Republic of Korea have some of the highest levels of ICT use, globally. E-waste contains, among other substances, lead, cadmium, mercury, chromium, polyvinyl chloride (PVC), brominated flame retardants, barium and beryllium. When improperly handled, all of these substances are highly toxic and hazardous to human health. The content of valuable recoverable material (which includes gold and copper) is an incentive to informal recycling activity which involves burning of wastes in the open and acid extraction carried out with little regard to environmental health. The resultant pollution impacts the health of those involved in recycling, and others. China was one of the first proponents of the *Basel Convention on Transboundary Movement of Hazardous Waste*, and banned the importation of e-waste in 2002. However, it is still a victim of illegal trade in these materials.

Industrial waste and pollution

Industrial waste accounts for the major portion of waste in the subregion. In the Republic of Korea, approximately 80 per cent of generated waste comes from industrial sources.[14] The Russian Federation's oil and gas extraction industries are significant sources of pollution and waste, and along with radioactivity and nuclear waste, compound waste burdens.

The production of hazardous waste increased by over 50 per cent in the Republic of Korea and the Russian Federation during the 1990s,[15] with the Republic of Korea also importing substantial amounts of hazardous and other wastes (Table 7.8). Legislation enacted in 2002 in the Russian Federation legalizes the importation of hazardous waste for treatment, the proceeds of which are earmarked by the federal government for environmental improvements. In Japan, treatment of polychlorinated biphenyls (PCBs) and control of dioxin emissions has received much attention in the

Table 7.8 Trade in hazardous and other waste: North-East Asia, 2000 (thousand metric tons)

	Imports	Exports
China	-	3 346
Democratic People's Republic of Korea	-	-
Japan	3 924	1 539
Mongolia	-	-
Republic of Korea	17 380	60
Russian Federation	8 083	96 988
Sub-Total	29 387	101 933

Source: Secretariat of the Basel Convention, data as reported by parties.

media. Production, import, and use of PCBs, which are mostly used in the manufacture of chemical equipment, have been prohibited since 1974. Action to reduce PCB emissions has been successful; discharges of PCBs in 2002 were 90 per cent lower than in 1997. However, prior to this action large quantities of PCBs were inappropriately disposed of and still present a threat.

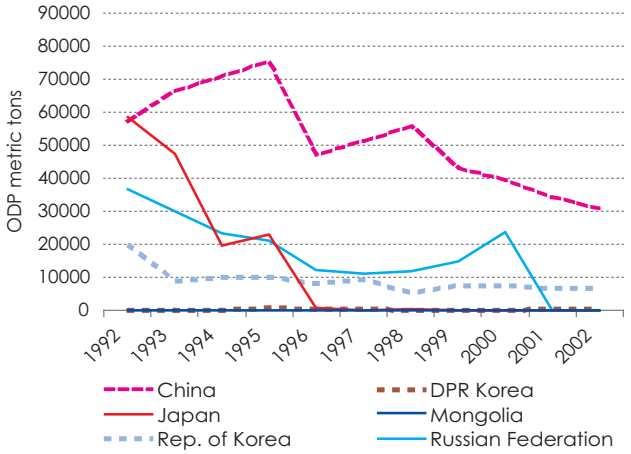
Ozone-depleting substances

In keeping with the provisions of the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, efforts have been made to phase-out chlorofluorocarbons (CFCs). As a result, most countries in the subregion have cut back CFC production, demonstrating the success of domestic policies (Figure 7.5). However, the subregion still accounts for 60 per cent of the CFCs consumed in Asia and the Pacific.

Among the national responses to improve the management of air pollution and waste are:

- The Democratic People's Republic of Korea's energy strategy that focuses on improvements in energy efficiency;
- China's "Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment" (see box 7.1). China's revision of the *Law of Air Pollution and Control* was issued in 2000 to include amendments to define pollution discharge standards, establish the total control system and discharge permit system,

Figure 7.5 Consumption of ozone-depleting substances (all CFCs), North-East Asia



Source: United Nations Environment Programme (UNEP), *GEO Data Portal*, compiled by the Ozone Secretariat, <http://geodata.grid.unep.ch/>.

Box 7.1 Trade solutions to the e-waste problem

As one of the world's largest exporters of electronic goods, China has been looking for solutions to tackle the upcoming EU waste electrical and electronic equipment (WEEE) regulations. China's Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive (China RoHS) is expected to provide incentives for the development of cleaner replacement technologies. These initiatives not only protect the environment, but by taking steps to comply with the regulations of their trade partners, China is also seeking to protect its competitiveness in the global market. The China RoHS Directive is expected to strongly influence other Asian countries and trade markets. By introducing the China RoHS and WEEE directives, China is applying extended producer responsibility principles in production policy.

The initial China RoHS draft, entitled "Management Methods on the Prevention and Control of Pollution Caused by Electronic Information Products", underwent detailed review and discussion up to the final stages of ratification. It was approved at the end of 2004, and took effect on 1 July, 2005. Modelled on the EU RoHS, it aims at reducing and restricting the use of mercury, lead, cadmium, chromium, polybromide biphenyl, and polybromide biphenyl ether over the product life-cycle. These substances are to be phased out by July 2006. It also requires manufacturers to provide product information on packages, including the names of hazardous substances and their contents. (Articles 10, 13, 14). In addition, it mentions producer responsibility on 'take-back' and recycling of waste electrical and electronic equipment (WEEE) (article 16). Accordingly, China is in the process of developing "Management Regulations on Recycling and Treatment of Waste and Used Household Electrical and Electronic Products".

Sources: China Environmental Protection Net, "Management Methods on the Prevention and Control of Pollution Caused by Electronic Information Products," <http://www.ep.com.cn/cgi-bin/dbfg/doc.cgi?id=1849> (in Chinese); China Court (2004). "The Law on Management Methods on the Prevention and Control of Pollution Caused by Electronic Information Products to be Implemented Next July," <http://www.chinacourt.org/public/detail.php?id=123675> (in Chinese); National Development and Reform Commission, "Management Regulations on Recycling and Treatment of Waste and Used Household Electrical and Electronic Products (Draft for Comment)", Draft as of September 17, 2004

establish the charge rates based on total pollutant discharge, focus on air pollution prevention and control in major cities, strengthen the control of pollution from vehicles, strengthen the control of urban dust pollution and cement legal liabilities;[16]

- Japan's "Special Measures for Total Emission Reduction of Nitrogen Oxides and Particulate Matter from Automobiles in Specified Areas", adopted in 2002,[17] which include restrictions on the use of high pollution vehicles (especially diesel automobiles), and the promotion of public transportation. Japan's Clean Air Act targets a specified quantity for reduction of dioxin and PCB emissions, and has successfully decreased PCB emissions from incinerator plants. Furthermore, a system for the appropriate treatment of stored PCBs has been established, which is expected to facilitate the treatment of all PCB waste by 2016;
- Mongolia's Waste Reduction Programme and efforts to improve waste disposal in Ulaanbaatar.[18] Mongolia has also introduced regulatory measures along with economic instruments to address air pollution, with international assistance, although insufficient monitoring and weak capacity have reduced the effectiveness of these initiatives;
- The Republic of Korea's long-term air pollution control plan called Blue Sky 21, provides the legal basis for introducing total emission-load control, emission trading and mandatory purchasing of low emission vehicles. The Republic of Korea's 2002 *Law on the Promotion of Saving and Recycling Resources* mandates the collection of used products by manufacturers. Products designated for collection are batteries, tires, lubricating oil, electrical appliances and fluorescent lights. Cellular phones and audio equipment also became items for collection under this law in 2005; and
- The Russian Federation's initiatives on cleaner production, starting in the early 1990s with the establishment of the Russian-Norwegian Cleaner Production Centre. Over 1,650 specialists from 500 enterprises have participated in the training and technical assistance programme.

Seeking to promote the development of more eco-efficient economies and more sustainable solutions to the problem of waste and pollution, China has stated its intention to build a resource-efficient society as an underlying principle of its economic and social development plans. This visionary objective has been built into the *Eleventh Five-Year Plan* (see chapters 3 and 4). A consensus on cleaner production has also been reached in China. At the Second National Conference on Industrial Pollution Control in 1993, cleaner production was officially proposed and promoted as part of China's sustainable development planning.[19] On 29 June 2002, the National People's Congress approved the *Cleaner Production Promotion Law*. This law has been identified as one of the most significant initiatives adopted by the Government of China.[20] Interim guidelines for cleaner production audit, cleaner production indicators for three key industries, and cleaner production guidelines for key industries have been issued. China has also begun developing "Green GDP" in an attempt to measure the environmental costs of development activity.

Japan's 3R Initiative outlines an action plan to promote waste-reduction, recycling and reuse globally. This initiative has been supported by Japan's ongoing work on monitoring material flow accounts and resource productivity. The initiative went a step beyond cleaner production and better product design which has already taken root. Better product design based on life-cycle assessments and an emphasis on easily recyclable materials has already begun to green the production process. In Japan, clean production integration into environmental policy is mature; the Eco-Town Project is a key example of Japanese cleaner production efforts (Box 7.2). Japan has also established the *Fundamental Law for Establishment of a Material-cycle Society* in 2000, accompanied by laws such as the *Waste Management and Public Cleaning Law*, the *Law for the Promotion of Effective Utilization of Resources* and the *Container and Packaging Recycling Law*. In addition, the *End-of-life Vehicle Recycling Law* was passed

in 2002 as a companion law, which defined the responsibilities and roles of automobile manufacturers and related agencies.

The Republic of Korea's cleaner production initiatives began with the introduction of two policies in the 1990s. The first, the *Deposit-Refund System* (1992) placed the burden of responsibility for waste recovery on producers and importers, while providing incentives that promoted the recovery of recyclable materials. The second, the *Waste Production Charges System* (1993) aimed at suppressing the consumption of products with high waste-treatment costs and poor characteristics for recycling. In addition, the *Extended Producer Responsibility (EPR) System* holds producers accountable for the entire life cycle of their products and set mandatory recycling targets. It has been in force since 2003.

Green procurement stimulates and supports cleaner production initiatives and relies heavily on credible ecolabelling schemes. Japan and the Republic of Korea have both expanded green procurement activity through legislative action. Japan's green purchasing law was enacted in April 2000 and revised in March 2004 to expand the list of items targeted for green purchasing. It requires the public sector to promote procurement of products and services that contribute to reducing the negative impact on the environment. It also obliges national governmental bodies to formulate green procurement policies and to publicly disclose this information. The result, reported by the Ministry of the Environment in 2003, was that more than 95 per cent of procurement in 2002 met eco-friendly procurement requirements; significant increases in green procurement activity in uniforms and air-conditioners, have been recorded.[21] The Republic of Korea's 2004 green purchasing law placed similar requirements on the public sector and is projected to result in an expansion of the domestic "green" market from US$2 billion to US$5 billion dollars between 2004 and 2006.[22]

Ecolabelling schemes are the basis for creating vibrant markets for environmentally friendly goods and services. The ecolabelling system of the Republic

Box 7.2 Eco-industrial development and waste reduction: zero-emission eco-town projects in Japan

Since 1997, the Government of Japan has provided both technical and financial support to local governments to promote "Eco-town projects" under what has been one of the most successful policy programmes to address Japan's serious waste management crisis.

Eco-towns are areas in which zero-emission concepts are put to practical application. Once the Ministry of Economy Trade and Industry approves a development plan, local governments and companies receive funding to support the establishment of ecologically sound industrial activity that applies a holistic approach to material flow through the area. Waste reduction is promoted through process changes and recycling, and waste and final products are used as inputs for other industries or processes in the area. Such efforts maximize efficiency of resource-use, reduce waste and emissions and result in tangible economic benefits. Consequently, by-product exchange and zero-emissions efforts are now perceived as a potential source of economic value, rather than a burden on businesses needing to comply with strict regulations.

Local governments can also use government funds to develop and implement comprehensive plans for the area and attract companies that will actively facilitate recycling and waste and energy use reduction programmes. Up to 50 per cent of the project cost, including both managerial activities, such as planning or promotion, and technical costs, such as recycling facilities or new technologies, can be financed by the funds. Eco-town projects have been initiated in 26 areas, mainly in former chemical industrial zones including:

- Chiba Prefecture (eco-cement plant, environmental engineering complex)
- Gifu Prefecture (recycling industry complex, environmental research and education facility)
- Akita Prefecture (electronic recycling facility and promotion of sustainable energy)
- Kitakyushu City (eco-industrial complex, recycling park, research center)

The tangible economic benefits of eco-town projects include reduced costs of waste disposal and energy. Even in cases where eco-town projects have not been found to be financially viable, they have nevertheless made important contributions to reducing the environmental impact of industrial activity. In one low-tech. example, the eco-cement plant in Chiba Prefecture uses ash, the by-product of incineration processes, to make cement by adding natural limestone. The result is significant waste reduction, reduced costs of waste disposal and reduced expenditure on purchase of virgin aggregate.

of Korea includes four certification schemes: (i) the Eco-label (life-cycle environmental performance); (ii) the GR Mark (quality and recycled material content); (iii) the Energy Mark (energy efficiency); and (iv) the EDP-Label (most recently established, certifies the reliability of environmental declaration of products based on the life-cycle assessment). As of May 2005, more than 2,000 products had received certification. The 2003 market size of green products was reported as being equivalent to 0.2 per cent of the GDP of the Republic of Korea, or some US$1.5 billion, with fluorescent lamps, paint and water faucets having claimed the largest market shares.

7.3.3 Water resources

Water scarcity, contamination and pollution harm human health, reduce food security and damage valuable ecosystems. Japan's per capita freshwater withdrawals for 2000 were approximately five times that of Mongolia, and the largest in the subregion. The annual water withdrawal of China is expected to reach 764 km^3 by 2025, or almost twice the volume as in 1970.[23]

Many factors have been driving the increase in water demand in the subregion. Agriculture has been the largest consumer of water in all North-East Asian countries, except in the Russian Federation. In the Russian Federation, hydroelectric power and industry use more water than any other sector. However, with the declining efficiency of outmoded irrigation systems built in the 1950s and 1960s, water losses have been increasing.[24]

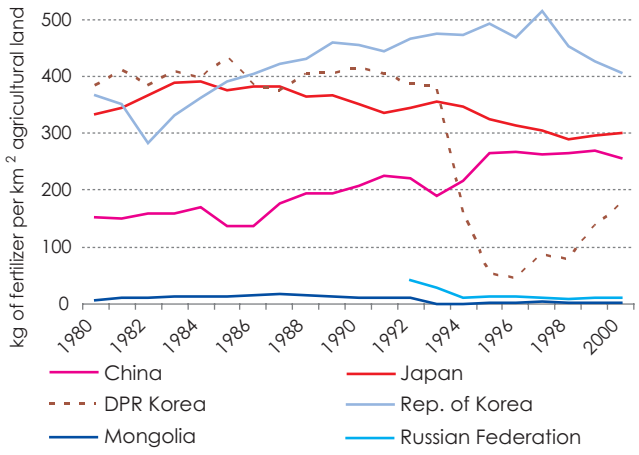
Rapid large-scale urbanization and industrialization has resulted in localized shortages of freshwater resources in China, Japan, Mongolia and the Republic of Korea, particularly in times of drought. Lakes in Xinjiang, eastern Qinghai-tibet plateau, and Yunnan, China have all shrunk in the past 200 years, as a result of accelerated evaporation and increased water consumption by industry and agriculture. Groundwater exploitation has lowered water tables by up to dozens of metres since the 1960s.[25] Responses to the shortages, such as regulating the overexploitation of groundwater, introducing cascade use of secondary treated water, and improving rainwater harvesting with modern technology have recently been promoted in Japan and the Republic of Korea.

Although well-endowed with water, water pollution has advanced water resources management on the development agenda of the Democratic People's Republic of Korea.[26] Freshwater resources are increasingly polluted in China and Mongolia, reducing the availability of water of suitable quality, and increasing the costs of treatment. Low access to sanitation and high rates of urbanization in Mongolia and China, together with limited or declining treatment of wastewater, added to the load of organic pollutants from the industry. Mongolia's population, with the lowest levels of access to safe drinking water in both urban and rural areas, is increasingly at risk from environmental health problems. Water treatment plants treated around 96 per cent of all wastewater at the end of the 1980s, but 10 years later, less than 50 per cent was treated.[27] Mining is another major source of water pollution in Mongolia.

China is facing serious water quality problems in both surface and groundwater. Industrial wastewater as the main pollutant until the late 1990s, has been replaced by domestic sewage. From 1998 to 2002, the volume of wastewater discharged from domestic sources increased by almost 20 per cent, as compared with a four per cent increase in the same period for the industrial sector. Likewise, COD discharge from industry decreased during this period by some 30 per cent, while domestic discharges of COD increased by 13 per cent, topping the discharges from industry by one third. In the seven river basins (Liao River, Huai River, Hai River, Songhua River, Yellow River, Pearl River, and Yangtze River), approximately half of the rivers, lakes and groundwater are seriously polluted. Industrial accidents (see chapter 2, section 2.4) are serious threat to water quality in China. The unregulated disposal and recycling of e-wastes also has a potentially severe impact on water quality in localized areas of China.

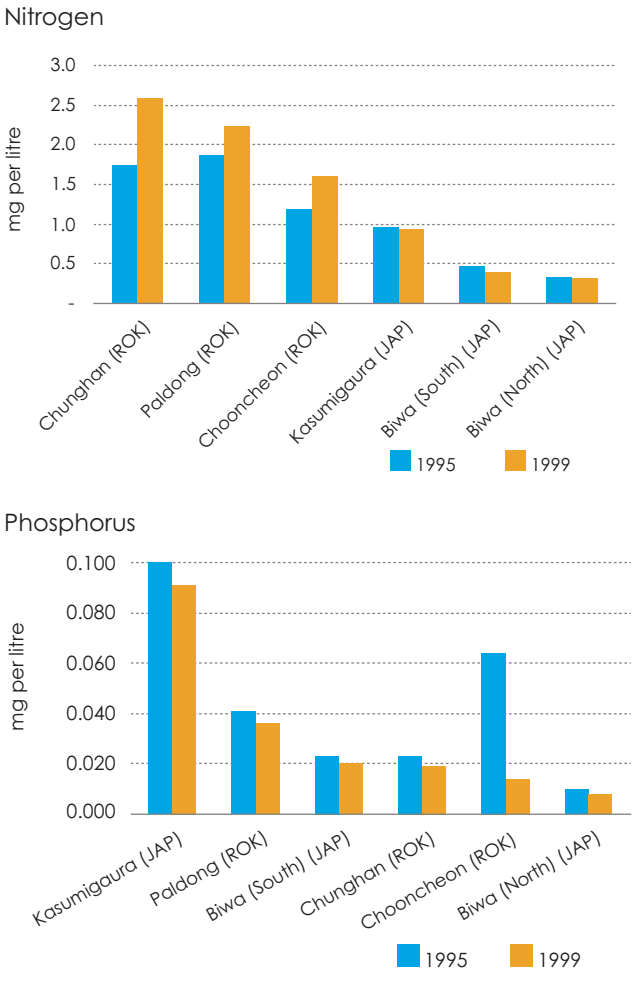
While there have been some marginal reductions in phosphorus levels in major lakes in Japan and the Republic of Korea, rising nitrogen

Figure 7.6 Fertilizer use intensity, North-East Asia



Source: FAO FAOSTAT online database, accessed on 9 December 2004 from <http://faostat.fao.org>.

Figure 7.7 Pollutant concentrations: major lakes in Japan and the Republic of Korea



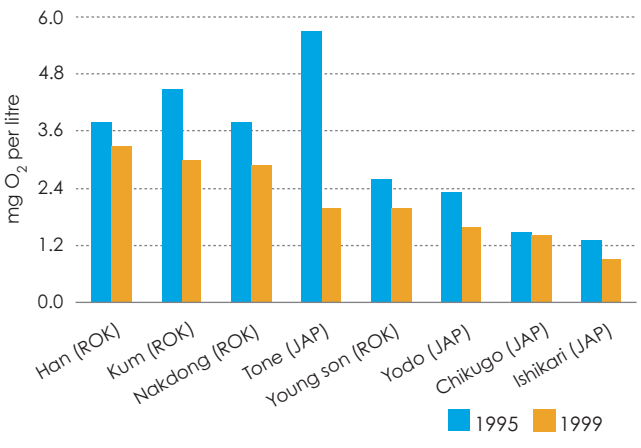
Source: OECD (2003). *Environmental Data Compendium 2002* (Paris, OECD).

levels in the Republic of Korea are the result of agricultural pollution and domestic sewerage. (Figure 7.6, figure 7.7 and figure 7.8).

In semi-closed areas along the coasts of these countries, red tides and eutrophication continue to occur as a result. BOD levels have declined in most of the major rivers in both the Republic of Korea and Japan, with technological improvements and more stringent regulations (Figure 7.8). In Japan, on the whole, there has been an improvement in water quality. Hazardous substances such as cadmium and mercury have been drastically reduced and heavily contaminated areas have been cleaned up.[28]

The ability of the subregion, and in particular, China and Mongolia, to meet its water needs may be further compromised by the impacts of climate change, which are already changing localized rainfall patterns in China. Warming air temperatures have decreased glacial areas by some 17 per cent and increased evaporation rates. Long-term studies of precipitation dynamics over the Gobi region of Mongolia, comprising some 44 per cent of the country's land area, showed a decrease in average precipitation of some 10 per cent over 50 years. Mongolia's annual surface run-off decreased by some 40 per cent from 1999 to 2000; in the last five years, about 683 rivers, 1,484 springs and 760 lakes have reportedly dried up.[29]

Figure 7.8 BOD concentrations: major rivers in Japan and the Republic of Korea



Source: OECD (2003). *Environmental Data Compendium 2002* (Paris, OECD).

7.3.4 Land resources

Desertification is particularly severe in the western and north-western parts of China, as well as in Mongolia. In China, the total land area affected by desertification has reached 267 million hectares, or about 28 per cent of the country's total land area. Desertification is estimated to claim as much as one million hectares per year, affecting approximately 400 million people. Reforestation efforts have yet to halt China's spreading deserts.[30]

Forest cover varies markedly across the subregion. The Democratic People's Republic of Korea, Japan, the Republic of Korea and the Russian Federation are relatively rich in forest resources. In 2000, forests covered over 60 per cent of the Democratic People's Republic of Korea, Japan and the Republic of Korea, and about 50 per cent of the Russian Federation. In contrast, Mongolia has only 6.8 per cent forest cover. China's total forest area increased from 145.4 million hectares to just under 163.5 million hectares during the period 1990 to 2000. In the 1990s, the forest cover increased by some 18 million hectares, due to natural forest protection and plantation programmes, particularly in China. Despite the overall reversal of forest loss, forest degradation/loss issues still require further attention and constant monitoring. Reforested areas were often also planted as monocultures, lacking in biodiversity and vulnerable to disease and climate change.

Forest degradation, climate change, and in Mongolia, over-grazing, have been the driving forces for severe land degradation that affected an estimated 27 per cent of the region's land area, with over 30 and 40 per cent in China and the Republic of Korea, respectively. The result has been decreasing productivity of arable land, an increase of dry and sandy areas, extreme weather events, and increasing frequency of dust and sandstorms (DSS). Forest resources are critical to the protection of the environment, as well as maintaining and securing local and regional ecosystems and livelihoods. Forest degradation and loss directly affects the livelihoods of people working in the logging industry, as well as those in the wood dependent industries and consumers of timber products. Forest degradation also deprives society of the forests' ecosystem services such as water resource conservation, moderation of harsh climate, mitigation of desertification, carbon sequestration and biodiversity conservation. The 1998 flood in the Yangtze River basin had a strong impact on the forest management policy of China, and resulted in strengthening forest protection and reforestation programmes.

The frequency of seasonal DSS has increased, rising from an average of eight in the 1960s to 23 in the 1990s. In 2001, 32 DSS events were recorded.[31] As many as 72 events were recorded in China during the period 2001 to 2004, and almost one month per year was recorded as "dust days" in Mongolia.[32] These potentially devastating masses of airborne particulates originate in the desert margins and transition zones between pastoral and agricultural cropland in the northern regions of China and in southern Mongolia. DSS are transboundary phenomena; dust from these storms has been carried by strong winds as far away as Beijing, Ulaanbaatar, Seoul, and Fukuoka, and as far as North America. DSS cause health problems by raising the risk of respiratory ailments, cause extensive crop damage, remove topsoil, and result in economic losses by impacting a range of economic activities. In March 2002, a three-day DSS event covered 67 per cent of Mongolia's land area and left "three people and 53,000 animals dead, 83 houses damaged, 24 communication lines and six power towers destroyed." The direct economic loss to Mongolia's economy was estimated at more than US$2 million.[33] This event also caused the cancellation of 70 domestic flights in the Republic of Korea. On 9 March 2004, a severe DSS engulfed Lanzhou City, the capital of arid Ganzu Province in North-West China along with the surrounding region including Hexi Corridor, Baiyin City, the North part of Ningxia Hui Autonomous Region, and West and Central parts of Inner Mongolia Autonomous Region. Visibility dropped to 400 metres and wind velocity was as high as 21m/s.[34]

The increasing frequency of DSS signals a widespread deterioration of rangeland and cropland, linked to desertification processes, increasing populations (both human and livestock), a policy of

promoting food self-sufficiency in DSS-prone drylands, changes in herders' lifestyles and grazing patterns and, changes in the mix of animals in response to the demand for cashmere. The number of sheep grazed in China's pastures is estimated to exceed the carrying capacity by 124 per cent. In Mongolia, livestock population increased by some 50 per cent between 1988 and 1999, following which 12 million head of cattle were lost during the winters of 1999-2000.[35] While describing the various climatic and geological features of the northern regions of Mongolia and China that make the area susceptible to DSS, ADB has emphasized that "environmental factors often take the blame for degradation, where serious problems could lie elsewhere in the structure of the rural economy."

National action to mitigate DSS has primarily focused on slowing land degradation processes, and included reforestation policy, legislation covering the use of water, the agricultural sector and the use of grasslands. However, it has been noted that the underlying principle for many of these legislative frameworks has been the concept that economic development takes precedence over environmental management.[36] China continues to implement its 1998 natural forest converstion programme and 2001 anti-desertification law. In Mongolia, dust and sandstorms are monitored and the management of dryland ecosystems promoted to mitigate DSS events. In May 2005, the Green Wall Eco-Stripe Programme was approved to promote revegetation and tree planting in a 2,000 km-long strip of desertification-affected areas in Mongolia.

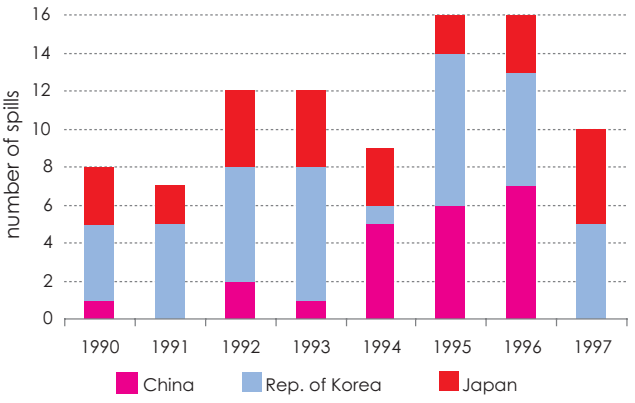
7.3.5 Marine resources

The marine environment is being degraded by extensive coastal development, pollution of rivers that flow to the sea, oil spills and eutrophication. Red and blue tides have harmed fisheries and degraded coastal recreation areas. Red tides have become a major concern in Japan, the Republic of Korea, and China, and have severely damaged marine-based aquaculture activities.

The most serious environmental threat to North-East Asia's marine environment and coastal economies has been oil spills from tankers and offshore oil rigs. Higher volumes of tanker traffic have increased the likelihood of oil spills (Figure 7.9). On 2 January 1997, the hull of the Russian-flagged Nakhodka failed as it was sailing off the Oki Islands near Shimane Prefecture, Japan resulting in the second largest spill in Japanese history, with about one third of the Nakhodka's 19,000 metric tons of fuel oil being spilled. Gradually increasing in viscosity as it absorbed water, the oil drifted widely and reached nine prefectures along the Sea of Japan coast. By the end of 1999, the total amount of compensation sought was about 35.1 billion yen.

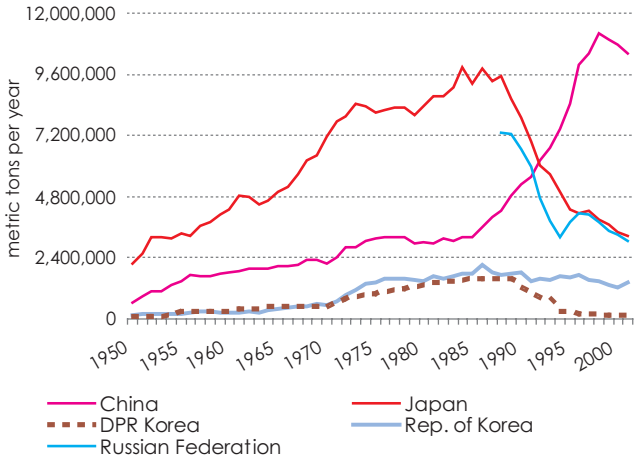
Fish catches in North-East Asia increased dramatically from three million metric tons in 1950 to 19 million metric tons in 2001, due largely to increased exploitation by China. However, more recent data shows a general decline in fish catches throughout the subregion (Figure 7.10). The fishing capacity of Chinese boats working in the East China Sea increased by a factor of 7.6 between 1960 and 1990, and the catch per unit effort (CPUE), an indicator of the abundance of fisheries resources, fell by two-thirds. In coastal areas of the East China Sea and the Yellow Sea, fish catches shifted from large, high-value fish to comparatively small fish of little value.[37] The impacts of over-fishing have contributed to a loss of critical habitat for breeding fish-stocks. China lost almost 50 per cent of its mangrove forests from 1990 to 2000.[38]

Figure 7.9 Frequency of oil spills, North-East Asia



Source: Northwest Pacific Action Plan Marine Environmental Emergency Preparedness and Response Action Center Website, "List of Oil Spill Accidents," accessed on 20 July 2005 from <http://merrac.nowpap.org/html/i_1.html>.

Figure 7.10 Capture production by country: marine fish, North-East Asia



Source: FAO (2003), FISHSTAT Plus: *Universal software for fishery statistical time series, Version 2.3*, available on-line at <http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>; Aquaculture Production dataset, Rome.

7.3.6 Biodiversity

North-East Asia's biodiversity is under increasing pressure from the conversion of natural forests and grasslands. The value of biodiversity continues to be underestimated and efforts to address the issue remain inadequate. China is the third most biologically-diverse country on earth. With more than 30,000 species of higher plants and 6,347 types of vertebrates, China accounted for 10 per cent and 14 per cent respectively of the world's total.[39]

The IUCN's annual Red List of Threatened Species paints a stark picture. There has been an increase in the number of threatened species between 1997 and 2002 in each country. While some of the increase may be attributed to improvements in monitoring capacity, it underscores the precarious situation of biodiversity in the region. Examples of species in the critically endangered category from the subregion include the Changjiang Dolphin and the Yangtze Sturgeon which are threatened largely by loss of habitat and water pollution. Freshwater habitats appear to be particularly threatened; in China's seven major rivers[40] high biodiversity losses have been observed.

Wetlands have long been considered to be worthless and have been reclaimed for development and for dumping of solid wastes. However, attitudes may be changing in some countries. In the 1990s public support for the protection of tidal flats resulted in the protection and sustainable management of tidelands such as Fujimae and Sanbanse in Japan.

Establishment and expansion of protected areas are among the most important measures for halting biodiversity loss. Recognizing this, many countries in the subregion have designated protected areas within the frameworks of the Ramsar Convention on Wetlands, the United Nations Convention on Biological Diversity, and the Convention Concerning the Protection of the World Cultural and Natural Heritage.

Mongolia adopted the Law on Special Protected Areas and the Law on Buffer Zones of Special Protected Areas in 1994 and 1997 respectively. This strengthened legislative framework for designating protected areas, and for promoting the appropriate management of biodiversity has resulted in an expansion of protected area, which reached 14 per cent of its land area in 2004. China has established the Compensation Fund for Forest Ecological Benefits, to be used for protection and management of forest resources, including shelterbelts and special forests providing ecological benefits. China's increase in forest cover is attributed to resources made available through this fund and various projects.[41]

Despite efforts to protect biodiversity at local, national, and international levels, the demand for land occupied by biologically diverse virgin forests and wetlands has eroded past achievements in habitat protection. In the Russian Federation, the transportation of oil across vast territories has become a new threat to habitats.

7.4 Subregional cooperation

Transboundary environmental issues and more conducive political climates have fostered significant subregional cooperation initiatives over the last ten years. Major intergovernmental cooperation mechanisms include initiatives such as the North-East Asian Subregional Programme on Environmental Cooperation (NEASPEC), the North-East Asian Conference on Environmental Cooperation (NEAC), and the Tripartite

Environment Ministers Meeting (TEMM). Subregional countries, with the exception of the Democratic People's Republic of Korea, also participate in the cooperation programmes that extend to other countries of the region such as the Acid Deposition Monitoring Network for East Asia (EANET), focusing on acid deposition, the Partnership in Environmental Management for the Seas of East Asia (PEMSEA) and the East Asia Regional Seas programme.

Intergovernmental cooperation framework - NEASPEC

NEASPEC is the first comprehensive intergovernmental cooperation mechanism in the subregion. It was initiated in 1993 as a forum for intergovernmental discussion on environmental issues. The member states, China, Japan, Democratic People's Republic of Korea, Mongolia, Republic of Korea and the Russian Federation fully support NEASPEC project activities, and interim secretariat services have been provided by ESCAP. Since its inception, Meetings of Senior Officials (SOM) have been held annually. The first SOM identified three priority areas: energy and air pollution; nature conservation; and capacity building. On the basis of the decision, NEASPEC has undertaken projects for reducing air pollution from coal-fired power plants, as well as environmental data collection and analysis. The projects have carried out on-site training and demonstration activities, the development of methodologies for air pollution monitoring, and the compilation of the monitoring data through the creation of the North-East Asian Center for Environmental Data and Training. NEASPEC has also begun a project in 2005 for the creation of a Framework for Nature Conservation Programme in North-East Asia. The scope of NEASPEC activities have been expanded to examining the nexus between the environment and economy by initiating subregional dialogue on eco-efficiency since the 11th SOM in 2005.

Subregional dialogue - NEAC and TEMM

NEAC, established in 1992 and TEMM, established in 1999 are forums for dialogue on environmental issues. The former includes participation of government officials, local governments, NGOs and researchers from China, Japan, Mongolia, the Republic of Korea and the Russian Federation, and has helped promote domestic environmental policies and facilitated bilateral and multilateral collaboration. TEMM facilitates high-level dialogue between the environment ministers of China, Japan and the Republic of Korea. This forum has developed projects on environmental education and has paid special attention to DSS.

Marine environments - NOWPAP

In addition to these forums, multilateral and bilateral cooperative programmes such as the Northwest Pacific Action Plan (NOWPAP) have been established. NOWPAP, established in 1994, addresses marine environmental issues under the initiative of UNEP and is a comprehensive response to the challenges facing the Sea of Japan and the Yellow Sea. Participating countries include China, Japan, the Republic of Korea, and the Russian Federation. Japan and the Republic of Korea are co-hosts to the Regional Coordination Unit (RCU) which functions as NOWPAP's secretariat. NOWPAP regional activity centres have been established in each country and manage projects in the area of monitoring and data gathering, marine environment emergency preparedness and response, and coastal environmental assessment. NOWPAP's programme for the future includes assessment and management of land-based activities.

Dealing with DSS

Recognizing the transboundary nature of the DSS problem, the environment ministries of China, Japan, the Republic of Korea and Mongolia proposed that ADB, UNCCD, ESCAP, and UNEP jointly develop an expanded technical assistance project to be co-financed by ADB and GEF. The result was a ten-year programme endorsed by the GEF Council in 2002, to be implemented by China, Japan, the Republic of Korea and Mongolia, ADB, ESCAP, UNCCD and UNEP. The project has conducted in-depth analysis of DSS, as well as developed a Regional Master Plan which includes a monitoring

programme and early warning network. In addition, the project has also formulated an investment strategy, and is in the process of identifying demonstration projects in both China and Mongolia. National counterparts in Mongolia and China have agreed to the development of a demonstration project that will use renewable energy to pump water for irrigation to support re-vegetation.

New initiative on energy cooperation

The first session of the Senior Officials Committee on Energy Cooperation in North-East Asia was hosted by the Ministry of Fuel and Energy of the Government of Mongolia in collaboration with the Korea Energy Economics Institute and convened by ESCAP in November 2005. The governments of the North-East Asia subregion adopted the proposed "Collaborative Mechanism on Energy Cooperation in North-East Asia." The vision of the mechanism is "improved energy security in North-East Asia through energy cooperation in a sustainable manner" by 2020. Its objectives are to:

(i) increase the supply of energy in North-East Asia, lessening its dependence on energy imports from outside of the subregion;
(ii) optimize the economy and efficiency of supply and use of energy; and
(iii) minimize the environmental impact of energy production and consumption through improved energy mix and greater energy efficiency.

A Working Group on Energy Planning and Policy was established to coordinate activities within the framework of the collaborative mechanism. Its activities began in 2006.

7.5 Conclusion

Growing demand for land and water resources, deteriorating air and water quality owing to unsustainable consumption and production patterns, and large volumes and changing nature of wastes are the major environmental challenges in North-East Asia. North-East Asia's carrying capacity is being eroded by a combination of deteriorating environmental conditions and climate change factors, particularly in China and Mongolia. The North-East Asian economies which are transitioning to market-economies are at the crossroads of their development. They can continue the old patterns of dependence on natural resources, or can invest in creating new, more environmentally sustainable development patterns that will meet the needs of people while protecting the natural resource base.

This means tapping and developing vibrant markets in environmentally-friendly goods and services, and building on the examples of countries, such as Japan and the Republic of Korea. Expanding access to energy across these economies is needed to support poverty alleviation efforts, but may prove to be both an economic and environmental liability if needs are not met in a more environmentally sustainable manner. Efficiency of resource use, in particular water resources, as well as investment in the natural systems which sustain the water cycle to ensure continued access to fresh-water resources has become increasingly critical.

Subregional cooperation is still very much focused on traditional environmental protection and pollution control measures. There have been some very positive initiatives by the governments of Japan and the Republic of Korea to improve the sustainability of production and consumption processes which could be further enhanced. China's efforts to improve the environmental sustainability of its energy use has already borne fruit, and further progress can be expected in other areas of resource use. These initiatives should impact positively, not only in China, but in the long run, also on the environmental situation in those countries which are suppliers of environmentally sensitive commodities.

End Notes

[1] ESCAP is the secretariat for the North-East Asia Subregional Programme on Environmental Cooperation, an intergovernmental initiative of which these countries are members. For this reason, the composition of this subregion is not consistent with the standard ESCAP-designated subregion.

[2] UNEP (2003). *DPR Korea: State of the Environment 2003* (Pathumthani, UNEP RRCAP), accessed on 12 October 2005 from <http://www.unep.org/PDF/DPRK_SOE_Report.pdf>.

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[5] Based on data from World Bank (2004), ibid.

[6] FAO (2004). *Selected Indicators of Food and Agriculture Development in Asia-Pacific Region: 1993-2003* (Bangkok, FAO Regional Office for Asia and the Pacific).

[7] ADB (2004). "Prevention and Control of Dust and Sandstorm in North-East Asia," RETA 6068 Draft working paper, July 2004, accessed on 20 October 2005 from <http://www.asiansandstorm.org/WORKING%20DRAFT%20RETA%206068.pdf>.

[8] Based on United Nations Population Division data from *World Urbanization Prospects: The 2001 Revision* (New York, United Nations).

[9] United Nations (2003). *World Population Prospects: The 2003 Revision*, United Nations publication, Sales No. E.04.XIII.6 (New York, United Nations).

[10] Energy intensities, or energy used per unit GDP, are a measure of the use of energy across the economy. The values reflect energy efficiency levels and also economic structures; a high energy intensity indicates relatively low energy efficiency or high contribution of energy-intensive economic activity to GDP.

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[14] Based on data from the Ministry of Environment, Republic of Korea, accessed on 2 November 2005 from <http://eng.me.go.kr/user/statistics/5_waste.html?msel=d5>.

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[20] National Development and Reform Commission of China (undated). Cleaner Production in China website "Environmental Legislation," accessed on 20 October 2005 from <http://www.chinacp.com/eng/cnenvleg.html>.

[21] See Japan for Sustainability website "Information Centre". "National Government Achieves 95% Green Purchasing in FY 2002 for Most Goods," article posted on 20 January 2004, accessed on 20 August 2005 from <http://www.japanfs.org/db/database.cgi?cmd=dp&num=576&dp=data_e.html>.

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[34] UNCCD Secretariat (2004), op. cit.

[35] Adyasuren Ts.Borjigdkhan (2005), op. cit.

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