Chapter 1

Overviews of Environmental Issues and Environmental Conservation Measures in China

This chapter is divided into six sections, containing information about China's environmental laws and regulations and other basic information required by Japanese companies when developing appropriate environmental measures for their business operations in China.

Section 1 describes the development of China's environmental policy, provides an overview of the environmental legislative system, and explains China's environmental administrative framework. Sections 2 to 5 deal with environmental controls related to air pollution, water pollution, industrial waste, and soil contamination, as the principle concerns for Japanese companies engaged in business operations in China. The discussion covers environmental laws and regulations, including specific emission standards, essential to each type of environmental control. Section 6 discusses the efforts of the Tianjin Environmental Protection Bureau (TianjinEPB) as an example of China's local environmental protection bureaus, which are the first point of contact for Japanese companies in day-to-day procedural matters relating to environmental regulations.

To augment the discussion in this chapter, the Appendices to this report contain translations of the Environmental Protection Law, on which China's environmental policy is based, and three other laws and regulations pertinent to specific environmental controls -- the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, and the Implementation of the Law on Water Pollution Prevention and Control. In addition, a translation of Tianjin's Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler is provided as an example of a more stringent standard implemented by a local environmental administration.

It should be noted that as field studies could only be conducted in Beijing and Tianjin, the information contained in this report basically pertains to those two areas only.

Section 1
Environmental Administration and Legislation in China

This section describes the features of China's environmental policy and outlines the environmental legislative and administrative framework. Readers should note that the field studies for this project were limited to Beijing and Tianjin only. Since Beijing is the capital of China, and neighboring Tianjin is one of the four municipalities directly under the central government, these two areas rank alongside the Shanghai region as having the highest level of economic development and administrative capability. The information herein therefore applies only to these two areas; it should not be assumed that the same environmental measures are being implemented nationwide.

1. China's Environmental Policy: Development and Distinctive Features

Environment protection as one of China's state policies

Along with population control, as represented by the one-child policy, China has made environmental protection one of its state policies and shows a determination to take positive action on environmental conservation. Environmental protection became a state policy as a result of a statement to that effect by Li Peng, then Vice-Premier of China, at the Second National Conference on Environmental Protection held in 1983. Since 1979, China has maintained a high rate of economic growth following its adoption of economic reform policies, opening up to the outside world, and transition to a market economy. One of the repercussions of this fast growth is a number of environment problems which cannot be ignored. Specifically, rapid economic growth has caused pollution of increasingly serious concern, including water and air pollution, waste problems, and natural disaster resulting from the destruction of nature caused by excessive logging and other economic activities. It is true that the growing gravity of China's environmental problems could soon hamper its economic growth.

The situation has raised alarm in the Chinese government. While holding environmental protection to be a state policy, China had previously emphasized economic development above all else. In recent years, the government has again started to promote environmental controls as a key policy. As well as strengthening the regulations on pollution, through the establishment of relevant legislation and a more robust administrative framework, the government has also started looking seriously at ways of preventing pollution before it becomes apparent. Such preventive measures include the enactment of the law to promote cleaner production, regulations on chemical substances, and plans to implement recycling laws.

According to figures released in January 2004 by the National Bureau of Statistics of China, the country's gross domestic product (GDP) for 2003 showed continuing strong growth, up 9.1% over the previous year, with per capita GDP topping US$1,000 for the first time. As a result, the Chinese government is trying to strike a balance between economic growth and environmental protection. At the Tenth National People's Congress held in March 2004, Premier Wen Jiabao himself cited "all-round, balanced and sustainable development of the economy and society" as one of the key tasks for fiscal 2004. He mentioned several specific policies, such as: (1) strict control over pollutant emissions by stepping up law enforcement, and speedy resolution of environmental problems that threaten public health and safety; (2) development of a recycling-based economy and promotion of cleaner production; (3) building of a society that conserves resources. While touching on these policies, Premier Wen reiterated and assured both national and international audiences that the government has every intention of taking positive action on environmental issues.

China's admission to the World Trade Organization (WTO) in December 2001 is accelerating the enactment of environmental legislation. This is because WTO membership requires the establishment and transparent operation of a basic legal framework.

Three founding environmental policies; nine environmental management regimes

China's environmental controls are founded on three environmental policies and nine environmental management regimes. In brief, the three environmental policies are:

(1) Prevention should be paramount, integrated with end-of-pipe treatment;
(2) The polluter should be responsible for treating pollution, developers should be required to protect the environment, and those who cause pollution (environmental destruction) should be penalized;

(3) Environmental management should be strengthened.

These three policies spell out the three fundamental principles behind China's environmental policies -- namely, pollution prevention, the "polluter pays" principle, and reinforcement of direct environmental controls through legislation.

The nine environmental management regimes based on these three environmental policies are as follows:

(1) Environmental impact assessment
(2) The "three synchronizations" (三同时), which requires that the design, construction, and operation of pollution treatment facilities be integrated into the overall design of projects;
(3) Pollutant discharge fees (pollution levies) (排污费);
(4) Responsibility for achieving targets;
(5) Quantitative evaluation of the urban environmental infrastructure;
(6) Centralized treatment of pollutants;
(7) Emission registration and licensing;
(8) Regime of pollution control deadlines;
(9) Corporate auditing of environmental protection.

The third of these regimes, the system of pollutant discharge fees, imposes emission charges (environmental penalties) on any organization that discharges pollutants, and is an environmental measure based on economic instruments. This system was already incorporated in the Environmental Protection Law of the People's Republic of China (Trial Version), enacted in 1979. Although the system of pollutant discharge fees was subsequently amended, it is noteworthy that China, then a developing country, adopted economic measures, in a form combined with a direct environmental regulatory scheme, a quarter of a century ago.

Progressive development of an environmental legislative and administrative framework

China's first efforts to develop proper environmental policies at the national level grew out of the First National Conference on Environmental Protection, held in 1973. The impetus for this conference was the attendance of a Chinese delegation at the United Nations Conference on the Human Environment (UNCHE), held the previous year in Stockholm, Sweden, as well as a number of major incidents of water pollution. The conference considered basic policy regarding environmental protection, and acknowledged "a number of regulations relating to protecting and improving the environment," which was subsequently notified as China's first environmental regulations by the State Council the same year. In 1974, China's first environmental administrative body, the Leading Group for Environmental Protection, was initiated under the State Council.

Environmental protection provisions were incorporated in the constitution when China revised it in 1978. Article 11 of the Constitution of the People's Republic of China (1978) states that "the State protects the environment and natural resources and prevents and eliminates pollution and other hazards to the public," a clear signal that initiatives on environmental protection are a responsibility of government. The following year, in 1979, China enacted the Environmental Protection Law of the People's Republic of China (for Trial Implementation), which was followed by a succession of laws, ordinances, and implementation regulations.

The 1982 amended constitution currently in force incorporates a substantial number of additional provisions relating to the environment, and to the protection of natural resources in particular. Among others, these provisions stipulate that "the State protects and improves the living environment and the ecological environment, and prevents and remedies pollution and other public hazards," and "the State organizes and encourages afforestation and the protection of forests," and "the appropriation or damage of natural resources by any organization or individual by whatever means is prohibited." That is, the government's responsibilities in protecting natural resources and cultural assets are laid down in law.

China's environmental administrative framework has also been given greater authority and clout. In 1982, the Leading Group for Environmental Protection became the State Environmental Protection Bureau

(SEPB), under the Ministry of Urban and Rural Construction and Environmental Protection. In 1984, the SEPB was restructured as the State Environmental Protection Commission (SEPC). In 1988, as China progressively established a broad framework that would unify environmental administration nationwide, the SEPC became an agency directly under the State Council.

The Environmental Protection Law, implemented on a trial basis in 1979, was enacted as a full-fledged law in 1989, establishing most of the aforementioned nine environmental management regimes in the statute books. Thus, around the same year as the Environmental Protection Law was enacted, China's framework environmental legislation and administrative organization had been largely completed.

Subsequently, in 1998, the SEPC was elevated to the status of State Environmental Protection Administration (SEPA).

The Environmental Protection Law at the heart of China's environmental legislative system

The foundation of China's system of environmental legislation is the Environmental Protection Law of the People's Republic of China, enacted on a trial basis in 1979 and re-enacted in revised and augmented form in 1989. Under this law, seven other separate laws have been enacted for controlling industrial pollution. These are the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, the Law of the People's Republic of China on the Prevention and Control of Water Pollution, the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, the Marine Environment Protection Law of the People's Republic of China, the Law of the People's Republic of China on the Environmental Impact Assessment, the Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise, and the Law of the People’s Republic of China on the Promotion of Clean Production. Other independent laws relating to wildlife protection and forestry conservation have also been established under the Environmental Protection Law.

In addition to these individual laws, numerous administrative regulations have been enacted by the State Council to give teeth to the environmental legislation. There are three types of regulations: (1) by-laws drafted to augment the individual laws; (2) ordinances, provisions, and notices covering areas not provided for in the individual laws; and (3) decisions and decrees that give guidelines and principles on specific measures to protect the environment. Among the by-laws concerned with industrial environmental controls are the Implementation of the Law of the People's Republic of China on Atmospheric Pollution Prevention and Control and the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control. Environmental ordinances include the Ordinance on Levying for Discharge, and environmental decisions include the Decisions of the State Council on Several Issues Concerning Environmental Protection.

Precedence of local emission standards

As well as the national environmental legislation discussed above, China has a large number of related regulations laid down by local administrative bodies, such as provinces and government-controlled municipalities (similar to cities specially designated by the government ordinance in Japan). Local environmental regulations are said to number more than 1,000. There are several different types of regulations, including those equivalent to a basic environmental law that applies to specific provinces and government-controlled municipalities, corresponding to the Environmental Protection Law at the national level. Local regulations also include ordinances and rules for handling specific environmental problems and environmental practices in a manner distinctive to that locality. Tianjin (one of China's four municipalities directly under the central government), where field studies for this report were conducted, has a large number of environmental regulations in place. They include the basic environmental law, the Tianjin Environmental Protection Ordinance, together with the Tianjin Air Pollution Prevention Ordinance and the Tianjin Management Measures for the Environmental Protection of Building Projects.

In China, the emission standards governing discharge of factory pollutants, which most affect the environmental practices of Japanese companies, are prescribed separately, not under the provisions of the Law on the Prevention and Control of Atmospheric Pollution or the Law on the Prevention and Control of Water Pollution. Under Article 9 of the Environmental Protection Law, the State Environmental Protection Administration (SEPA) may determine emission standards at the national level, and the governments of provinces, autonomous regions, and government-controlled municipalities may determine emission standards at the local level. Under Article 10, local governments may establish their own standards for items not specified in the national standards, and may set pollutant emission standards which exceed the national standards. The Environmental Protection Law therefore provides for extension of the range of application and greater stringency in emission standards at the local level. Consequently, both national and local emission standards may sometimes coexist. Moreover, where emission standards are prescribed at both national and local levels, the local standard takes precedence.

Among the national emission standards currently in place that have a significant bearing on industrial environmental practices are the Integrated Emission Standard of Air Pollutants and the Integrated Wastewater Discharge Standard, which indicate the allowable emission levels for each type of pollutant. Tianjin, where field research was conducted, has implemented emission standards for boiler flue gases and odors that are more stringent than the national standards.

Vital role played by long-term environmental protection plans

While China has sought to establish an environmental legislative system and administrative framework, it has also set explicit goals relating to environmental protection in each of its Five-Year Plans for National Economic and Social Development since the Sixth Five-Year Plan announced in 1982. Based on these stated goals, over recent years China has prepared several long-term plans related to environmental issues. In 1993, China's Environmental Action Plan (1991-2000) was announced. In 1996, the Ninth Five-Year Plan for National Environmental Protection and the Long-Term Targets for the Year 2010 were issued. The Tenth Five-Year Plan for National Environmental Protection was announced in 2001. These plans play an important role in directing government strategy for environmental protection over a set length of time. They state the objectives and basic thrust of the environmental policies to be implemented during the period, and the areas that will be a particular focus of environmental efforts.

In the Ninth Five-Year Plan for National Environmental Protection issued in 1996, the stated objectives are to establish environmental management and legislative systems, and to curb pollution and worsening ecological destruction. Among the specific initiatives covered in the plan are the prevention and improvement of industrial pollution (emphasizing air and water pollution measures, but also directing efforts toward the control of solid wastes, noise, and radioactive contamination), environmental protection measures for specific regions (key watershed areas), and building and strengthening environment management capacity through environmental structures established at the county level.

The State Council Decision on Problems Regarding Environmental Protection, issued in August 1996, about the same time as the Ninth Five-Year Plan, sets forth 10 mechanisms for achieving the plan's environmental objectives. These mechanisms include: (1) Clearly defined improvement targets and implementation of a system of environmental administrative responsibilities; (2) Clearly defined key issues and drastic solutions to regional environmental problems (three rivers, three lakes, two air pollution control zones, and one municipality are designated as key environmental control areas); and (3) strict inspection and firm pollution control by strengthening the "three synchronizations"(三同时) system.

China subsequently began a number of environmental initiatives based on the Ninth Five-Year Plan. For example, a variety of measures targeted to the end of 2000 were implemented under the banner of “one control and double attainments”(一控双达标). The "one control"(一控) in this slogan means that the total emission loads of major pollutants in all regions nationwide should be kept within State-specified levels (1995 standards). The "double attainments"(双达标) requires that pollutant emissions from all industrial sources nationwide should meet both national and local standards by the target date. In addition, by the end of 2000, general air and water quality in centrally-governed municipalities, provincial capital cities, cities within special economic zones, open coastal cities, and major tourist cities should meet the relevant national standards applicable to the particular city.

The Tenth Five-Year Plan for National Economic and Social Development and Tenth Five-Year Plan for National Environmental Protection, announced in 2001 and currently in force, is aimed at significant improvement of the quality of the environment in cities, rural towns, and particularly in large and medium-sized cities by 2005. It contains specific initiatives, including target values, such as: (1) Reducing the total emission pollutant load (air pollution, water contaminants, and solid waste) by 10% from 2002 levels; (2) Building sewage treatment facilities in all cities and treating 45% of urban sewage water by 2005; (3) Implementing an air pollution control project in the "two control zones" (acid rain control zone and sulfur dioxide (SO_2) control zone), and reducing the total SO_2 emission load in these two control zones by 20% from 2000 levels by 2005; and (4) Establishing regulations on sources of industrial pollution, and powers to shut down any enterprise responsible for severe pollution that damages public health.

<u>Keywords for understanding the distinctive features of China's environmental policy</u>

In order to understand China's environmental policies and regulations, readers need to know several keywords, including the names of China's special environmental management systems and distinctive slogans or jargon.

(1) Keywords related to environmental management regimes

- Three synchronizations (三同时)
  A concept applied to factory construction, expansion, and renovation projects, requiring facilities for preventing anticipated environmental pollution to be designed, constructed, and put into operation at the same time as each stage of the planning, construction, and operation of the main construction project.

- Pollutant discharge fees (pollution levies) (排污费)
  Basically, a regime that imposes emission charges on any enterprise or organization that discharges pollutants (effluents, waste gas, or solid wastes), embodying the "polluter pays" principle. This regime originally applied to pollutants in excess of the emission standards. It was revised in July 2003, however, due to criticisms that the fees paid were less than the cost of implementing the policy. The amended regime now penalizes any emission of air pollutants or water contaminants even if the level does not exceed the standards.

- Responsibility for achieving targets
  A system that sets forth the practical environmental targets to be attained by the heads of provincial, municipal, and county governments during their term of office. The signing of a written statement of responsibility for achieving those targets is required.

- Quantitative evaluation of the urban environmental infrastructure
  A set of indicators for quantitatively evaluating the environmental performance and infrastructure of major cities according to a points system.

- Centralized treatment of pollutants
  A system aimed at efficient, centralized treatment of pollutants through centralized urban sewage treatment, and the construction and operation of effluent treatment facilities by cooperation between related industries.

- Emission registration and licensing
  The emission registration system requires organizations emitting pollutants to register with the environmental administrative authority in the area, and give details about their facility, the types of emissions, volumes and concentrations, and other such data. This basic data serves as the basis for levying pollutant discharge fees and is useful in assessing the organization's environmental

circumstances. Under the emission licensing system, a license is granted if the organization emitting pollutants adheres strictly to the emission standards and if the total emission load is appropriate, given the environmental capacity of the region. The system thus serves as a basis for implementing quantitative management and total emission control of pollutants.

- Pollution control deadlines
  A regime that requires any enterprise that exceeds the emission standards to improve its performance within a set period of time. Steps are taken if the enterprise is unable to comply. For example, the enterprise may be fined, its operations suspended, or its factory shut down.

(2) Other terminology

- Three wastes
  Waste gas, wastewater, and solid wastes.

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  Represents three rivers (Huaihe, Haihe, and Liaohe), three lakes (Taihu, Chaohu, and Dianchi Lake), two air pollution control zones (SO_2 control zone and acid rain control zone), one city (Beijing), and one marine area (Bohai Sea). These are priority regions where the Chinese government is focusing its environmental efforts.

- Two-control zones
  SO_2 control zone and acid rain control zone.

- Zero-hour (0 a.m.) campaign
  The enforcement of emission regulations on factories in key regions according to stipulated time limits (by 0 a.m. on a specified date).

2. Legislation Related to China's Industrial Environmental Measures

Four anti-pollution laws of particular relevance

China's environmental legislative system is based on the 1982 revised constitution as the highest level of authority. Under the constitution is the founding law on environmental policy, the Environmental Protection Law (1989). Under this law there are separate laws aimed at preventing specific categories of pollution, such as air and water pollution, and other laws for protecting natural resources, such as the Law on the Protection of Wildlife. Implementation by-laws have been enacted in response to these individual environmental laws, and a body of administrative regulations comprising ordinances, provisions, and directives have been issued in regard to areas not covered in the statutes. The State Council and State Environmental Protection Administration (SEPA) have also issued a large number of decisions, rules, and circulars to publicize guidelines and principles relating to specific issues. In addition, China has set emission standards and enacted a number of national laws in response to specific international environmental treaties, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Besides these environmental statutes at the national level, more than 1,000 local environmental regulations applicable only to a specific region are in force nationwide. These huge number of environmental regulations form a pyramid of legislation with the constitution at the top.

Among the laws with particular relevance to industrial environmental measures are the Environmental Protection Law, the four pollution control laws (the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, the Law on the Prevention and Control of Environmental Pollution by Solid Waste, and the Law on Prevention and Control of Pollution from Environmental Noise), related by-laws and ordinances, and general air and water emission standards. The same category of local environmental regulations enacted by the people's governments of the various provinces should also be noted. Outside the area of industrial pollution, China has recently started to beef up controls on chemical substances and soil contamination. The Regulations on the Environmental Administration of New Chemical Substances (effective October 2003), the Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products (due to come into effect in 2005), and the Environmental Quality Risk Assessment Criteria for Soil at Manufacturing Facilities issued by SEPA in 1999 may also have a bearing on the industrial environmental practices of Japanese companies.

Although not directly regulating pollutants, the Law on Environmental Impact Assessment (enacted in October 2002 and in force since September 2003), and the Law on the Promotion of Cleaner Production (enacted in June 2002 and in force since January 2003) are also very relevant to industrial environmental practices. China's implementation of the latter law will be watched with interest. As well as encouraging companies to take action on matters such as conserving resources and using them effectively, the Law on the Promotion of Cleaner Production requires companies to disclose environmental information and to undergo official certification of their cleaner production standards. In 2004, China is expected to enact a Household Appliance Recycling Law (provisional title) to promote the reuse of used electrical products. In parallel with overhauling legislation focused on traditional anti-pollution measures that target the "three wastes," China is also starting to construct a new legal framework aimed at building a recycling-based society, as in developed countries.

The Environmental Protection Law: Aimed at balancing environmental and economic interests

The present Environmental Protection Law of the People's Republic of China forms the basis of China's environmental policy and results from a complete revision in December 1989 of the old Environmental Protection Law (EPL) enacted and enforced on a trial basis in 1974. An English translation of the newer EPL is contained in Appendix 1. The law consists of six chapters. Its purpose, as stated in Article 1, is "protecting and improving people's environment and the ecological environment, preventing and controlling pollution and other public hazards, safeguarding human health and facilitating the development of socialist modernization." In Article 4, the policies under the EPL are required to be "favourable for environmental protection with economic construction and social development."

The EPL also mentions the division of functions between the competent environmental administrative department under the State Council (which actually refers to the State Environmental Protection Administration) and local environmental authorities. For example, the EPL states that "the competent department of environmental protection administration under the State Council shall, in accordance with the national standards for environment quality and the country's economic and technological conditions, establish the national standards for the discharge of pollutants." This statement thus establishes legal grounds that enable local governments to determine more stringent criteria, or an extended range of application, than provided by the national emission standards.

The EPL includes pertinent descriptions about China's basic environment management regimes, such as the environmental impact assessment system, "three synchronizations," emission registration and licensing and pollution control deadlines, and sets forth the grounds for implementing these environmental management regimes. Enterprises wishing to build or renovate a factory are required to deploy production technology that produces minimal pollutants and uses resources with a high level of efficiency. In addition, the EPL recognizes the right of all organizations and individuals to report on or file charges against those who cause pollution.

Nevertheless, the Environmental Protection Law consists of just 47 provisions in total, and goes no further than indicating general principles. Specific environmental regulations are executed in accordance with the various pollution prevention laws, administrative provisions, and emission standards established individually under this basic law.

Regulations related to the "three wastes" central to China's environmental controls

China's environmental controls are grounded in anti-pollution measures based on the "three wastes" (waste gas, effluents, and solid wastes). Statutes related to these concepts include the Law on the Prevention and Control of Atmospheric Pollution, the Law on the Prevention and Control of Water Pollution, the Law on the Prevention and Control of Environmental Pollution by Solid Waste. The first two of these laws are further amplified by another two regulations, the Implementation of the Law on Atmospheric Pollution Prevention and Control and the Implementation of the Law on Water Pollution Prevention and Control. Emission standards based on these laws stipulate the actual limits on factory emissions and are separately enacted. These are the Integrated Emission Standard of Air Pollutants, Emission Standard of Air Pollutants for Coal-Burning Oil-Burning Gas-Fired Boilers, and the Integrated Wastewater Discharge Standard, all of which have particular relevance for Japanese companies.

Apart from these statutes at the national level, environmental regulations have been enacted in many regions in the form of ordinances, directives, and decrees pertaining to air pollution, water contamination, and solid wastes. As already mentioned, local environmental regulations take precedence where relevant regulations exist in the locality in which a factory is sited. It is therefore required to carefully gather information about pollutant emission standards specific to a region, since they are often more stringent or have greater scope than the national standards.

(1) Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution

The Law on the Prevention and Control of Atmospheric Pollution was enacted in 1987 and amended twice, in 1995 and 2000. The 2000 revision was determined by the Standing Committee of the Ninth National People's Congress in April of that year, and the revised law came into effect in September 2000. An English translation of this law is contained in Appendix 2. The law includes basic provisions about the requirements and procedures for conducting an environmental impact assessment when constructing or extending a factory or other facility that emits air pollution, the implementation of pollutant discharge fees (pollution levies) and a system of total emission control for air pollutants, the right of environmental administrative authorities to make on-site inspections, measures for preventing air pollution caused by coal burning, measures for preventing waste gas, dust and odors, and the penalties imposed on polluters. Incorporated in the 2000 revision are a number of robust provisions relating to, in particular, air pollution from coal burning, and the designation of key cities for the control of air pollution (centrally-governed municipalities, provincial capitals, and open coastal cities).

Section 2 in this chapter provides more detailed information, including specified emission limits, regarding the two emission standards (Integrated Emission Standard of Air Pollutants and Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boilers) that have direct relevance to the air pollution prevention measures implemented by Japanese companies.

(2) Law of the People's Republic of China on the Prevention and Control of Water Pollution

The Law on the Prevention and Control of Water Pollution is aimed at preventing water contamination, another major form of environmental pollution in China. It came into effect following its adoption by the Standing Committee of the Sixth National People's Congress in 1984, and was revised in 1996. An English translation of the revised law is contained in Appendix 3. The law applies to surface waters (rivers, lakes, canals, irrigation channels, reservoirs, etc.) and groundwater. Marine pollution is regulated separately, under the Marine Environment Protection Law of the People's Republic of China (enacted 1982, revised 1999). The Law on the Prevention and Control of Water Pollution incorporates a wide range of provisions regarding the prevention of water pollution, including the establishment of environment water quality standards and water contaminant discharge standards governing appropriate levels in the water environment, the implementation of environmental impact assessments at construction projects, promotion of centralized urban sewage treatment, measures to protect domestic and drinking water resources, prevention of surface and groundwater pollution, and penal provisions.

Provisions relating to corporate activities include the implementation of environmental management regimes such as the "three synchronizations" system for preventing water pollution, pollutant discharge fees (pollution levies), and emission registration. In regard to pollutant discharge fees, the law states that "enterprises and institutions that discharge pollutants into a water body shall pay a pollutant discharge fee in accordance with State regulations; if the discharge exceeds the limits set by the national or local standards, they shall pay a fee for excess discharge according to State regulations" (Article 15). That is, the polluter is required to pay fees even if the emission standards are not exceeded. The law also states that environmental administrative authorities are empowered to conduct on-site inspections. Other features of this law include the requirement that the opinions of the people living in the vicinity of a construction project should be included in the environmental impact report, the recognition of the right of any party affected by water pollution to claim damages, and the effective utilization of water resources.

Section 3 in this chapter provides more detailed information, including specified emission limits, regarding the Integrated Wastewater Discharge Standard, which has direct relevance to the air pollution prevention measures implemented by Japanese companies. An English translation of the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control is contained in Appendix 4.

(3) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste

China is pursuing measures on waste management under the Law on the Prevention and Control of Environmental Pollution by Solid Waste, which was enacted in 1995 and came into effect in 1996. Aimed at preventing pollution caused by waste, the law sets forth provisions relating to solid waste management infrastructure, and solid waste collection, storage, transportation, and treatment. As China has made the promotion of waste reduction and "comprehensive reuse" (recycling) of resources one of its key policies, a number of provisions to this end are incorporated in the law, including the three principles of solid waste treatment (waste reduction, decontamination, and recycling), and responsibilities and obligations regarding recycling and management of solid waste.

Under this law, solid wastes are classified into three types: (1) solid and semi-solid wastes generated by industrial activity (industrial waste); (2) waste generated in daily life and consumer activities (domestic waste); and (3) dangerous waste included in industrial and domestic wastes (hazardous waste). Of these three types, the hazardous wastes that are relevant to the environmental measures of Japanese companies can be found in the National Catalogue of Hazardous Wastes. Substances that are highly toxic or carry a high environmental risk, and wastes that are difficult to treat or dispose of by ordinary means, such as PCBs, medical waste, and fly ash emitted from waste incinerators, are listed as scheduled hazardous wastes.

The provisions of the law also make enterprises responsible for treating any industrial solid waste that they generate. However, as China is said to have, at present, only one facility (in Tianjin) that is capable of comprehensively treating and disposing of hazardous waste, it may be some time before all industrial solid waste can be treated in accordance with the legislation.

The Law on the Prevention and Control of Environmental Pollution by Solid Waste is currently in the process of revision. The revised law is expected to come into force in 2004.

(4) Other statutes relating to industrial waste management

Among other laws relating to pollution prevention and of direct relevance to Japanese companies' environmental practices is the Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise, enacted in 1996 and effective since 1997. This law regulates all environmental noise generally, but includes a chapter specifically about the prevention of industrial noise.

Under this law, where noise is generated from stationary equipment, the factory must report details about that noise source, and about the noise levels during normal work conditions, to the competent local environmental administration. Factories must also meet the Industrial Enterprise Boundary Noise Standard, which came into effect in 1990. Under this standard, the specified noise limits for a factory located in an industrial zone, for example, are 60 dB(A) Leq (equivalent continuous sound level) for the daytime period (6 a.m. to 10 p.m.) and 55 dB(A) Leq for the night period outside these hours. Fines are imposed on violators, who are required to pay pollutant discharge fees in accordance with the degree of violation, based on the Ordinance on Levying for Discharge discussed below.

The Ordinance on Levying for Discharge puts into practice one of China's distinctive environmental controls, the system of pollutant discharge fees (pollution levies). The ordinance is a revision of the Interim Measures on the Collection of Pollution Discharge Fee, enacted in 1982, and came into effect in July 2003. The Measures for the Administration of the Charging Rates for Pollutant Discharge Fees, an order that states how actual charges are to be calculated, came into effect at the same time as the 2003 ordinance. Under these regulations, pollutant discharge fees are levied for four types of waste (wastewater, waste gas, solid waste and hazardous waste, and noise). Of these four types, discharge fees are levied for entire discharge volumes of wastewater and waste gas, according to the pollutant type and volume, and an excessive discharge fee is additionally levied for wastewater discharge that exceeds the emission standards. Further, pollutant discharge fees are levied if waste or noise violates any statutes in force. In regard to waste, in particular, payment of fees is obligatory for waste that fails to meet related standards, whether or not storage and disposal facilities are available.

The Law of the People's Republic of China on the Environmental Impact Assessment was enacted in 2002 and came into effect in 2003. China had formerly conducted environmental impact assessments (EIAs), of new factories and other construction projects, on the basis of the provisions in the Environmental Protection Law. The Law on Environmental Impact Assessment put China's EIA system on a sound legal footing and clarified its scope of application. The law provides for three stages of assessment, according to the extent to which a construction project affects the environment, and sets forth requirements for drafting EIA documents. An environmental impact statement must be prepared if the project potentially has a major environmental impact, or an environmental impact report form if the environmental impact is likely to be slight. Where the environmental impact is expected to be very minor, instead of carrying out an EIA, the company is required to fill in an environmental impact registration form. In addition, the law prescribes the particulars that must be noted in environmental impact statements, and the procedures to be followed by the competent authorities in examining EIA documents.

Since an environmental impact assessment is basically required for all construction projects that affect the environment, including new construction, renovation, and expansion of existing facilities, the same requirement naturally applies to the construction of factories or additional facilities by Japanese companies. However, the assessment procedure is simplified considerably if the project being undertaken is located in an industrial park (generally known as an "economic development zone") where environmental impact assessments have already been conducted.

The Law on Environmental Impact Assessment also requires a classification and management list relating to the environmental impact assessment of construction projects to be drawn up separately by the State Environmental Protection Administration (SEPA). However, partly because this research was conducted just a few short months after the law came into force, it was not possible to obtain the list.

(5) Drafting environmental statutes from a new standpoint

A number of laws will become fully operative in the years ahead, including the aforementioned Law on the Promotion of Cleaner Production (effective January 2003) and the Regulations on the Environmental Administration of New Chemical Substances (effective October 2003), which is the counterpart of Japan's Chemical Substances Control Law (otherwise known as the Law concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances). Meanwhile, new types of environmental statutes are due to come into effect in the near future, including the Management Methods for the Prevention and Control of Pollution from Production of Electronic Information Products, promulgated in response to the EU directive banning the use of certain hazardous substances in electronic and electrical equipment, and the Household Appliance Recycling Law (provisional title). In the future, an environmental legislative system built from a new standpoint, and based on the same concept of creating a "recycling-based society" as in Japan, is expected to be established in China at a rapid pace. Japanese companies, too, will be required to take new initiatives that go beyond mere compliance with end-of-pipe pollution controls.

Promoting policies that encourage companies to gain ISO 14001 certification

In tandem with environmental measures based on the various environmental laws and regulations discussed above, China is also moving forward with policies that will act as incentives for companies to voluntarily build environmental management structures. A typical example is the introduction of an environmental management system that draws on the ISO 14001 series of international environmental management standards. The aim is to give greater clout to industrial environmental controls generally, by encouraging enterprises to adopt a positive stance on addressing environmental issues. The demand for management methods based on international standards, driven by a developing market economy, also appears to have had an indirect bearing on China's present approach.

As of December 2003, the number of companies in China with ISO 14001 certification had reached 5,064, the second highest number in the world after Japan, which has 13,000 ISO 14001-certified companies. Given that China ranked just tenth in the world, with roughly 1,000 certified companies, two years ago at the end of 2001, it becomes apparent how quickly the number is rising. The Chinese government has put tax incentives in place to encourage further companies to achieve certification.

ISO 14001 certification was first achieved in China in 1997 by four companies, including a Japanese electrical products manufacturer. In 1998, China introduced a national approval scheme for ISO 14001 certification and initiated a system of examination of certification entities by a national accreditation body and national registration of auditors. At present, the China National Accreditation Board for Certifiers (CNAB), established under the Certification and Accreditation Administration of the People's Republic of China (CNCA), is an accreditation body corresponding to the Japan Accreditation Board for Conformity Assessment (JAB) in Japan. Under the CNAB there are 118 certification entities, counting those for ISO 9000 certification. Most of these were established with some sort of backing from governmental agencies. They are said to include seven or eight foreign certification agencies operating in a joint venture form.

During our field study, we had the opportunity to visit the Environmental Certification Center of the State Environmental Protection Administration (SEPA). The center is a certification body that was established in 2003 by incorporating four certification agencies already in existence under the supervision of SEPA. It is one of the largest certification bodies in China. Although "SEPA" appears in its name, the center is run as a financially independent private company. It has a staff of about 60, of whom 40 are qualified ISO 14001 auditors. In addition, there are about 300 people nationwide who serve as auditors in conjunction with other work, such as researchers in research organizations.

Over the past year, the Environmental Certification Center processed approximately 200 applications for ISO 14001 certification. These were primarily fast-growing, small and medium-size Chinese companies, with Japanese companies accounting for around 10%. The standard screening fee for acquiring ISO 14001 certification at the center is RMB30,000 (approximately JPY 450,000), which is roughly one seventh of the fees required in Japan.

Many Japanese companies in China are working hard to obtain ISO 14001 certification. Of the 12 Japanese companies visited in this survey, five have already qualified. All these companies decided that implementing a properly constructed in-house environmental management system would be helpful as a preventive measure to avoid contravening emission standards and so on, and would be advantageous from a business point of view.

3. China's Environmental Administration

China's administrative structure is organized into five levels: the national (central) level, provincial level (provinces, autonomous regions, and municipalities directly under the central government), city level, county level, and town and village level. The structure of environmental administration follows the same five-level hierarchy. At the national level is the State Environmental Protection Administration (SEPA), which is directly under the State Council. The local administrative structure consists of Environmental Protection Bureaus (EPBs) set up at the provincial, city, and county levels.

State Environmental Protection Administration at the center of China's environmental administrative framework

China's first national environmental administration, the Leading Group for Environmental Protection, was established under the State Council in 1974. It later evolved into the State Environmental Protection Bureau under the Ministry of Urban and Rural Construction and Environmental Protection (established in 1982), and then into the State Environmental Protection Commission (established in 1984). The present national environmental administration, the State Environmental Protection Administration (SEPA), was launched in 1988.

SEPA consists of 10 departments, including the Department of Policies, Laws and Regulations, Department of Pollution Control, and Department of Environmental Impact Assessment. As well as responsibilities related to environmental protection in general, SEPA is charged with managing nuclear safety. It has 210 employees.

SEPA has a wide scope of responsibility, as prescribed by the Environmental Protection Law. Major responsibilities include: (1) Supervising and managing environmental protection activities throughout the country; (2) Establishing national standards for environmental quality and for pollutant emissions; (3) Building and managing environmental monitoring systems; (4) Preparing environmental news bulletins; (5) Drafting and implementing plans for environmental protection; (6) Approving environmental impact reports; (7) Inspecting facilities that discharge pollutants; (8) Making inspections in regard to the "three synchronizations" system and approving pollution treatment facilities; (9) Collecting and registering pollution discharge data; (9) Levying pollutant discharge fees; (11) Enforcing penalties on polluters and applying to the People's Court for compulsory enforcement.

For Japanese companies, the first point of contact in regard to environmental measures is normally the local Environmental Protection Bureau (EPB), described in the following paragraph. In some cases, however, SEPA is directly responsible for approval of new large-scale projects, such as cement plants and steel plants, involving certain types of industrial pollution.

While SEPA and the EPBs have a vertical relationship, SEPA has no authority over the personnel or financing of EPBs at the provincial level. The relationship is more akin to a loose, cooperative association, with SEPA providing operational guidance only.

Environmental Protection Bureaus handling routine procedural matters

In principle, Environmental Protection Bureaus (EPBs) are set up within local administrations at the provincial level, city level, and county level. In the course of this research, however, it was not possible to verify whether an EPB is in place in every local administration from the county level upward. At least in Tianjin, where we were able to conduct field studies, we found that all 21 city districts and counties had an EPB.

EPBs are charged with a wide range of responsibilities. Except for establishing environmental quality and pollutant emission standards, and for building environmental monitoring systems, EPB’s functions are similar to those of the State Environmental Protection Administration (SEPA). For Japanese companies, the local EPB is a familiar entity with which close contact is required in the course of assessing the environmental impact of factory construction projects, and for various procedural matters such as day-to-day environmental monitoring, payment of pollutant discharge fees, and so on.

As mentioned above, local administrations in China can set emission standards that are more stringent than the national standards, or that regulate pollutant parameters not covered in the national standards. EPBs have no authority to formulate emission standards, which is granted only to local governments at the provincial level and above.

4. China's Environment Policy: Challenges for Future Development

Over the past quarter of a century, China has achieved enormous economic growth through an economic development policy that emphasizes industrialization. On the other hand, the rapid increase in air and water pollution, and in the volumes of waste generated particularly in urban areas, is causing serious damage to the environment. Any further worsening of China's environmental problems could become constraining factors on sustained economic growth. In 1979, dubbed as China's "first year of high economic growth," the Chinese government enacted the Environmental Protection Law of the People's Republic of China (for Trial Implementation) and embarked on building the environmental regulatory system and administrative framework described earlier in this section. In fact, however, these environmental policies, and the measures based on them, failed to stop China's environmental problems from growing worse.

With the Beijing Olympics opening in 2008, and the World Expo 2010 to be held in Shanghai, China's high economic growth is expected to continue over the coming years. However, regional disparities such as the various differences between urban and rural areas, and the economic gap that exits between the coastal region, which has achieved relatively high economic development, and the hinterland, which failed to catch the wave of development, are becoming problems of increasing proportions that will likely impact on the future development of environmental policy in China.

Since the various environmental regulations that apply to Japanese companies are handled in principle by Environmental Protection Bureaus (EPBs), the emerging regional disparities will necessarily produce differences in capacity between the various EPBs. Very effective environmental regulations are being implemented by local governments in the economically developed coastal regions. Having a certain amount of financial discretion and administrative clout at their disposal, they can develop specific measures of their own, such as adopting emission standards that are more stringent than required by the national environmental policy. In the economically backward hinterland, however, insufficient funding and a lack of professional staff hamper local governments from implementing State-issued environmental statutes, and factory pollution regulations are far from being carried out in any adequate way.

Staff at SEPA, which we visited in the course of this research, acknowledge these problems and said that although the anti-pollution regulations apply everywhere in China, it is true that regional discrepancies exist in practice in environmental management. The main reason, they said, is lack of expert staff.

To date, Japanese companies have established production bases predominantly in coastal areas, particularly around Shanghai, and in areas such as the Yangtze River Delta area, Guangdong, Jiangsu, Liaoning, and Tianjin. More recently, however, a growing number of Japanese companies are choosing to locate in the hinterland to take advantage of the ample labor supply. If this trend continues, the disparities in capabilities among EPBs will have a major impact on the environmental practices of Japanese companies. They will need to take a high level of voluntary action on environmental matters to make up for the inadequate administrative capability.

Although the various challenges that China faces rule out any immediate change, it is to be hoped that a transparent administrative framework will be put in place as soon as possible, enabling the environmental policies and discharge controls determined by the central government to be applied uniformly across the whole country, and that environmental controls without regional disparities will soon be implemented.

Section 2
Air Pollution Management

1. China's Air Pollution Regulations

Air pollution control focused on sulfur dioxide

Air pollution caused by sulfur dioxide (SO_2), nitrogen oxides (NOx), particulate matter (where particulate matter less than 10 microns in size is measured as total suspended particulate matter (TSP)), and other pollutants is becoming a serious problem throughout China. The environmental regulations give high priority to controlling waste gas. Regulations are currently in force for total emission control of three types of air pollutants -- sulfur dioxide, industrial particulate dust, and sooty smoke. To strengthen controls on pollution caused by sulfur dioxide, areas specially designated as "SO_2 control zones" and "acid rain control zones," where controlling sulfur dioxide is given particular emphasis, were set up in 1998. The combined area of these two control zones is roughly 1.1 million km^2, amounting to just 11% of China's total territory, but they are estimated to account for more than 60% of sulfur dioxide emissions nationwide.

Sulfur dioxide and dust are caused primarily by burning coal, which has a high sulfur content and is widely used as fuel in China. Consequently, the Chinese government is pressing forward with air pollution controls and has introduced various measures as part of its emission control program. These measures include prohibiting the use of high-sulfur coal, banning the construction of coal-fired power plants in urban areas, and requiring thermal power plants to install desulfurization equipment. However, air pollution from the rapidly increasing numbers of motor vehicles and other mobile sources is becoming serious, and the pollution problem is not getting any better. According to recently published measurements for 2003, acid rain was recorded in more than half of the cities in China.

China's air pollution controls are based fundamentally on the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution, revised in September 2000. Among the provisions of this law are requirements for environmental impact assessment when constructing a new factory that is likely to produce air pollution, an environmental management regime for collecting pollutant discharge fees (pollution levies), and controls governing the total emission load of specific air pollutants. In addition, the law provides for national air pollution emission standards to be set by the State Environmental Protection Administration (SEPA), and for region-specific air pollution emission standards to be set by local people's governments at the provincial level and above. The law incorporates provisions not only about controlling air pollution from stationary sources, but also about curbing air pollution from mobile sources such as automobiles and ships, and about preventing offensive odors.

China's legislative system prescribes only principles in law, while emission standards and other specific environmental controls are given in by-laws and a large number of ordinances, directives, decrees, and other regulations. Similarly, the Law on the Prevention and Control of Atmospheric Pollution lays down basic principles only regarding air pollution control, while particulars about implementing the controls are given in related regulations. Numerous ordinances and decrees are prescribed at the local level, too.

Two pieces of legislation directly affect the day-to-day air pollution measures of Japanese companies. These are the Integrated Emission Standard of Air Pollutants and the Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boilers. These standards define emission standards for air pollutants from factories, and are laid down by SEPA, based on the Law on the Prevention and Control of Atmospheric Pollution. Details about these standards are described below, but it should be remembered that these are emission standards at the national level. Note also that, as mentioned above, emission standards that are more stringent than the national standards may be drafted by the local government of a particular region and, if so, the local standards apply.

2. Specific Waste Gas Controls Applicable to Factories

China's emission standards relating to air pollutants can be divided into two categories: those for a particular industry or particular type of pollution, and general standards specified in the Integrated Emission Standard of Air Pollutants. The former are prescribed for five types of stationary sources (boilers, thermal power plants, industrial kilns and furnaces, coke ovens, and cement plants), two types of mobile sources (motor vehicles and motorcycles), and eight types of facilities that discharge malodorous substances. All other air pollutant emission sources, including factories in general, are subject to the emission standards in the Integrated Emission Standard of Air Pollutants. Since Japanese companies are mainly manufacturing industries, the emission standards of greatest relevance to their day-to-day business activities are the integrated standards and the emission standard for boilers. The following explanation is therefore limited to these two standards only.

(1) Integrated Emission Standard of Air Pollutants

China's Integrated Emission Standard of Air Pollutants was enacted in 1996 and came into effect in 1997. The standard prescribes two sets of emission limits, one set for new facilities installed on or after January 1, 1997, and another set for existing facilities installed prior to that date. Table 1-2-1 lists the emission limits for new facilities (installed on or after January 1, 1997), as these would be the most relevant standards for Japanese companies going to operate in China.

As many as 33 air pollutants are covered in the integrated standard, ranging from general pollutants, such as sulfur dioxide and nitrogen oxides, through to hazardous heavy metals and organic chemical compounds, and to non-methane hydrocarbons, which produce photochemical oxidants. Pollutant emission levels are regulated according to three measurement categories: concentration (mg/m^3) at a standard state of 0°C and pressure of 1 atmosphere, emission rate per hour (kg/h), and concentration of monitored fugitive emissions. Emission rates are specified by stack height and by the air quality level applicable to the location of the emission source. The air quality levels are divided into Class II and Class III, where the Class II standard is a lower level of pollution than Class III, the stricter standard. No emission limits are set for Class I because installation of new facilities in an area ranked as Class I is not permitted by law. As new plants are required to meet both the emission concentration standard and the emission rate standard, dilution by air is not permitted.

The standards also cover the concentration of monitored fugitive emissions, released into the atmosphere without passing through a smokestack. Fugitive emissions are measured at the perimeter of the factory site. The point of maximum concentration changes as the prevailing wind changes direction; thus, the stipulated limit applies to the measurement where the emission concentration is highest among a number of measurements taken at different points. Methods employed to analyze gases and measure their emission rates must comply with SEPA regulations.

Where a concentration limit can be compared with a Japanese standard, the comparable limit under Japan's Air Pollution Control Law is indicated in the "Maximum allowable concentration" column of Table 1-2-1. China's concentration limits are roughly on a par with Japan's. In Japan, however, a range of limits is prescribed for each specific type of facility. In China, since there are fewer categories of facilities, the specified limit may be stricter, depending on the particular facility.

For example, in Japan, a maximum of 300 mg/m^3 is permitted for particulate matter generated by plants that manufacture activated carbon. This is a more lenient standard than in China, where particulate matter comes under the “others” category and has a maximum allowable concentration of 120 mg/m^3. For hydrogen chloride emissions, Japan permits a maximum of 700 mg/m^3 for waste incinerators. In China, the hydrogen chloride limit is a uniform 100 mg/m^3 for all facilities, a far more stringent standard than in Japan. For zinc and its compounds, a standard of 0.7 mg/m^3 is set in China, whereas zinc is unregulated in Japan. This should be noted as zinc is likely to be emitted from a large number of facilities. Under Japan's control standards for designated substances, benzene is regulated to a range of 50 - 600 mg/m^3, depending on the type of facility, but is set to a uniform 12 mg/m^3 in China. In Japan, the benzene emission limit is 600 mg/m^3 for benzene storage tanks; the Chinese standard for the same type of equipment can therefore be said to be extremely strict.

Table 1-2-1: Waste gas emission standards
(for new facilities constructed on or after January 1, 1997)

No	Pollutant	Maximum allowable concentration (mg/m³)	Maximum allowable emission rate (kg/h)			Maximum concentration for monitored fugitive emissions	
			Emission stack height (m)	Class II	Class III	Monitoring site	Concentration (mg/m³)
1	Sulfur dioxide	960 (Production of sulfur, sulfur dioxide, sulfuric acid, and other sulfur compounds)	15 20 30 40 50	2.6 4.3 15 25 39	3.5 6.6 22 38 58	Highest concentration point outside perimeter[1]	0.40
		550 (Use of sulfur, sulfur dioxide, sulfuric acid, and other sulfur compounds)	60 70 80 90 100	55 77 110 130 170	83 120 160 200 270		
2	Nitrogen oxides	1400 (Production of nitrates, chlorine-based fertilizers and explosives)	15 20 30 40	0.77 1.3 4.4 7.5	1.2 2.0 6.6 11	Highest concentration point outside perimeter	0.12
		240 (Use of nitrates, nitrites, etc.)	50 60 70 80 90 100	12 16 23 31 40 52	18 25 35 47 61 78		
3	Particulate matter	18 (Coal dust and dye dust)	15 20 30 40	0.51 0.85 3.4 5.8	0.74 1.3 5.0 8.5	Highest concentration point outside perimeter	Not detectable by the naked eye
		602 (Fiberglass dust, quartz powder dust, mineral wool dust)	15 20 30 40	1.9 3.1 12 21	2.6 4.5 18 31	Highest concentration point outside perimeter	1.0
		120 (Other) (Japanese standard: 30-300 for industrial dust, depending on facility type and outflow location)	15 20 30 40 50 60	3.5 5.9 23 39 50 85	5.0 8.5 34 59 94 130	Highest concentration point outside perimeter	1.0
4	Hydrogen chloride	100 (Japanese standard: 80 for chlorine reaction and absorption facilities; 700 for waster incinerators)	15 20 30 40 50 60 70 80	0.26 0.43 1.4 2.6 3.8 5.4 7.7 10	0.39 0.65 2.2 3.8 5.9 8.3 12 16	Highest concentration point outside perimeter	0.20

5	Chromium oxide mist	0.070	15 20 30 40 50 60	0.008 0.013 0.043 0.076 0.12 0.16	0.012 0.020 0.066 0.12 0.18 0.25	Highest concentration point outside perimeter	0.0060
6	Sulfuric acid mist	430 (Gunpowder plants) 45 (Others)	15 20 30 40 50 60 70 80	1.5 2.6 8.8 15 23 33 46 63	2.4 3.9 13 23 35 50 70 95	Highest concentration point outside perimeter	1.2
7	Fluorides	90 (General calcium plants) 9.0 (Others) (Japanese standard: 1.0 - 20.0, depending on facility)	15 20 30 40 50 60 70 80	0.10 0.17 0.59 1.0 1.5 2.2 3.1 4.2	0.15 0.26 0.88 1.5 2.3 3.3 4.7 6.3	Highest concentration point outside perimeter	20μg/m^3
8	Chlorine gas	65 (Japanese standard: 30 for chlorine reaction and absorption facilities)	25 30 40 50 60 70 80	0.52 0.87 2.9 5.0 7.7 11 15	0.78 1.3 4.4 7.6 12 17 23	Highest concentration point outside perimeter	0.40
9	Zinc and its compounds	0.70	15 20 30 40 50 60 70 80 90 100	0.004 0.006 0.027 0.047 0.072 0.10 0.15 0.20 0.26 0.33	0.006 0.009 0.041 0.071 0.11 0.15 0.22 0.30 0.40 0.51	Highest concentration point outside perimeter	0.0060
10	Mercury and its compounds	0.012	15 20 30 40 50 60	1.8 x 10-3 3.1 x 10-3 10 x 10-3 18 x 10-3 28 x 10-3 39 x 10-3	2.8 x 10-3 4.6 x 10-3 16 x 10-3 27 x 10-3 41 x 10-3 59 x 10-3	Highest concentration point outside perimeter	0.0012
11	Cadmium and its compounds	0.85 (Japanese standard: 1.0 for cadmium pigment manufacturing equipment, baking furnace in zinc manufacturing, etc.)	15 20 30 40 50 60 70 80	0.050 0.090 0.20 0.50 0.77 1.1 1.5 2.1	0.080 0.13 0.44 0.77 1.2 1.7 2.3 3.2	Highest concentration point outside perimeter	0.040

12	Beryllium and its compounds	0.012	15 20 30 40 50 60 70 80	1.1 x 10-3 1.8 x 10-3 6.2 x 10-3 11 x 10-3 15 x 10-3 23 x 10-3 33 x 10-3 44 x 10-3	1.7 x 10-3 2.8 x 10-3 9.4 x 10-3 16 x 10-3 25 x 10-3 35 x 10-3 50 x 10-3 67 x 10-3	Highest concentration point outside perimeter	0.0008
13	Nickel and its compounds	4.3	15 20 30 40 50 60 70 80	0.15 0.26 0.88 1.5 2.3 3.3 4.6 6.3	0.24 0.34 1.3 2.3 3.5 5.0 7.0 10	Highest concentration point outside perimeter	0.040
14	Tin and its compounds	8.5	15 20 30 40 50 60 70 80	0.31 0.52 1.8 3.0 4.6 6.6 9.3 13	0.47 0.79 2.7 4.6 7.0 10 14 19	Highest concentration point outside perimeter	0.24
15	Benzene	12 (Japanese suppression standard: 50-600, depending on facility)	15 20 30 40	0.5 0.9 2.9 5.6	0.8 1.3 4.4 7.6	Highest concentration point outside perimeter	0.40
16	Toluene	40	15 20 30 40	3.1 5.2 18 30	4.7 7.9 27 46	Highest concentration point outside perimeter	2.4
17	Xylene	70	15 20 30 40	1.0 1.7 5.9 1.0	1.5 2.6 8.8 15.0	Highest concentration point outside perimeter	1.2
18	Phenol	100	15 20 30 40 50 60	0.10 0.17 0.58 1.0 1.5 2.2	0.15 0.26 0.88 1.5 2.3 3.3	Highest concentration point outside perimeter	0.08
19	Formaldehyde	25	15 20 30 40 50 60	0.26 0.43 1.4 2.6 3.8 5.4	0.39 0.65 2.2 3.8 5.9 8.3	Highest concentration point outside perimeter	0.20

20	Acetaldehyde	125	15 20 30 40 50 60	0.05 0.09 0.29 0.50 0.77 1.1	0.08 0.13 0.44 0.77 1.2 1.6	Highest concentration point outside perimeter	0.04
21	Acrylonitrile	22	15 20 30 40 50 60	0.77 1.3 4.4 7.5 12 16	1.2 2.0 6.6 11 18 25	Highest concentration point outside perimeter	0.60
22	Acrolein	16	15 20 30 40 50 60	0.52 0.87 2.9 5.0 7.7 11	0.78 1.3 4.4 7.6 12 17	Highest concentration point outside perimeter	0.40
23	Hydrogen cyanide	1.9	15 20 30 40 50 60 80	0.15 0.26 0.88 1.5 2.3 3.3 4.6	0.24 0.39 1.3 2.3 3.5 5.0 7.0	Highest concentration point outside perimeter	0.024
24	Methanol	190	15 20 30 40 50 60	5.1 8.6 29 50 77 100	7.8 13 44 70 120 170	Highest concentration point outside perimeter	12
25	Aniline	20	15 20 30 40 50 60	0.52 0.87 2.9 5.0 7.7 11	0.78 1.3 4.4 7.6 12 17	Highest concentration point outside perimeter	0.40
26	Chlorobenzenes	60	15 20 30 40 50 60 70 80 90 100	0.52 0.87 2.5 4.3 6.6 9.3 13 18 23 29	0.78 1.3 3.8 6.5 9.9 14 20 27 35 44	Highest concentration point outside perimeter	0.40
27	Nitrobenzene	16	15 20 30 40 50 60	0.05 0.09 0.29 0.50 0.77 1.1	0.08 0.13 0.44 0.77 1.2 1.7	Highest concentration point outside perimeter	0.04

28	Chloroethylene	36	15 20 30 40 50 60	0.77 1.3 4.4 7.5 12 16	1.2 2.0 6.6 11 18 25	Highest concentration point outside perimeter	0.60
29	3,4-Benzo(a)pyrene	0.3 x 10-3 (Production and processing of asphalt and carbon products)	15 20 30 40 50 60	0.05 x 10-3 0.08 x 10-3 0.29 x 10-3 0.50 x 10-3 0.77 x 10-3 1.1 x 10-3	0.08 x 10-3 0.13 x 10-3 0.43 x 10-3 0.76 x 10-3 1.2 x 10-3 1.7 x 10-3	Highest concentration point outside perimeter	0.008 μg/m³
30	Phosgene	3.0	25 30 40 50	0.10 0.17 0.59 1.0	0.15 0.25 0.88 1.5	Highest concentration point outside perimeter	0.08
31	Asphalt	140 (Blown asphalt) 40 (Melting and dip coating) 75 (Mixing for building)	15 20 30 40 50 60 70 80	0.18 0.30 1.3 2.3 3.6 5.6 7.4 10	0.27 0.45 2.0 3.5 5.4 7.5 11 15	No visible fugitive emissions are permitted from production equipment.	
32	Asbestos dust	1 fiber/m³ or 10 mg/m³	15 20 30 40 50	0.55 0.93 3.6 6.2 9.4	0.83 1.4 5.4 9.3 14	No visible fugitive emissions are permitted from production equipment.	
33	Non-methane hydrocarbons	120 (Use of solvent gasoline or use of other mixed hydrocarbons)	15 20 30 40	10 17 53 100	16 27 83 150	Highest concentration point outside perimeter	4.0

1) The "highest concentration point outside perimeter" is generally set within 10 meters outside the perimeter of the facility, downwind from the emission source. If the expected highest point of ground-level concentration of fugitive emissions is more than 10 meters from the perimeter, the monitoring site may be moved to that position. For details, see Appendix C. Same applies to the following.
2) All types of industrial dust containing 10% or more of free silica.
3) Height of stack emitting chlorine gas must be at least 25 m.
4) Height of stack emitting hydrogen cyanide must be at least 25 m.
5) Height of stack emitting phosgene must be at least 25 m.

Source: The information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added based on the data published by SEPA.

(2) Specific emission standard for boilers

The emission standard (waste gas standard) specifically for air pollutants from boilers was promulgated in November 2001 and is defined in the Emission Standard of Air Pollutants for Coal-Burning Oil-Burning Gas-Fired Boilers, which came into force in January 2002. As shown in Table 1-2-2, for soot emission limits, boilers are categorized by fuel type as coal-fired, gas-fired, and oil-fired boilers, and by location as Class I, Class II, and Class III. Standards are set separately according to whether the boiler was built and commissioned before January 1, 2001 or after that date. The prescribed emission limits are a relatively low 100-350 mg/m^3 for coal-fired boilers, a low 80-200 mg/m^3 for oil-fired boilers, and 50 mg/m^3 for gas-fired boilers. The indicated concentration limits are at a standard state of 0°C and pressure of 1 atmosphere. The emission limits in the following tables are for the same standard state.

As shown in Table 1-2-3, the emission limits for sulfur dioxide (SO_2) and nitrogen oxides (NOx) are based on similar categories as for soot, but apply to all locations. The SO_2 emission limit for coal-fired boilers built on or after 1 January 2001 is 900 mg/m^3, which is roughly equivalent to the SO_2 concentration in the waste gas when coal with a 0.5% sulfur content is burned. Therefore, if the coal used has a higher sulfur content, a flue gas desulfurization device will be required.

As will be discussed in the second case study in Chapter 2, Tianjin has set an SO_2 emission limit of 650 mg/m^3 as its own local air quality standard. This is far stricter than the national emission standard for SO_2. Meeting this standard means using coal that has a sulfur content of 0.5% or less and carrying out flue gas desulfurization, or using coal with a sulfur content not exceeding 0.3%. Tianjin also regulates the sulfur content of the coal used in coal-fired boilers, and requires factories to use coal containing no more than 0.5% sulfur.

The NOx emission limit is 400 mg/m^3 for both oil-fired and gas-fired boilers. This is equivalent to 195 ppm when converted into a ppm measurement for comparison with the Japanese standard. In Japan, emission standards are prescribed separately for oil-fired and gas-fired boilers. The NOx limit in Japan is 130-180 ppm for oil-fired boilers, depending on the boiler size, and 60-150 ppm for gas-fired boilers. Although China's standard is slightly more lenient, it is roughly on a par with Japan's.

The dust concentration from coal-fired boilers is unavoidably at a higher level when the boiler is first fired up. Soot emission limits are set for these initial concentrations, as shown in Table 1-2-4. Also, as the amount of generated soot varies widely according to the combustion method, separate standards are prescribed for each of three different combustion categories (fire grate, fluidized-bed, and entrained-bed combustion). Fluidized-bed combustion generates the most soot, and therefore has higher specified emission limits.

The minimum stack height is prescribed by boiler capacity, as shown in Table 1-2-5. A minimum stack height of 20 meters is required even for the smallest boilers.

Analysis of the constituents in waste gas requires that the state of air admixture is prescribed. Thus, for coal-fired, oil-fired, and gas-fired boilers, the Chinese standard has an emission rate correction factor for excess air, as shown in Table 1-2-6. In Japan, oxygen concentration in the waste gas is prescribed, which amounts to the same thing. For example, 6% oxygen concentration is prescribed in Japan for analysis of waste gas from coal-fired boilers. If we convert the correction factor ($\alpha = 1.8$) in the Chinese standard, the result is equivalent to an oxygen concentration of 8.8%. In other words, China allows a slightly higher excess air ratio than Japan.

Table 1-2-2: Soot emission standards for boilers

Boiler type	Combustion type or fuel type	Location	Soot concentration (mg/m^3)		Ringelmann Density No.
			Built up to Dec. 31, 2000	Build from Jan. 1, 2001	
Coal-fired	Natural-draft furnace	Class I	100	80	I
		Classes II, III	150	120	
	Other	Class I	100	80	I
		Class II	250	200	
		Class III	350	250	
Oil-fired	Light diesel or kerosene	Class I	80	80	I
		Classes II, III	100	100	
	Other fuel oils	Class I	100	80	I
		Classes II, III	200	150	
Gas-fired	Gas fuel	All locations	50	50	I

Table 1-2-3: Sulfur dioxide and nitrogen oxide emission standards for boilers

Boiler type		Combustion type or fuel type	SO_2 (mg/m^3)		NOx (mg/m^3)	
			Built up to Dec. 31, 2000	Built from Jan. 1, 2001	Built up to Dec. 31, 2000	Built from Jan. 1, 2001
Coal-fired		All areas	1,200	900	--	--
Oil-fired	Light oil or diesel	All areas	700	500	--	400
	Other fuels	All areas	1,200	900*	--	400*
Gas-fired		All areas	100	100	--	400

* Construction of new boilers using heavy oil or residual oil is prohibited in Class I areas.

Table 1-2-4: Soot emission standards for coal-fired boilers at initial combustion

Boiler type		Standard ash content of arriving coal (%)	Soot concentration at initial combustion (mg/m^3)		Ringelmann Density No.
			Built up to Dec. 31, 2000 Building use	Built from Jan. 1, 2001 Building use	
Grate-fired boiler	Natural-draft (< 0.7MW (1t/h))	--	150	120	I
	Other (≤ 2.8MW (4t/h))	Aar ≤ 25%	1,800	1,600	I
		Aar > 25%	2,000	1,800	I
	Other (> 2.8MW (4t/h))	Aar ≤ 25%	2,000	1,800	I
		Aar > 25%	2,200	2,000	I
Fluidized-bed boiler	Circulating fluidized bed	--	15,000	15,000	I
	Other fluidized bed	--	20,000	18,000	I
Entrained- bed boiler		--	5,000	5,000	I

Table 1-2-5: Minimum boiler stack height

Boiler capacity	MW	< 0.7	0.7 - < 1.4	1.4 - < 2.8	2.8 - < 7	7 - < 14	14 - < 28
	t/h	< 1	1 - < 2	2 - < 4	4 - < 10	10 - < 20	20 - ≤40
Minimum permissible height	m	20	25	30	35	40	45

Table 1-2-6: Excess air ratio correction factor

Boiler type	Parameter	Excess air ratio
Coal-fired	Soot at initial combustion	$\alpha = 1.7$
	Soot and SO_2	$\alpha = 1.8$
Oil-fired, gas-fired	Soot, SO_2, and NOx	$\alpha = 1.2$

Source: For Tables 1-2-3 to 1-2-6, the information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added and based on the data published by SEPA.

(3) Waste gas monitoring

The amount of SO_2 in the waste gas of coal-fired boilers used to be monitored by local government twice a year. It was difficult to conduct checks more frequently because waste gas sampling requires a high level of technical skill and substantial equipment. China therefore switched to a monitoring system that involves an on-site inspection without prior notice, sampling the coal immediately before it enters the furnace, and checking that the sulfur concentration does not exceed the prescribed amount. This coal sampling check was previously conducted once every two or three months.

At present, although factories themselves are not legally required to monitor waste gas, large-scale facilities such as thermal power plants are now required to install online monitoring equipment.

Section 3
Water Pollution Management

1. China's Water Pollution Regulations

Water pollution as top priority

Water pollution in China, due to increasing volumes of factory effluent and domestic wastewater, is a problem of growing concern. Water bodies in China are categorized by purpose of utilization and protection objectives into five grades, from Grade I (water catchments and water bodies in national nature reserves) to Grade V (water for agricultural use and for general landscaping requirements). According to water quality measurements for 2001, however, 44% of the 752 monitoring stations along China's seven major river systems failed even to meet the water quality standard for the lowest Grade V ranking. Water quality is ranked Grade V or worse in more than 60% of rivers in the three river systems where pollution is particularly bad (Haihe River, Huaihe River, and Liaohe River). The three lakes (Taihu Lake, Chaohu Lake and Dianchi Lake) are all ranked Grade V or lower. Measures to halt eutrophication of the lakes is a pressing issue.

In response, China has taken action on the three rivers and three lakes, implementing measures to prevent water pollution of these key areas through its Ninth Five-Year Plan for National Environmental Protection (targeting the period 1996 to 2000) and through the subsequent Tenth Five-Year Plan for National Environmental Protection (2001 to 2005). Specifically, under these plans total emission controls on chemical oxygen demand (COD) and ammonia nitrogen were introduced, and sewage treatment facilities are being intensively established in these areas. Further, administrative measures are being taken for suspending or closing the operation of small and medium-size factories that have obsolete production equipment and are discharging large amount of water pollutants. However, due to the rapidly increasing volumes not only of industrial effluent but of domestic wastewater as well, no real improvement is being made on water pollution. There is serious water pollution in regions other than the three rivers and three lakes designated as key area. Future water shortages are predicted as the worsening pollution reduces the accessibility of water resources, and measures to combat water pollution will likely become the most important of China's environmental programs.

Water pollution measures are based on the Law of the People's Republic of China on the Prevention and Control of Water Pollution, which was revised in 1996. This law provides for environmental impact assessment of water pollution-related parameters when a factory is constructed, and prescribes environmental management regimes for preventing water pollution, including the "three synchronizations" system, pollutant discharge fees (pollution levies), and emission registration. In addition, the law provides for national wastewater standards to be set by the State Environmental Protection Administration (SEPA), and empowers local people's governments at the provincial level and above to set region-specific wastewater standards. Article 23 of the law states that the State shall forbid construction of any small enterprises, devoid of measures for prevention and control of water pollution, that seriously pollute the water environment, such as chemical pulp mills, printing and dyeing mills, dyestuff mills, tanneries, electroplating factories, petroleum refineries and pesticides manufacturers. As well as pollution of surface waters (rivers and lakes), the law is also aimed at preventing groundwater pollution. Article 41 prohibits companies from discharging or dumping wastewater containing toxic pollutants or pathogens or other wastes into seepage wells or pits, crevices or limestone caves.

Among other provisions, pollutant discharge fees are of particular relevance to companies in addressing water pollution. Article 15 of the Law on the Prevention and Control of Water Pollution states that enterprises and institutions that discharge pollutants into a water body shall pay a pollutant discharge fee in accordance with State regulations; if the discharge exceeds the limits set by the national or local standards, they shall pay a fee for excess discharge according to State regulations.

However, as mentioned in the previous section about air pollution management, the laws in China state fundamental principles only. Specific controls are based on a large number of regulations, primarily the Implementation of the Law of the People's Republic of China on Water Pollution Prevention and Control (revised in March 2000), which is based on the Law on the Prevention and Control of Water Pollution. In regard to pollutant discharge fees, for example, particulars about how charges are to be levied are given in the Ordinance on Levying for Discharge, as well as in the Measures for the Administration of the Charging Rates for Pollutant Discharge Fees, which is based on that ordinance and came into effect in July 2003.

As with the air pollution regulations, a large number of locally specific provisions related to preventing water pollution are laid down at the local level. Companies must therefore check the requirements in ordinances and other regulations passed by the particular province, municipality, or autonomous region in which the factory is located.

The following describes the system of industrial wastewater controls in China, principally the Integrated Wastewater Discharge Standard, which is the national wastewater standard and has a major influence on the day-to-day wastewater practices of Japanese companies.

2. Specific Wastewater Controls Applicable to Factories

As mentioned above, China's emission standards for industrial wastewater include standards set by the State for the whole country, and local standards set separately by individual local governments at the provincial level and above (e.g. Beijing). If deemed necessary to meet the water quality standards, local governments at the provincial level and above are empowered to set discharge limits that are more stringent than those set by the State, as in Japan, and to regulate pollutant parameters not covered in the national standards. However, due to the difficulty of comprehensively investigating all the wastewater standards set by local governments in China, this section outlines the national Integrated Wastewater Discharge Standard and, by way of example, mentions some local discharge limits, set by the local government of the area in which the company's factory is located, that apply to some of the Japanese companies we interviewed in China.

(1) National wastewater standard set by the Chinese government

China's national wastewater standard consists of two categories of discharge standards. The first category is industry-specific wastewater standards prescribed for 12 industry types: the paper industry, ship and shipbuilding industry, offshore oil development industry, textile finishing and dyeing, meat processing industry, synthetic ammonia industry, iron and steel industry, industries that use aerospace propellant, military industry, phosphate fertilizer industry, caustic soda industry, and PVC-related industry. The other category is the Integrated Wastewater Discharge Standard, which was promulgated in 1996 and came into effect in January 1998 as the wastewater standard for all other industries.

As most of the Japanese companies operating in China are subject to the latter Integrated Wastewater Discharge Standard, the discussion here is limited to the regulations in that standard.

In the Integrated Wastewater Discharge Standard, the regulated parameters are divided into two groups: Class I and Class II pollutants. Class I pollutants cover 13 toxicity parameters, such as total mercury, alkyl mercury, and cadmium. Class II pollutants cover 56 parameters, including acidity (pH), suspended solids (SS), chemical oxygen demand (COD), and biochemical oxygen demand (BOD). Of these parameters, only those likely to be present in the wastewater from a particular factory are set as applicable wastewater control parameters for that factory by the environmental administration, and the factory is legally obliged to comply with those standards. For Class I pollutants, the standard regulates the pollutant concentration in the effluent sampled at the discharge outlet of the particular facility within the factory site. Each individual facility must therefore have dedicated wastewater treatment equipment installed before the discharge outlet. For Class II pollutants, the standard applies to the pollutant concentration at the discharge outlet exiting the factory site. In this case, it is permissible to combine and centrally treat the wastewater from several facilities.

Table 1-3-1a lists the wastewater discharge limits for Class I pollutants, compared with the corresponding Japanese uniform standard for each parameter. Total mercury and total lead have more lenient limits, by one decimal place, than the Japanese standard, but the other parameters are on a par with Japan. Apart from Japan, only China requires a "not detectable" level of alkyl mercury, which is not a regulated parameter in Europe or the United States. China also has discharge limits for six parameters that are not controlled in Japan, including total nickel, total silver, and 3,4-benzo(a)pyrene. The requirement for nickel should be noted as nickel may be discharged from electroplating processes. Silver is rarely discharged in wastewater, but is a controlled parameter in the West, too, because it is said to be as toxic as cadmium.

Table 1-3-1b lists Class II pollutants. Two sets of wastewater discharge limits are prescribed, one set for new facilities constructed on or after January 1, 1998, and another set for existing facilities installed prior to that date. The controlled parameters for new facilities are more numerous, and slightly stricter, than those for existing facilities.

Tables 1-3-1a and 1-3-1b give the discharge limits for new factories, which many Japanese companies would be subject to, and compares them with the wastewater standards in Japan. For some parameters, the discharge limit applies to a specific industrial sector; for other parameters, the discharge limit applies to all sectors. The discharge levels are prescribed separately for three classes, categorized according to the receiving water body. The Class I standard is for discharge to drinking water sources, Class II is for discharge to general water bodies, and Class III is for discharge into sewerage systems for final disposal. That is, the standard becomes stricter from Class III to Class I. Contrasted with Japan's wastewater standards, China's Class I is stricter, Class II is comparable, and Class III is more lenient.

The Class II standard for chemical oxygen demand (COD_{Cr}) is set in the range 120 to 300 mg/liter, depending on the sector. The figure appears to be the same level as Japan's limit of 160 mg/liter, but note that the method of measurement differs between the two countries. There are two ways of measuring COD. Japan uses the permanganate test (COD_{Mn}), which uses potassium permanganate as the oxidizing agent for measuring the amount of oxygen required for the oxidizing reaction. China, on the other hand, uses the chromate method (COD_{Cr}), based on potassium dichromate as the oxidizing agent. As potassium permanganate is a less powerful oxidizing agent, it yields a lower result when the same sample is analyzed by both methods. Although it depends on the sample, the COD_{Mn} method gives a value roughly one third of that given by the COD_{Cr} method. Therefore, China's limit of 120 mg/liter (by COD_{Cr}) is equivalent to 40 mg/liter using the COD_{Mn} method. This figure is a far more stringent standard than Japan's limit of 160 mg/liter. As a consequence, wastewater treatment equipment meeting Japan's effluent standards will not adequately serve the purpose if taken to China without any modification. Note also that although the COD_{Cr} method is used in China for controlling factory effluent, control of general water quality is based on the COD_{Mn} method.

The Class II standard for ammonia nitrogen in "other polluting sectors" (industries other than pharmaceutical preparation, dye manufacturing, and the petrochemical industry) is set at 25 mg/liter, a very strict limit. In Japan, the figure calculated as $NO_3 + NO_2 + 0.4 \times NH_3$ must not exceed 100 mg/liter. Thus, supposing that nitrogen is present entirely as ammonia nitrogen (NH_3), without any nitrate nitrogen (NO_3) or nitrite nitrogen (NO_2) being present, a value of up to 250 mg/liter is acceptable. In comparison, the limit of 25 mg/liter in China is quite stringent. This should be noted as ammonia nitrogen may be emitted by a wide range of industries, including fertilizer plants and meat processing plants. Ammonia nitrogen is not controlled under the Class III standard, but the plant that we visited in Tianjin, which is located in a Class II area according to the national standard, is nevertheless subject to a Class II standard of 25 mg/liter, set as an extended regulation by the Tianjin local government. Local governments can add parameters to the wastewater parameters in the national standards at their discretion.

The standard of 1 mg/liter for copper is stricter than the 3 mg/liter limit in Japan. Copper in wastewater tends to form compounds called complexes that do not react easily with alkaline agents. This can make it difficult to treat the discharged wastewater to an acceptable copper level by adding caustic soda or some other additive in the normal neutralizing coagulation and sedimentation method. Some kind of treatment must be added to decompose these complexes.

In addition to the discharge concentration limits, plants built in or after January 1998 in a total of 22 industries, including mining, nonferrous metals, coke, and petroleum refining, are subject to a maximum allowable wastewater discharge volume, as shown in Table 1-3-2. Most of the restrictions are in terms of discharge volume per ton of the end product. However, the allowable discharge for the gold mining industry is defined per ton of gold ore, and the allowable discharge for the petroleum refining industry is defined per ton of crude oil. In addition, a number of industries engaged in mining or processing of nonferrous metals are subject to a water utilization recycling rate. For these industries, the total discharge of pollutants is controlled through the restrictions on the wastewater discharge volume and the discharge concentration described above.

Table 1-3-1a: Wastewater discharge standards for Class I pollutants

(mg/liter)

No.	Pollutant	Maximum allowable concentration	Japanese uniform standard
1	Total mercury	0.05	0.005
2	Alkyl mercury	Not detectable	Not detectable
3	Total cadmium	0.1	0.1
4	Total chromium	1.5	2.0
5	Hexavalent chromium	0.5	0.5
6	Total arsenic	0.5	0.1
7	Total lead	1.0	0.1
8	Total nickel	1.0	--
9	3,4-Benzo(a)pyrene	0.00003	--
10	Total beryllium	0.005	--
11	Total silver	0.5	--
12	Total alpha radiation	1 Bq/l	--
13	Total beta radiation	10 Bq/l	--

Table 1-3-1b: Waste discharge standards for Class II pollutants (facilities constructed on or after January 1, 1998)

(mg/liter)

No	Pollutant	Sector	Class I standard	Class II standard	Class III standard	Japanese uniform standard
1	pH	All polluting sectors	6 - 9	6 - 9	6 - 9	5.8 - 8.6
2	Colorimetry (dilution factor)	All polluting sectors	50	80	--	
3	Suspended solids (SS)	Mining, ore dressing, and coal processing	70	300	--	200
		Gold deposit processing	70	400	--	
		Placer gold processing in frontier regions	70	800	--	
		Urban Class II wastewater treatment plants	20	30	--	
		Other polluting sectors	70	150	400	
4	Biochemical oxygen demand (BOD_5)	Sugarcane refining, jute degumming, wet-process fiberboard manufacturing	20	60	600	160
		Beet sugar refining, alcohol, chemical seasonings, tanning, and chemical fiber pulper industry	20	100	600	
		Urban Class II wastewater treatment plants	20	30	--	
		Other polluting sectors	20	30	300	

5	Chemical oxygen demand (COD_{Cr})	Beet sugar refining, coke, synthetic fatty acids, wet-process fiberboard, dyes, fur washing, and organophosphate factories	100	200	1000	160
		Chemical seasonings, alcohol, pharmaceutical preparation, biochemicals, jute degumming, tanning, and chemical fiber pulper industry	100	300	1000	
		Petrochemical industry (including petroleum refining)	60	120	500	
		Urban Class II wastewater treatment plants	60	120	--	
		Other polluting sectors	100	150	500	
6	Petroleum	All polluting sectors	5	10	20	5
7	Animal/plant oils	All polluting sectors	10	15	100	10
8	Volatile phenol	All polluting sectors	0.5	0.5	2.0	5
9	Total c	All polluting sectors	0.5	0.5	1.0	1.0
10	Sulfides	All polluting sectors	1.0	1.0	1.0	--
11	Ammonia nitrogen	Medicine raw materials, dyes, and petrochemical production	15	50	--	100[1)]
		Other polluting sectors	15	25	--	
12	Fluorides	Yellow phosphorous industry	10	15	20	8
		Low-fluoride areas (Fluoride content of water body < 0.5 mg/l)	10	20	30	
		Other polluting sectors	10	10	20	
13	Phosphates (as P)	All polluting sectors	0.5	1.0	--	16
14	Methyl alcohol	All polluting sectors	1.0	2.0	5.0	--
15	Aminobenzene	All polluting sectors	1.0	2.0	5.0	--
16	Nitrobenzene	All polluting sectors	2.0	3.0	5.0	--
17	Anionic surfactants (LAS)	All polluting sectors	5.0	10	20	--
18	Total copper	All polluting sectors	0.5	1.0	2.0	3
19	Total zinc	All polluting sectors	2.0	5.0	5.0	5
20	Total manganese	Synthetic fatty acid manufacturing	2.0	5.0	5.0	10
		Other polluting sectors	2.0	5.0	5.0	
21	Color developers	Movie film developing	1.0	2.0	3.0	--
22	Total volume of developers and oxides	Movie film developing	3.0	3.0	6.0	--
23	Phosphorous	All polluting sectors	0.1	0.1	0.3	--
24	Organophosphate fertilizers (as P)	All polluting sectors	Not detectable	0.5	0.5	--
25	Dimethoate	All polluting sectors	Not detectable	1.0	2.0	--

26	Parathion	All polluting sectors	Not detectable	1.0	2.0	--
27	Methyl parathion	All polluting sectors	Not detectable	1.0	2.0	--
28	Malathion	All polluting sectors	Not detectable	5.0	10	--
29	Pentachlorophenol (PCP) and sodium pentachlorophenate (Na-PCP) (as PCP)	All polluting sectors	5.0	8.0	10	--
30	Absorbable organic halogens (AOX) (as Cl)	All polluting sectors	1.0	5.0	8.0	--
31	Chloroform	All polluting sectors	0.3	0.6	1.0	--
32	Carbon tetrachloride	All polluting sectors	0.03	0.06	0.5	--
33	Ethylene trichloride	All polluting sectors	0.3	0.6	1.0	--
34	Tetrachloroethylene	All polluting sectors	0.1	0.2	0.5	--
35	Benzene	All polluting sectors	0.1	0.2	0.5	0.1
36	Toluene	All polluting sectors	0.1	0.2	0.5	
37	Ethylbenzene	All polluting sectors	0.4	0.6	1.0	
38	o-Xylene	All polluting sectors	0.4	0.6	1.0	
39	p-Xylene	All polluting sectors	0.4	0.6	1.0	
40	m-Xylene	All polluting sectors	0.4	0.6	1.0	
41	Chlorobenzene	All polluting sectors	0.2	0.4	1.0	
42	o-Dichlorobenzene	All polluting sectors	0.4	0.6	1.0	
43	p-Dichlorobenzene	All polluting sectors	0.4	0.6	1.0	
44	p-Nitrobenzene	All polluting sectors	0.5	1.0	5.0	
45	2.4-Dinitroaniline	All polluting sectors	0.5	1.0	5.0	
46	Phenols	All polluting sectors	0.3	0.4	1.0	5
47	m-Methylphenol	All polluting sectors	0.1	0.2	0.5	--
48	2,4-Dichlorophenol	All polluting sectors	0.6	0.8	1.0	--
49	2,4,6-Trichlorophenol	All polluting sectors	0.6	0.8	1.0	--
50	Dinonyl phthalate	All polluting sectors	0.2	0.4	2.0	--
51	Dioctyl phthalate	All polluting sectors	0.3	0.6	2.0	--
52	Acrylonitrile	All polluting sectors	2.0	5.0	5.0	--

53	Total selenium	All polluting sectors	0.1	0.2	0.5	0.1
54	Fecal coliform bacteria count	Pathogen-containing wastewater from hospitals*, veterinarian clinics, and health care organizations	500/l	1000/l	5000/l	3,000
		Wastewater from infectious disease and TB hospitals	100/l	500/l	1000/l	
55	Total residual chlorine (Wastewater of hospitals using chlorinated disinfectants)	Pathogen-containing wastewater from hospitals*, veterinarian clinics, and health care organizations	<0.5**	>3 (contact time ≥ 1.5h)	>2 (contact time ≥ 1.5h)	--
		Wastewater from infectious disease and TB hospitals	<0.5**	>6.5 (contact time ≥ 1.5h)	>5 (contact time ≥ 1.5h)	--
56	Total organic carbon (TOC)	Synthetic fatty acid manufacturing	20	40	--	--
		Jute degumming industry	20	60	--	--
		Other polluting sectors	20	30	--	--

Note: "Other polluting sectors" refers to all polluting sectors other than the industries specifically listed for the particular control parameter.
* Hospitals with 50 or more beds.
** The effluent must meet this standard after it has been dechlorinated following disinfection by chlorine addition.
1) $NO_3 + NO_2 + 0.4 \times NH3 \leq 100$ mg/liter

Table 1-3-2: Maximum allowable wastewater discharge volumes for specific industries (facilities constructed on or after January 1, 1998)

No	Industry type			Maximum allowable wastewater discharge volume; Minimum allowable water recycling rate
1	Mining industry	Nonferrous metal processing		Water recycling rate: 75%
		Mining, dressing, and processing in other mining industries		Water recycling rate: 90% (coal dressing)
		Gold deposit processing	Repetitive processing	$16.0m^3/t$ (ore)
			Flotation	$9.0m^3/t$ (ore)
			Cyanidation	$8.0m^3/t$ (ore)
			Carbon serum	$8.0m^3/t$ (ore)
2	Coke industry (coal gas factories)			$1.2m^3/t$ (coke)
3	Nonferrous metal smelting, refining, and metalworking			Water recycling rate: 80%
4	Petroleum refining industry (excluding direct-effluent petroleum refineries) Categorized by stage of processing: A. Fuel-only refineries B. Fuel + lubricating oil-producing refineries C. Fuel + lubricating oil + petrochemical-producing refineries (Includes oil refineries at production sites producing high-sulfur shale oil and oil additives.)			> 5 mill. tons, $1.0m^3/t$ (crude oil) A: 2.5 - 5 mill. tons, $1.2m^3/t$ (crude oil) < 2.5 mill tons, $1.5m^3/t$ (crude oil)
				> 5 mill. tons, $1.5m^3/t$ (crude oil) B: 2.5 - 5 mill. tons, $2.0m^3/t$ (crude oil) < 2.5 mill tons, $2.0m^3/t$ (crude oil)
				> 5 mill. tons, $2.0m^3/t$ (crude oil) C: 2.5 - 5 mill. tons, $2.5m^3/t$ (crude oil) < 2.5 mill tons, $2.5m^3/t$ (crude oil)
5	Synthetic detergent industry	Alkyl benzene production using chlorination		$200.0m^3/t$ (alkyl benzene)
		Alkyl benzene production using decomposition		$70.0m^3/t$ (alkyl benzene)
		Detergent production from alkyl benzene		$10.0m^3/t$ (end product)
6	Synthetic fatty acid manufacturing			$200.0m^3/t$ (end product)
7	Wet-process fiberboard manufacturing			$30.0m^3/t$ (boards)

8	Sugar refining		Sugarcane refining	10.0m^3/t (sugarcane)
			Beet sugar refining	4.0m^3/t (sugar beet)
9	Tanning industry		Wet salt pigskin	60.0m^3/t (raw leather)
			Dry cowhide	100.0m^3/t (raw leather)
			Dry sheepskin	150.0m^3/t (raw leather)
10	Brewing and distilling industry	Alcohol production	From corn	100.0m^3/t (alcohol)
			From potatoes	80.0m^3/t (alcohol)
			From molasses	70.0m^3/t (alcohol)
		Chemical seasonings industry		600.0m^3/t (chemical seasonings)
		Breweries (Discharge volume excludes germination liquid.)		16.0m^3/t (beer)
11	Chromates industry			5.0m^3/t (end product)
12	Sulfuric acid industry			15.0m^3/t (sulfuric acid)
13	Jute degumming industry (washing method)			500m^3/t (raw jute)
				750m^3/ (processed jute)
14	Viscose fiber and simple fiber industry		Short fiber (medium length cotton and wool)	300m^3//t (fiber)
			Long fiber	800m^3/t (fiber)
15	Chemical fiber pulp industry			Unbleached: 150m^3/t (pulp) Bleached: 240m^3/t (pulp)
16	Pharmaceutical preparation and medicine raw materials		Penicillin	4700m^3/t (penicillin)
			Streptomycin	1450m^3/t (Streptomycin)
			Terramycin	1300m^3/t (Terramycin)
			Macromycin	1900m^3/t (Macromycin)
			Lincomycin	9200m^3/t (Lincomycin)
			Aureomycin	3000m^3/t (Aureomycin)
			Gentamycin	20400m^3/t (??Gentamycin??)
			Vitamin C	1200m^3/t (vitamin C)
			Chloromycetin	2700m^3/t (Chloromycetin)
			Sinomin	2000m^3/t (Sinomin)
			Vitamin B2	3400m^3/t (vitamin B2)
			Novargin	180m^3/t (Novargin)
			Phenacetin	750m^3/t (Phenacetin)
			Furazolidone	2400m^3/t (Furazolidone)
			Caffeine	1200m^3/t (caffeine)
17	Organophosphate fertilizer factories*		Dimethoate (Rogor)	700m^3/t (end product)
			Methyl parathion (liquid method)**	300m^3/t (end product)
			Phosphorus parasulfide (P2S method)**	500m^3/t (end product)
			Phosphorus parasulfide (PSCl3 method)**	550m^3/t (end product)
			DDVP (trichlorfon potassium decomposition method)	200m^3/t (end product)
			Trichlorfon	40m^3/t (end product) (Excludes effluent from production of trichloroacetaldehyde)
			Malathion	700m^3/t (end product)

18	Herbicide industry*	Nitrofen (NIP, TOK)	$5m^3$/t (end product)
		Sodium pentachlorophenoxide	$2m^3$/t (end product)
		Sodium pentachlorophenol	$4m^3$/t (end product)
		Dichloromethane	$14m^3$/t (end product)
		2.4-D	$4m^3$/t (end product)
		Butylamin	$4.5m^3$/t (end product)
		Chlorotoluron (reduced using Fe powder)	$2m^3$/t (end product)
		Chlorotoluron (reduced using Na_2S)	$3m^3$/t (end product)
19	Thermal power generation industry		$3.5m^3$/ (MW.h)
20	Freight train washing facilities		$5.0m^3$/unit
21	Movie film developing		$5m^3$/1,000m (35mm film)
22	Petroleum asphalt industry		Rate of recycling water from cooling ponds: 95%

Notes
* Calculation based on 100% product concentration.
** Excludes effluent from P2S5, PSCl2, and PCl3 raw material production.
Source: For Tables 1-3-1a, 1-3-1b, and 1-3-2, the information being made public on the website of the Sino-Japan Friendship Center for Environmental Protection (http://www.zhb.gov.cn/japan/) was edited and other information added based on data published by SEPA.

(2) Wastewater monitoring

Three methods of industrial wastewater monitoring are employed by environmental administrations: regular monitoring, irregular monitoring, and online monitoring. Regular monitoring and irregular monitoring without prior notice are generally conducted annually. Online monitoring targets COD as regards water quality, but is performed by only small number of factories as yet. SEPA's stated policy is to encourage as many factories as possible to adopt online monitoring in the future, but because the factory itself must bear the costs of installing and operating the necessary instruments and equipment, for local industries the outlay appears quite onerous.

Although factories are not legally obliged to monitor effluent, a factory may be requested to install an online monitoring system by the Environmental Protection Bureau (EPB) of the area in which it is located. Such requests are advisory in nature, but the factory cannot refuse to comply. In the future, through the requirement for online monitoring for factories above a certain size, wastewater monitoring in China looks likely to become mandatory in practice. In fact, one company in our survey, although not required to install an online monitoring system, has a contractor sampling and analyzing its effluent in order to voluntarily control the effluent water quality.

Section 4
Industrial Waste Management

1. Entering a New Phase in Industrial Waste Management

Counted as one of the "three wastes," alongside waste gas (air pollution) and wastewater (water pollution), solid waste in China is now one of the country's main environmental problems. Rapid economic growth, particularly over the last decade or so, has been accompanied by a dramatic increase in both household and industrial waste (generally called "industrial solid waste" in China) as well as in household waste. In urban areas and elsewhere in country, solid waste has become an issue demanding urgent solution.

In response, the Chinese government has embarked on a program to tackle solid waste. The Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste was enacted in 1996. In the Ninth Five-Year Plan for National Environmental Protection (1996 - 2000), and in the following Tenth Five-Year Plan for National Environmental Protection (2001 - 2005), measures to combat solid waste, particularly industrial waste, are prioritized as key areas along with air and water pollution measures. The Five-Year Plans map out policies promoting the establishment of waste treatment facilities and the "comprehensive use" (recycling) of industrial waste. As a specific target, the Tenth Five-Year Plan calls for a 10% reduction in industrial waste from 2000 levels by 2005. In tandem with these waste management initiatives, the building of a "recycling-based society " has become a key concept in recent years in discussions of future environmental issues in China. The Law on the Promotion of Cleaner Production, aimed at encouraging companies to practice conservation and effective utilization of resources, was enacted in January 2003. A number of other recycling-related laws, such as the Household Appliance Recycling Law (provisional title), are planned as China enters a new phase in waste management.

Implementation of waste controls in China is based fundamentally on the aforementioned Law on the Prevention and Control of Environmental Pollution by Solid Waste, which lays down a management framework and contains provisions relating to the collection, storage, transportation, and treatment of solid waste. In addition, the law incorporates provisions on reducing, reusing, and rendering waste harmless, responsibilities and obligations for recycling and management of solid waste, and penalty provisions. The law also makes any company that generates industrial waste responsible for its treatment. Practical implementation of the law is governed by decrees drafted and issued by local people's governments, taking into account the distinctive features of the specific area.

Solid wastes are classified under this law into three types: (1) Solid and semi-solid wastes generated by industrial activity (industrial waste); (2) waste generated in daily life and consumer activities (domestic waste); and (3) dangerous waste included in industrial and domestic wastes (hazardous waste). China also has pollutant discharge fees which are levied if a company, whether or not it has storage facilities, stores industrial waste in a site that lacks any measures for protecting the environment (against seepage or scattering of the waste, for example), or buries toxic waste in a manner that does not meet the standards relating to hazardous waste.

Of these three types of waste, hazardous industrial waste is relevant to Japanese companies' environmental practices. Substances to be controlled as hazardous waste are specified in the National Catalogue of Hazardous Wastes, published in 1998 and based on the Law on the Prevention and Control of Environmental Pollution by Solid Waste. The classes of hazardous waste defined in the catalogue comply with the Basel Convention. Hundreds of different types of waste are listed by substance name in roughly 60 groups. Toxic substances, substances that carry a high environmental risk, and wastes that are difficult to treat or dispose of by ordinary means, such as PCBs, medical waste, and fly ash emitted from waste incinerators, are categorized as scheduled hazardous wastes.

According to the State Environmental Protection Administration (SEPA), 945.09 million tons of industrial waste were generated in 2002, of which 10 million tons were hazardous waste. However, only 26.35 million tons of the total industrial waste (including 17,000 tons of hazardous waste) were sent off-site. This means that rest was recycled or treated, or is being stored on-site or at external locations. The total volume of industrial waste dumped or being held in storage for a long length of time is estimated to exceed 7 billion tons. Treatment of this waste is regarded as an important future issue.

2. The need for more treatment facilities to cope with hazardous industrial waste

Of the industrial waste generated by Japanese companies, substances classed as hazardous waste are subject to the storage, treatment, and transportation procedures laid down in the Law on the Prevention and Control of Environmental Pollution by Solid Waste. Treatment and transportation of hazardous waste must be contracted to a licensed operator. The following types of hazardous waste are likely to be generated at the factories of Japanese companies:

- Waste mineral oils
- Wastes resulting from the production, formulation, and use of inks, dyes, pigments, lacquer, and varnish
- Wastes resulting from the production, formulation, and use of resins, latex, plasticizers, and adhesives
- Wastes resulting from the surface treatment of metals and plastics
- Hexavalent chromium, copper, zinc, arsenic, selenium, cadmium, antimony, mercury, tellurium, thallium, lead, fluorides, inorganic cyanide compounds, acids in liquid or solid form, bases in liquid or solid form, organic phosphorus compounds, organic cyanide compounds, phenol and its compounds, halogenated organic solvent, PCBs, dioxins, etc., and other wastes containing any of these substances

Final disposal of these hazardous wastes can be categorized in general terms as either of two methods: incineration or stabilization plus landfill. If the incineration ash contains heavy metal residues, it must be further stabilized by cement solidification.

Under the Tenth Five-Year Plan for National Environmental Protection, comprehensive treatment facilities for hazardous waste are to be built in eight locations in China by the target year, 2005. However, as of February 2004 when our field study was conducted, there was apparently only one treatment plant in China capable of handling the incineration, stabilization, and landfill of hazardous waste in a comprehensive fashion. This is the Tianjin Integrated Hazardous Waste Treatment Center, established in 2003. Said to be technically world-class, the treatment center was constructed at a total cost of 130 million yuan (approximately 2 billion yen), financed by the central government, a French engineering company, and four local industries. Its annual waste treatment capacity is 13,500 tons of waste incineration and 6,200 tons of landfill waste. Capacity for decontamination and recovery processing of heavy-metal-containing effluent and waste solvents is 10,000 tons annually. The treatment charges are determined by the government and published on the Internet.

As an example of treatment charges at the center, the charge for incineration of waste oil, waste copier toner and other burnable wastes is RMB 3/kg (approximately JPY 45/kg), including transportation costs. This is comparable with treatment costs in Japan, but is actually extremely expensive, given that general price levels in China are about one fifth those in Japan. This presents a considerable burden for most local companies.

Prior to completion of the Tianjin Integrated Hazardous Waste Treatment Center, Japanese companies that generate hazardous waste have had to store it on-site over the many years since they began operations in China. There were contractors who would accept hazardous waste for a price, but the company generating the waste would be putting its reputation at enormous risk if it was discovered that the waste had been illegally dumped and its source came to light.

In Beijing, there are three companies that provide waste incineration only. Waste oil and other such substances generated in Beijing are treated at these plants. Incineration facilities are apparently available in other cities, too.

Hazardous waste unfit for incineration is trucked to the country's one and only Tianjin treatment facility from cities as far away as Shanghai in the south, and Shandong and Hebei in the north. Construction of seven more hazardous waste treatment facilities is planned, one in each of seven cities, including

Shanghai and Guangzhou. The Chinese government apparently believes that encouraging competition by allowing more than one plant per city would result in operators discounting prices and cutting corners. In the future too, the government will likely allow only one waste treatment plant per area.

For hazardous waste, a manifest system is in place, for tracking waste movement from the waste source factory to the waste treatment facility. The source company, haulage contractor, and waste treatment operator, in that order, fill in a manifest form. After the waste is treated, the form is submitted to the Environmental Protection Bureau (EPB) that has jurisdiction over the source company. The latter also receives a copy of the form. The details noted by each of the parties are the name of the source company, the type of waste and volume to be treated, the name, license number and contact details of the haulage contractor, and the name, license number, treatment method and contact details of the waste treatment operator. Any waste material to be treated for recycling that is classed as hazardous waste must also be consigned to a licensed waste treatment operator. In this case, the operator buys the waste, but the same manifest system applies.

In summary, hazardous waste management in China is ostensibly advanced as a control framework incorporating a manifest system, but the slow progress on establishing comprehensive waste treatment plants is a major issue. At present, with only one such facility in the whole country, the only options for Japanese companies wanting to deal with their hazardous waste in line with the law are to contract waste treatment to that one plant or to store the waste on-site. If they do choose the treatment plant, the waste may have to be transported nearly 1,000 km across the vast land of China to Tianjin where the plant is located, which is hardly realistic. It is anticipated that even more Japanese companies will locate in China in the future, making the management of hazardous waste a major issue that needs to be addressed.

According to a recent newspaper report, in January 2004 the State Council approved a plan for establishing new treatment facilities for hazardous and medical waste. Over the three years until 2006, approximately RMB 15 billion (JPY 225 billion) will be spent on constructing 31 hazardous waste treatment centers nationwide, providing a treatment capacity of 2.82 million tons annually. If this plan comes to fruition, albeit with some delay on the completion date, China's hazardous waste problem will reach a turning point.

Section 5

Soil Pollution Management

1. China's Soil Pollution Regulations

The need to address soil contamination at factory sites

As well as measures on waste gas, wastewater, and solid wastes, the need to address soil pollution should not be forgotten by Japanese companies operating in China.

In Japan, under the Soil Contamination Countermeasures Law, which came into effect in February 2003, soil pollution at factory sites is strictly controlled and the land owner is required to take remedial action if soil contamination is evident. In China, the Environmental Quality Risk Assessment Criteria for Soil at Manufacturing Facilities came into effect in 1999, as a State Environmental Protection Administration (SEPA) standard (HJ/T25-1999). Like the treatment of hazardous waste, this SEPA notice makes treatment of contaminated soil the responsibility of the company that caused it. Thus, any Japanese company that causes soil pollution would be liable for extremely costly clean-up operations.

In the notice, soil quality is controlled under two separate criteria. The first applies to soils where the groundwater flows are not used or contemplated for use as a drinking water source; the other applies to soils where the groundwater flows are used for drinking water. For both soil categories, the standards describe acceptable levels in terms of the concentration of soil pollutants. That is, if the concentration of soil pollutants exceeds the criteria, the same treatment is required as for hazardous waste. Where the groundwater is not used as drinking water, the maximum level of pollutant concentration in the soil is such that direct exposure to the skin causes no risk to human health. Where the groundwater is used as drinking water, the maximum pollutant concentration in the soil is such that the groundwater poses no health risk even when rainwater penetrates and dissolves the substances in the soil. The notice also gives water quality standards for groundwater at factory sites.

The soil quality standards include a huge number of parameters, 89 in all, and a maximum concentration is set for each parameter for each of the two soil categories described above. In Japan's Soil Contamination Countermeasures Law, pollutants are regulated using 25 parameters known as "specific hazardous substances." For each of these 25 parameters, a standard value is set, based on the concentration of the pollutant in the test solution when a leach test using weakly acidic water is performed on the soil. Japan also has specified concentration limits in soil for nine of the most frequently encountered soil contaminants, including cadmium, hexavalent chromium, and arsenic. As China's regulatory methods are different from Japan's, it is not possible to compare values for all parameters. However, if we take just the nine parameters controlled under Japan's Soil Contamination Countermeasures Law, and compare them against the standards in China for the same parameters, we obtain the comparative values shown in Table 1-5-1.

Table 1-5-1: Comparison between China's soil quality standards and Japan's corresponding standard

(mg/kg)

No	Parameter	Standard in case of groundwater not used as drinking water	Standard in case of groundwater used as drinking water	Japanese standard*
1	Total cadmium	3,790	147	150
2	Hexavalent chromium	189,000	1,470	250
3	Total cyanide compounds	75,800	5,860	50 (free cyanide)
4	Total mercury	1,140	88	15
5	Total selenium	18,900	1,470	150
6	Total arsenic	44	3.4	150
7	Lead and its compounds	--	--	150
8	Fluorine and its compounds	--	--	4,000
9	Boron and its compounds	--	--	4,000
Remarks		Standards are prescribed for further 80 parameters, 89 in total.		Standards are prescribed by the leach test method for further 25 parameters.

Source: Regulations for the enforcement of the Soil Contamination Countermeasures Law, December 26, 2002, Attached Table 3.

Looking at total cadmium, a very high concentration of 3,790 mg/kg is set as the soil standard where groundwater is not used as drinking water. The corresponding standard of 147 mg/kg where groundwater is used as drinking water is quite similar to the 150 mg/kg Japanese standard. For the other soil concentration standards where groundwater is not used as drinking water, very high figures are given for all parameters except total arsenic. Where groundwater is a drinking water source, the Chinese standards are again higher than in Japan except for total arsenic (3.4 mg/kg), which is extremely low compared with the Japanese standard of 150 mg/kg. Lead, fluorine, and boron are controlled parameters in Japan, but unregulated in China. The reason for lead's absence in the soil quality standards, although it is a controlled parameter in the wastewater and waste gas standards, is unknown. It will apparently be added when the soil quality criteria are revised.

No criteria are indicated as to the future use of groundwater as a drinking water source. Even if the groundwater is not currently being used for that purpose, it would be reasonable as a risk measure to adopt practices that meet the soil standards for drinking water sources.

An effective means of monitoring soil contamination at factory sites is to sample the groundwater. As yet, none of the Japanese companies in China visited in the course of this research was performing groundwater monitoring. Some Japanese companies in Singapore were monitoring groundwater at the time of our 2002 study in that country. There, sampling wells had been dug at points on the upstream and downstream boundaries of the groundwater flowing through the factory site, and the water quality was being regularly monitored. Monitoring serves two purposes: Firstly, to ascertain the extent of soil contamination before factory construction, and, secondly, to monitor the present soil status. Although not legally required to do so at the present time, Japanese companies operating in China will need to carry out groundwater monitoring in the future as a risk management precaution.

Essential to groundwater monitoring is a water quality standard for judging whether the groundwater is contaminated. In the Environmental quality risk assessment criteria for soil at manufacturing facilities, the same 89 parameters used as soil quality criteria are set as groundwater standards, three times as many as the 25 parameters specified in Japan's Soil Contamination Countermeasures Law. China and Japan have 16 parameters in common, but otherwise use different parameters. Table 1-5-2 lists the 16 common parameters which are likely to be of most relevance to Japanese companies. Except for total arsenic and 1,1-dichloroethylene, all of the Chinese government standards are many times more lenient than Japan's standards.

Table 1-5-2: Groundwater standards

(mg/liter)

No.	Parameter	Chinese government standard	Japanese standard
1	Dichloromethane	0.201	0.02
2	1,2-Dichloroethane	0.0166	0.004
3	1,1,1-Trichloroethane	3.02	1.0
4	1,1,2-Trichloroethane	0.0265	0.006
5	Carbon tetrachloride	0.0116	0.002
6	1,1-Dichloroethylene	0.00251	0.02
7	Sis-1,2-dichloroethylene	0.862	0.04
8	Ethylene trichloride	0.137	0.03
9	Tetrachloroethylene	0.029	0.01
10	Benzene	0.052	0.01
11	Total arsenic	0.00101	0.01
12	Total cadmium	0.0431	0.01
13	Hexavalent chromium	0.431	0.05
14	Total mercury	0.0259	0.0005 (Alkyl mercury not detectable)
15	Total selenium	0.431	0.01
16	Total cyanide	1.72	Not detectable
		Total 89 parameters	Total 25 parameters

Section 6

Efforts by Local Environmental Administration

- Tianjin Case Study -

Environmental Protection Bureaus at local administrative levels

As mentioned in Section 1 of this chapter, China's environmental administration is headed by a national authority, the State Environmental Protection Administration (SEPA), under which are a hierarchy of local administrations at the provincial level (provinces, autonomous regions, and municipalities directly under the central government), city level, and county level (counties and districts). Each of these local administrations has an Environmental Protection Bureau (EPB). At the town and village level, one level below the county level, the local governments have an Environmental Protection Section. The local government departments related to land use, mining, forestry, agriculture, and water utilization at the county level and above are charged with managing and overseeing nature conservation and resource protection in their respective areas of jurisdiction, in accordance with the relevant laws and regulations.

For Japanese companies operating in China, factory construction and the various other procedures related to the environment, such as day-to-day environmental monitoring and payment of pollutant discharge fees (pollution levies), are basically conducted through the EPB of the area in which the factory is located. The local EPB thus serves as an immediate point of contact in administrative matters.

During our field study, we had an opportunity to visit the Tianjin Environmental Protection Bureau (TianjinEPB). Its environmental programs are discussed briefly below as representative of local environmental administrations in China. It should be noted, however, that as one of the four major municipalities directly under the central government, and an economically advanced area of China, Tianjin has a very high level of administrative capability. TianjinEPB initiatives and programs are therefore at the top level among local environmental administrations in China.

600 employees engaged in Tianjin environmental governance

The TianjinEPB is a provincial-level local environmental administrative authority with jurisdiction over the whole Tianjin area. Established in 1980, it has 17 departments related to air quality, water protection, environmental monitoring, environmental administration, international cooperation, and so on. As of the end of 2003, the TianjinEPB had 105 employees. The 21 counties and districts that make up the Tianjin administration each have a county-level (district-level) EPB to which the TianjinEPB provides advisory services. These 21 county-level EPBs have 467 employees in total. Counting the EPBs at each level within Tianjin, nearly 600 employees are engaged in day-to-day environmental controls and related administration. In addition, Tianjin has 13 external entities, such as waste treatment facilities, that offer environmental services and operate on an independent financial basis.

The TianjinEPB has a wide range of responsibilities. They include: (1) Drafting and implementing plans for environmental protection; (2) Approving environmental impact reports; (3) Inspecting facilities that discharge pollutants; (4) Making inspections in regard to the "three synchronizations" system and approving pollution treatment facilities; (5) Collecting and registering pollution discharge data; (6) Levying pollutant discharge fees; (7) Enforcing penalties on polluters and applying to the People's Court for compulsory enforcement; (8) Preparing environmental news bulletins. Among these diverse responsibilities, the TianjinEPB's key tasks are monitoring (inspection) of facilities that discharge pollutants and enforcement of environmental legislation. Each of the 21 county-level EPBs in Tianjin has an environmental monitoring station. In 2002, these environmental stations carried out inspections of 8,454 factories licensed to discharge pollutants. Of these, pollution control deadlines, requiring compliance within a set period of time, were applied to 958 factories that exceeded the emission standards, and 88 factories that caused serious pollution were ordered to shut down. The EPB monitoring and supervision teams that carry out on-site inspections also levy pollutant discharge fees, we were told.

In this survey, we visited four Japanese companies in Tianjin. All of these companies handled environmental procedures through the EPB in their district and had received on-site inspections by their district EPB. Most of the latest information on environmental regulations also came from the district EPB.

To gauge the effectiveness and rate of implementation of environmental monitoring, the TianjinEPB requires large-scale factories that generate wastewater or waste gas to install online monitoring devices by the end of 2005. In regard to wastewater, the requirement applies to factories that have minimum daily discharge rates of $100m^3$ wastewater, 30kg COD, and 27kg ammonia nitrogen. In regard to waste gas, the requirements target key industries, such as thermal power plants, that need to control air pollution. The online monitoring equipment installed in the factory is connected to the EPB of the district or county in which the factory is located, and to the TianjinEPB. The equipment costs are borne by the particular company, but penalties are imposed if any company refuses to install such equipment.

Stringent local emission standards for boiler flue gas

Tianjin's environmental policy, like that of the central government, focuses on air pollution, water pollution, and hazardous waste management.

In regard to air pollution, Tianjin is a designated "SO_2 control zone," a key area for reducing air pollution. Tianjin is also targeted to become one of China's model cities for air pollution control by the end of 2004. To achieve this objective, stronger controls on emission sources and incentives for fuel conversion are being aggressively pursued. In 2002, the Blue Sky Program was launched, aimed at reaching National Ambient Air Quality Standard Grade II (air quality standard deemed suitable for urban areas) on a minimum of 80% of the 365 days of the year. The legal backing for these air pollution controls is the national Law on the Prevention and Control of Atmospheric Pollution and the Tianjin Air Pollution Prevention Ordinance, enacted by the People's Congress of Tianjin in July 2002. Based on these statutes, Tianjin is implementing controls on factories and other stationary emission sources, and on mobile emission sources such as automobiles. To prevent fugitive dust emissions from factories, roads, demolition and construction sites as well as from coal stockyards and other powder stockyards, Tianjin is introducing strict controls for preventing scattering of particulate matter.

Of particular note are Tianjin's local regulations for boilers, which are considerably more stringent than the national standards. These regulations are based on the Emission Standard of Air Pollutants for Coal-burning Oil-burning Gas-fired Boiler, issued by the Tianjin government in October 2003. For example, in regard to the sulfur dioxide content of boiler flue gas, the limit for coal-fired boilers is specified in the national emission standards as 1,200 mg/m^3 for existing facilities (built prior to December 31, 2000) and 900 mg/m^3 for new facilities (built on or after January 1, 2001). In Tianjin, the maximum SO_2 emission levels are restricted to 400 mg/m^3 and 200 mg/m^3, respectively, which is more than three times stricter. Equally stringent standards are set for boiler emissions of soot and nitrogen oxides. To meet these standards, the use of coal fuel is banned in small boilers, and medium-size boilers are required to convert from coal to a clean fuel such as natural gas. The reason Tianjin has adopted such strict emission standards is that, under the national Law on the Prevention and Control of Atmospheric Pollution, areas that fail to meet the air quality standards are required to comply by the end of 2005.

Tianjin also has enacted and implemented offensive odor controls that are stricter than the national standards. These are the Tianjin Emission Standards for Odor Pollutants (effective January 1996).

In regard to water pollution, the 1994 Management measures for the prevention and control of water pollution in Tianjin was revised in January 2004 and incorporates a number of new provisions. These include: (1) Implementation provisions relating to total discharge controls; (2) Clarification of the penalties imposed for violation of the management measures; (3) Provision for contracting factory wastewater treatment to a specialist treatment operator certified by the TianjinEPB; (4) Special discharge controls for factories that manufacture products which could cause serious water contamination or readily cause water pollution. In the future, while tightening its existing water pollution controls through stricter supervision of emission sources, the TianjinEPB plans to develop new methods of dealing with water pollution and will shortly adopt a new regime of emissions trading for specified water contaminants, targeting COD and ammonia nitrogen.

In regard to hazardous industrial waste, regulations tailored to local conditions have been put in place in Tianjin, regarding the licensing of hazardous waste treatment facilities and the implementation of a manifest system for the movement of hazardous waste. The regulation about waste treatment licensing sets out in detail the approval criteria for hazardous waste operators. To date, eight companies have been licensed as waste recyclers under the terms of this regulation, and one company has been licensed as an integrated waste treatment operator permitted to incinerate, stabilize, and landfill hazardous waste. This integrated hazardous waste treatment company is partly owned by Tianjin city (for details, see Section 4 in this chapter).

The regulation about manifests sets out details about implementing a manifest system for tracking the movement of hazardous waste from the generation source to the final disposal site. In China, hazardous waste must be treated and disposed of basically within the provincial-level administration area in which it is generated. As a special case, however, if there are no treatment facilities in the area or if it is considered better for the company to contract a treatment facility in another location, hazardous waste may be moved to another province for treatment. In such cases, with the approval of the provincial-level EPBs in both the source and destination areas, hazardous waste may be transported across provincial borders in accordance with the manifest system for hazardous waste movement. Regardless of where the waste is going, transportation of hazardous waste also requires a license to be obtained from the Tianjin Public Safety Department and Traffic Management Department.