Chapter 8

Company, Technology, and Environmental Problem

Preface

In recent years, those who manage multinational companies have begun to think more carefully about corporate social responsibility (CSR) and socially responsible investment (SRI). This is in part because of a decline in the number of individual investors and a corresponding increase in the number of institutional investors putting money into pension funds, but also because of the growing interest that general consumers and investors now show in the related issues of environment, health, and human rights. Since enterprises whose global interests have global effects are now being asked to take proper responsibility for their business activities, especially if these activities are likely to harm society, and since modern capitalism assumes that a company is the basic unit of the capitalist system, environmental economics inevitably takes a keen interest in how successfully leading companies balance their profit seeking motives with a commitment to protecting and preserving the environment.

This chapter considers how companies understand their relation to environmental problems: how genuinely, that is, participants called companies consider it their duty to intensify their voluntary ability to cope with whatever dangers to the environment their activities may cause, and how a system ought to be designed to ensure that they *do* consider this. And since environmental technology has become a source of international competitiveness between rival companies, as we may see particularly clearly in the automobile business, the author goes on to examine the relation between the development of environmental technology, the theories of corporate and environmental governance, while additionally examining what has come to be called "a sustainability report".

1 Corporate management and environmental preservation

We can classify the relation between companies and environmental problems under four theoretical headings.

[1] The environment and effective management

If we wish to reduce pollution we must economize on raw materials and save expenditure on energy. We have already spoken of the need for this when discussing "the economy in application of constant capital" (Chapter 2), and, as we shall see later, the Porter Hypothesis deals with it, too: it is, in fact,

the particular concern that has led to our awareness of the need for the conservation of raw materials and energy. As a result of raising their environmental effectiveness, companies achieve competitive predominance.

[2] Having a care of the environment as a signifier of good intentions

If a company takes, and is known to take, an active attitude towards the environment, the corporate image of that company will improve; and since, as a result, the market share of the company may well expand, leading companies can have a great influence on public policy.

[3] The environment and market opportunity

A company's expenditure on means to protect the environment will provide income for a third party: for example, it will offer business opportunities to the manufacturers of appliances for reducing contamination, to the suppliers of machinery for recycling or for cleaning industrial properties, and all those new businesses that have grown up in response to the needs of the environment. So that far from dampening the market, regulations designed to protect the environment will in fact work to create a more flourishing business market.

[4] Compliance with the environmental guidelines

Companies can minimize any confusion or uncertainty that may result from observing new rules, not only by passive compliance with existing environmental laws and current ordinances, but also by predicting future trends (Turner et al., 1994: 248–250).

In recent years, increasing emphasis is being placed on CSR (corporate social responsibility). One reason is that companies are now required to undertake responsibility for satisfying what these days are called stakeholders (not only stockholders, that is, but employees, customers, local residents, etc.). Another reason is that they also need to take actions that contribute not merely to the economy as if this were a thing apart, but also to the good of society and the environment: to the three domains, that is, of the economy, society and the environment, which have been our focus throughout this book. This indicates that a ground rule for those participants who are recognized as companies will be one that demands their observance of CSR as a means to realize the goal of sustainable development. It is thus important to view it as a means of social governance. As we saw in chapter 2, regulation by government and monitoring by civil society are indispensable for the proper functioning of CSR.

The EU defines the object of CSR as respect for society and the environment, while adding that such considerations are voluntary and constitute a

business activity (EU, 2002). In order to realize CSR as a workable system, however, we need to combine the three domains of the economy, environment and society within an institutional framework that is at the same time global in its reach. An international standard management system and an environmental report have become regularized tools for assisting those whose work affects the environment to learn to care *about* the environment and to care *for* it, while evaluation indexes such as fairness and compliance have been proposed to satisfy society.

These days, companies are answerable to many stakeholders, who, as we have just observed, consist of almost everybody, local residents, customers and the mass media, as well as stockholders and employees. When we look at company businesses from this perspective, we see that "companies are not black boxes which seek profit maximization", and that "while profit for companies is vital, as health is for humans, it is not a company's ultimate purpose" (Kobayashi, 2005). If companies are able to coordinate corporate earnings and the public interest, they should then find it easier to take voluntary action when faced with environmental problems. They need to do this [1] to reduce the potential risk of regulation change; [2] to have a beneficial influence on future policy; [3] to gain technological support and economic incentive; [4] to improve cost-effectiveness; and [5] to improve their relationship with stakeholders (stockholders, the general public, and the inhabitants of neighboring areas) (Khanna, 2001).

We can also look at CSR from the perspective of corporate capabilities and governance. When viewed from this angle, two issues become clear: that while a company must satisfy the wishes of stakeholders, it must also apply corporate resources and capabilities in a socially significant form. Yet, since the basic object of a company is to raise sales and increase profits, as we can see in the practice of active lobbying, even CSR is not able to eliminate strain in the relationship between capitalism and democracy. The present author firmly believes, as Robert Reich puts it, that constructive policy for change is to prevent companies from determining the rules of economic activity by themselves and thus adversely affecting the democratic process. (Reich, 2007: Chapter 5).

2 Corporate and environmental strategies

Although it is often taken for granted that anti-pollution investment does not contribute to productivity and that environmental regulations weaken corporate competitiveness by increasing the cost, Japan's experience in the

1970s makes it evident that environmental regulations do not necessarily weaken competitiveness. Michael Porter of Harvard University is a world-renowned specialist in the fields of competitiveness and corporate strategy, and he has developed a theory of corporate strategy to tackle this problem from the perspective of a theory of management strategy. Porter argues that a company that produces waste is not using resources effectively: he has criticized the idea of a "tradeoff between the economy and ecology" and has emphasized the need to integrate corporate and environmental strategy. His claim that strict environmental regulation raises the international competitiveness of domestic companies has come to be called "the Porter Hypothesis" (Porter and van der Linde, 1995) and it focuses on the beneficial effects of technical innovations.

"The Porter Hypothesis" may be summarized as follows (Hamamoto, 1997). If we look at productivity in terms of the use of raw materials and the expenditure of energy, we see that modern methods of production engineering, which are premised on mass disposal, are inefficient. Porter has noted, however, that a certain number of companies have attempted to reduce contamination and have encouraged improvement by adhering to environmental regulations through innovation in the productivity of their raw materials or by the appropriate use of energy in the manufacturing process, and that they have indeed realized the aim of improving profits in excess of any expenses that they may have incurred for environmental safety (this is called "the innovation offset"). So, although the current environmental regulations may at times appear to have a rather negative effect and may even discourage innovation, we are certainly able to find cases of an innovation offset, and it is therefore possible to reinforce corporate competitiveness if the environmental regulations are appropriately designed to promote innovation. The following would be the necessary requirements for designing desirable environmental regulations.

[1] The regulations should not apply to technological standards but to the emissions of pollutants. Where this is so, a company has sufficient room to use its own discretion, and is therefore more likely to introduce, on its own initiative, innovations in technology.

[2] The regulations should adopt market mechanisms such as an environmental tax so that the incentive to innovate can operate continuously.

[3] In order to close loopholes that would allow the infiltration of undesirable corporate lobbying, we must remove all uncertainties and ambiguities in the regulations, and for that purpose it will be necessary for the industry itself to participate in discussing and formulating them. This would also

have the effect of clarifying the schedules for the application of the regulations both in the long and the short terms.

Not everyone, however, accepts the validity of "The Porter Hypothesis" (Palmer et al, 1995). Its opponents claim that if innovation brings in profit even under strengthened regulations, a company must already have had prior incentives to innovate: that is, "they will not be expecting a windfall". Porter's critics have also been examining certain details of the Hypothesis, especially as to [a] the mutual interdependence of companies and of companies and regulators in making strategic decisions, and [b] the potential opportunities that are currently overlooked for some reason that will be actualized by the reinforcement of regulations. Although a model analysis of [a] presumed on strategic actions cannot reach a general conclusion on the validity of the hypothesis, it recognizes the likelihood of [b]. And since the cost offset (the cost reduction brought about through improving effectiveness in the use of energy and raw materials by environmental measures) of the manufacturing industry in the US is less than a mere 2% of the environmental expense, this might also be thought to encourage a skeptical view of "The Porter Hypothesis".

Before we leave "The Porter Hypothesis", though (and if only for the moment), we should pay attention to the following four points:

[1] While Porter basically focuses on environmental regulations and corporate level innovation, we need to look more carefully at the relationships and the distinctions between the various levels at work here, the corporate, the industrial, and the national, if we hope to grasp their potential significance.

[2] Since increased production efficiency and improvement in environmental measures are likely to move in step, it is difficult to subtract and isolate investment on plant and equipment for environmental measures from those other factors to which they will be intimately linked. In reality, too, an updating of all the facilities usually does more to lessen the environmental load than making use of 'end-of-pipe' technology.

[3] Many companies do not take the environmental cost sufficiently into account, and we regularly become aware of this tendency when such companies as these seek to initiate environmental regulations or acquire certification ISO14001.

[4] We need to analyze the effect of innovation when investing in research and development as the hoop that will bind in a firm barrel the planks of

environmental regulations and productivity improvements.

Each of these four issues can be treated as a specific problem. [1] raises the problem of the level at which we target our analysis. It is necessary to examine the difference among sections of industry that have not yet faced, or still need to face, the demands of strict regulation: this, in more detail, is a problem of the regulation standard and the methods set for the whole nation, as well as constituting the problem of each company's individual strategic perception and market structure.

[2] is a problem of the distinction that needs to be drawn between end-of-pipe technology and "cleaner production". We need to consider this issue carefully, especially when looking at the relation between production equipment and the environmental load in former socialist or developing countries. Since, as we have just said, the updating of all the facilities is often more effective than attaching additional anti-pollution appliances to the facilities already existing, we must take this into account when seeking to implement CDM (Clean Development Mechanism) or JI (Joint Implementation) if we hope to achieve the goal of the Kyoto Protocol.

[3] is the problem of a company's actual ability to grasp the nettle of the environmental cost. Yasushi Ito points out that according to the Environment Agency's "Environment-Friendly Company Survey (1996)", more than 60% of the listed companies had not, during the early 1990s, undertaken to fund the necessary environment-related measures; and in his 2001 survey he clarifies a role of environmental audits and environmental accounting such as ISO14001 (Ito, 2001: 100–113). The more recent "Environment-Friendly Company Survey (2007)" conducted by the Ministry of Environment shows that only 37% of the listed companies have so far introduced environmental accounting. When the present author checked Japanese companies' compliance with the EU's WEEE (Waste Electrical and Electronic Equipment Directive) and RoHS (Restriction of Hazardous Substances), he found that while the companies were re-organizing the part supply chains the material measurement cost had increased. This was when viewed from a short-term perspective, however; in the long run, a reduction in the number of parts and a thorough review of the suppliers contributed to an improvement in the corporate management.

[4] is a question of the relationship between environmental regulation and investment in research and development. Mitsunori Hamamoto pays attention to the possibility of improving productivity through a lowering of the cost as a result of environmental regulations that stimulate corporate innova-

tion, as in the environmental technology that is now being applied to automobiles (Hamamoto, 2006). His research into Japanese practices during the 1970–80s has revealed that the then current environmental regulations had the effect of raising the whole research and development expenditure over the years that followed. This has led him to propose a corporate action model, in which an expense burden derived from corporate correspondence to environmental regulation will trigger research and development to seek for a more effective production process, and will include measures to aid the environment.

During the 1990s, the growth of corporate research and development expenditure was lethargic, but during the 2000s it became active again. The percentage of companies conducting research and development studies of environmental problems is now very high, and 93% of the companies with more than 50 billion JPY ($0.5 billion) capital are carrying out such programs (Ministry of Education, Culture, Sports, Science and Technology, 2006). Toshihide Arimura's studies have confirmed that environmental performance regulations have increased the number of programs in environmental research and development (Arimura, 2009). In particular, the development of environmental technology in the design of automobiles has become the key to the restructuring of the world's automotive industry. In 2007, Toyota Motor Company, with 940 billion JPY ($9.4 billion), was first on the list, and the research and development expenditure of the motor companies was at a record high, maintaining thereby a significant level of response to the environment. Since policies like the Green New Deal that has been proposed by America's President Obama have not yet recommended any specific models, the companies cannot know for sure whether a hybrid car, a fuel cell-powered car or an ethanol-driven car will be the main vehicle of choice; and since only a handful of makers can sustain the burden of the expense required for research and development, so tie-ups and reorganization with other companies are being pushed forward so that each of them is able to adapt quickly to every technological advance.

We may illustrate the importance of corporate strategy in environmental measures by citing the significant example of the regulations concerning the refrigerant Freon (CFC). After the Montreal Protocol (1987) had specifically singled out Freon as an ozone depleting gas, Japan at first switched to Hydrochlorofluorocarbons (HCFs) in freezing apparatuses intended for business use, but when the Kyoto Protocol (1997) targeted the HCFs as greenhouse gases as well, Japan was forced to refrain from using them thereafter. In other words, Japan as a whole misjudged the strategic trend of the environmental regulations and over a short period invested uselessly. Germany and its

North European neighbors, on the other hand, when faced with the specific regulation concerning Freon and the question arose of switching to HCFs debated the issue in public. Environmentalist groups also joined in the discussions and it became generally understood that a proper environmental strategy should include opinions not only about ozone depletion but also about the greenhouse effect, and as a consequence industry decided to switch over to the use of hydrocarbons as refrigerants. We therefore conclude that companies should not simply accept the national policy and standard, but should examine and reexamine these policies for themselves, taking note of overseas trends and corporate strategies.

3 Japanese technology and environmental measures

Thanks to the innovative measures that Japan took to overcome the serious pollution problems that it faced during the period of high economic growth, its efforts have been appreciated globally; Japan, indeed, operates the majority of the world's desulfurizing equipment and denitrification devices; it also exports them to the rest of the world. At the same time, even though only a small amount of its land is usable, Japan houses the majority of the world's incinerators. When this resulted in severe dioxin contamination, the country was forced to expend enormous amounts of tax revenue on building incinerators that did not emit dioxin. This fact in itself indicates the need for an historical evaluation of Japanese anti-pollution technology and its environmental consequences, and a correct evaluation of its technical environmental policies.

Let us first then remind ourselves of the historical circumstances.

In the 1960s, Japan faced serious pollution problems, and in the 'Pollution Diet' of 1970 the government passed 14 pollution-related laws; in 1971, it created the Environment Agency. Thereafter, regulations affecting every form of environmental media, including both water and air, were strictly enforced, and around 1975 anti-pollution investment in such measures as wastewater treatment and pollution-abatement devices reached its peak. Japan, which has achieved high economic growth through its introduction of innovative technology, has also had to come up with its own environment-related technology, for since the pollution problems often occurred near residential areas with high population density, it became absolutely essential, if factories were to continue production, to develop sophisticated environment-related technology.

This was made possible by such measures as subsidies and tax incentives for research and development investment to compensate for the severe regula-

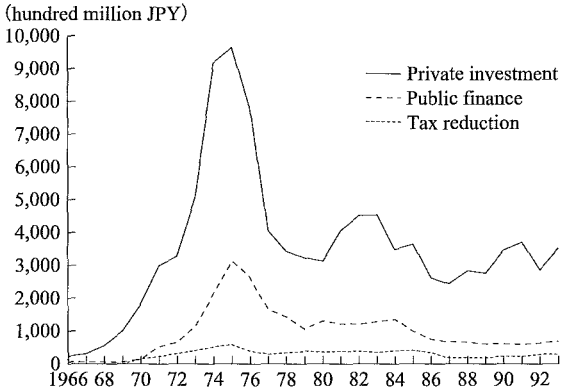

Figure 8-1 The change of anti-pollution investment and finance/tax incentives (Li and Ueta, 1997).

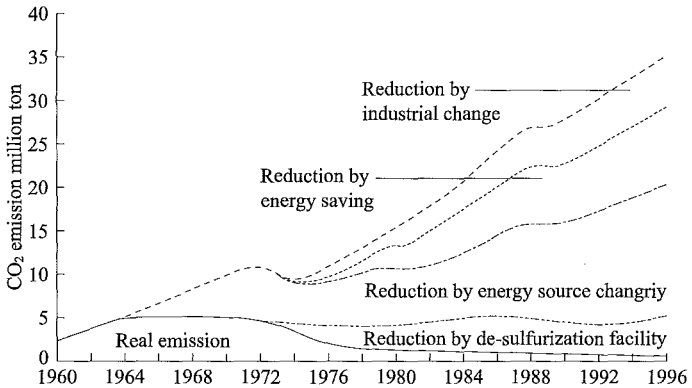

Figure 8-2 The factor analysis of discharge and change of sulfur oxide (Committee on Japan's Experience in the Battle against Air Pollution, 1997 :Figure 5-5).

tions imposed by the national and local governments; we should note, too, that these measures were carried out with the strong backing of public opinion. We should also pay attention to the energy saving and pollution-abatement measures that were triggered by the "Oil Crisis" of 1973. These two motors for change got off to a simultaneous start, and nowadays about half of the capacity of the desulfurizing equipment in Japan is used for the generation of energy, while approximately 30% of its facilities are sites for waste incineration.

Although the first anti-pollution appliances were developed without too much consideration of the cost, by spreading it within the public domain the

cost was in fact reduced. At the same time, fuel conversion to low sulfur heavy oil or LNG for sources with small emissions worked effectively. Another constant incentive to reduction was The Law Concerning Pollution-Related Health Damage Compensation and other government measures that rendered SO_2 discharge liable to prosecution. Furthermore, the national qualifying examination of managers in charge of pollution control and heat management "killed three birds with one stone" since it effected energy saving, pollution abatement and improvement to the quality of the plants. These elements cannot be overlooked for their role in building up the capacity for environmental policy. Since, during recent years, many of the original staff have been retiring, we need to train their successors in the techniques and know-how of environmental policy.

3-1 Automobile exhaust measures

Japan's technological measures to reduce automobile exhaust gas are second to none, and her automobile exhaust regulations, inspired by the US Muskie Act of 1970 (an amendment to the 1963 Clean Air Act), are often considered to have improved the performance of automobiles, and have strengthened the country's export competitiveness. The OECD evaluates Japan's efforts in the following way: "The content of the 1976 automobile exhaust emission regulation first announced in 1972 was carbon monoxide CO: 2.1 g/km, hydrocarbon HC: 0.25 g/km, and nitrogen oxide NOx: 0.25 g/km. While the regulation of CO and HC presented little difficulty, NOx was regulated unexpectedly strictly, and was strongly criticized for its technological difficulties. As a result, in 1976, a lighter standard was established (0.6 g/km=a compact car). Nevertheless, the decision was taken to aim for 0.25 g/km in 1978. …The automobile manufacturers announced that they would be able to produce automobiles that would achieve the NOx standard of 0.25 g/km. …The Japanese automobile manufacturers succeeded in areas where their overseas competitors failed." (OECD, 1977: 33–34)

Japan's ability to reach the desired automobile exhaust standard is often posited as an example of the predictive accuracy of the Porter Hypothesis with regard to environmental regulations and innovation, and here we should note Porter's assumption that "environmental regulation should be designed appropriately". As we have already seen, he laid down certain conditions, that [1] companies should have sea room to choose their own technology, [2] the regulations should use market mechanisms, and [3] companies should participate in discussing the regulations publicly without uncertainty or ambiguity. It is therefore necessary to look closely at how Japan satisfied these conditions

in the matter of the automobile exhaust regulations. We shall then need to consider the participants and analyze the system that they used to meet the regulations put in place to deal with automobile exhausts.

The regulation plan was proposed in 1972, and for nearly two and a half years lengthy and argumentative discussions raged over the effluent standard of automobile NOx before the adjudicating officials were finally able to submit their report at the end of 1974. During those discussions, the Automobile Discharge Gas Technical Committee, the Air Pollution Group and the Central Council for Environmental Pollution Control of the Environmental Agency heard from each manufacturer about the technical possibilities of its being able to apply the regulations (to satisfy Condition 3). In the process, the Seven Big City Automobile Gas Discharge Regulation Problem Investigation Group, which had been established by seven progressive local governments, argued that severe regulations encourage technological development: even the mass media was caught up in the major debate that then ensued. In the Japanese market, where more than 10 companies competed, Honda and Mazda saw the gas discharge regulation as a business chance to start production of four-wheel-driven vehicles, which would lead to competition in the development of technology (to satisfy Condition 2). In the US, however, the Big Three jointly opposed the regulation. Although, at first, Honda and Mazda led the business through the development of an engine combustion control method, Toyota and Nissan were soon able to comply with the regulations by a three-way catalyst method (a device for purifying NOx, HC, and CO by reduction and oxidation) and general technology to overcome the hazards they posed (thus satisfying Condition 1).

The foregoing highlights the importance — if the conditions of the Porter Hypothesis are to be satisfied — of a cooperative method of working between the administration and the companies, of following such institutional incentives as the instructions of the Environmental Agency, of attending carefully to the situation of the participants and the competitive circumstances that the companies face, as well as of listening to public opinion and seeking the cooperation of progressive local governments and the representatives of the local residents.

After the high non-regulation levels of 1973, the NOx, HC, and CO in exhaust ingredients had — as a result of such technological developments — been reduced thirty years later to lower than 1%. This was thanks to the combination of the electronic control type fuel injection device and the three-way catalysts, which had been enhanced remarkably in the engine of a general automobile. Because of the absolute increase in the number of automobiles,

however, air pollution in urban areas in particular does not seem to have been reduced. This is called the dilemma of the N-curve, showing "the limit of technology" for automobile exhaust measures, since an increasing number of automobiles offsets each automobile's improvement in technical performance.

There is also the problem of setting regulations for the exhaust emissions of a diesel-fired vehicle. A diesel engine has better heat efficiency than a gasoline engine, with less fuel consumption. In addition, as a result of the Japanese policy of pricing light oil more cheaply than gasoline, the cost of fuel for a diesel engine is much lower than that for a gasoline-run vehicle. Furthermore, the exhaust emission regulations for a diesel-fired vehicle were originally regulated for trucks in industrial use: since these regulations are loose, and basically regulate only emission concentrations, manufactures began to switch from gasoline-fired car engines to car engines driven by diesel fuel. This presented its own problems, however. The difficulty of reducing the gas discharge from a diesel car was said to lie in the difficulty of combustion control, a tradeoff between NOx and black smoke, and the impossibility of using three-way catalysts. Since the claim that "NOx reduction from a diesel engine is technologically difficult", manufacturers rapidly sought to economize on the transportation costs, especially of trucks, by making more use of diesel-fuelled engines, by upsizing, and by an increase in engine power. This is another example of "the limits of technology", however, for in recent years the issue of taking steps to counter global warming has become ever more pressing. The automobile manufacturers of Japan, the US, and Europe are now engaged in intense technological competition, wrestling for a solution to the problem of controlling exhaust emissions and improving mileage, as requested by the regulations that enforce gas emission reductions and energy saving. The EU, in particular, is experimenting with the 'dieselization' of, in the main, a compact car that will emit less CO_2, and is leading the world in a common rail type injection system in which electronic control enables flexible injection.

Japan, on the other hand, leads the world in hybrid technology designed for a gasoline-fired car. Yet since the development of a fuel cell-powered vehicle requires vast amounts of money, we need — as environmental measures to counteract global warming — not only "technological developments" that will reduce emissions from a single car but also measures to regulate general automobile traffic density, so as to reduce, for instance, the absolute number of automobiles.

3-2 Sewers and refuse disposal as a public works project

Since the 1990s, one of the characteristic trends of Japan's environmental measures technology is the high proportion of very costly public works projects that have been devoted to improving the sewage and refuse disposal systems. In fact, the construction and improvement of city sewers has been the most expensive item on the national environment-related agenda, and at its peak in 1997 the national and local governments spent 3,300 billion JPY ($33 billion) in all on sewage construction and management. The rate of subsidy from the national government to local governments is usually 50%, but the burden is still so heavy that it occupies 70% of a local government's debt, and during the ten years up to 2006, the deficits run up by the sewerage service exceeded 7 trillion JPY ($70 billion). Yet even though an enormous amount of money has been invested in engineering works, at the end of 2008 the facilities able to process sewage covered approximately only 73% of the national population. Some areas with a decreasing population are not even able to provide the costs of a basic maintenance service. Economists have questioned (and criticized) the cost-effectiveness of the sewerage service, and we may take — as an instance of the problems that the system faces — the issue of river-basin deposits from the main sewers and those sewage treatment plants that gather sewage from several municipalities over a wide area administered by several prefectures. There has been also a problem of junction-type channels into which both rainwater and drainage flow. In the circumstances, there is a role for a combined septic tank (occupying perhaps 8% of the processing equipment) that would be able to handle raw sewage and daily life drainage together.

When we turn to current municipal waste processing technology, we find that approximately 80% of Japan's domestic waste is burnt, which leads to the problem of dioxin-induced pollution. Originally, a legal system known as the Waste Disposal and Public Cleaning Law regulated the collection of excreta as a means of public sanitation to prevent city-wide epidemics, but since domestic waste has been mounting rapidly during the period of high economic growth, Japan has coped with the conditions by building more and more incinerators. Municipal waste incinerators guarantee a huge community market for the manufacturers, and once the problem of dioxin pollution came to the surface, the manufacturers developed very expensive incinerators that would not discharge dioxin, such as, for instance, gasification melting furnaces: but there is a fundamental problem with this. While the Basic Law for Establishing the cyclical Society that took effect in 2001 makes a principle of cutting down on waste, the Act for Special Measures against Dioxins (1999)

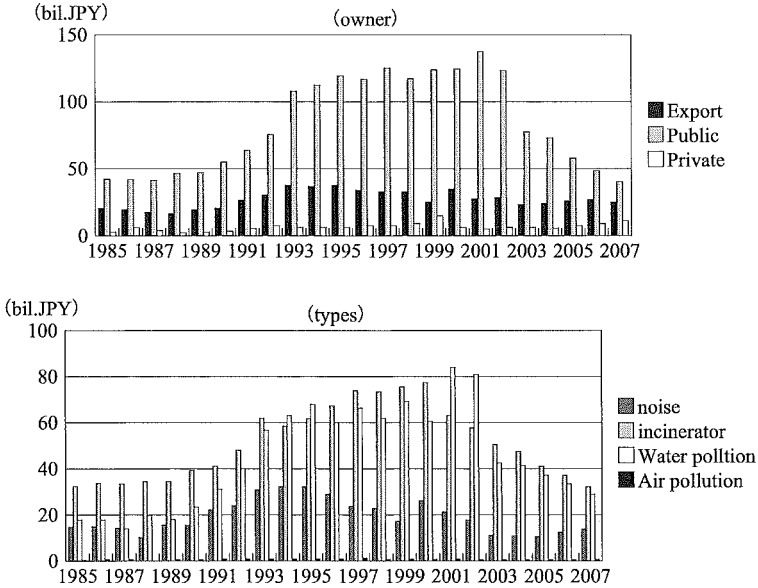

Figure 8-3 The change in owners and ordered types of environment devices (The Japan Society of Industrial Machinery Manufacturers).

had already laid down that waste disposal treatment must be carried out so as not to discharge dioxins, and since dioxins, including organochlorine, are easily produced during incomplete combustion of plastic at low temperatures of 250–400 degrees Celsius, the temperature of the furnaces must be kept higher than 800 degrees Celsius to avoid discharging the gases, which ironically entails a steady supply of waste. In addition, the country will need the injection of more tax revenue to pay for incinerators of high technological efficiency if it is to cope with the problem of increasing municipal waste. Since we can see here that Japan, too, has discovered that there are limits to what technologically sophisticated environmental measures are able to achieve, we are therefore in need of production techniques, consumption habits, and a restructuring of city resources that do not easily produce waste in the first place. And while Japan is said to have a comparative advantage in environmental technology, the sewerage and refuse disposal systems have been developed for a public works market, and the cost evaluation is therefore inadequate; nor has there been any price competitiveness in countries such as China to set against European and American technology. The hold of custom and

inertia make it hard to spread such techniques (Mori, 2009: 290).

3-3 Cleaner production

Wastewater treatment technology and desulfurizing equipment are end-of-pipe technological refinements that are attached to devices as additions; and though they have played a historic role in reducing the environmental load, they tend to be very expensive, making it much more difficult to transfer the technology to developing countries. Consequently, attention has shifted to devising techniques of cleaner production (CP), in which the resource effectiveness of plants and technologies to minimize waste discharge are being developed.

Although no one has yet defined CP to everybody else's satisfaction, Ryota Shinohara has suggested that CP is the domain where the three elements of environmental load reduction, productivity improvement and energy saving overlap (Shinohara, 1998: 1–10). One example of CP in Japan would be the technical switch that was made in the production of caustic soda from a mercurial method to an ion exchange membrane method: it was triggered by the Minamata disease in the 1970s and cost a huge sum. While some have questioned its cost-effectiveness, the switch from end processing to the main facilities has led to considerable environmental improvement and should be evaluated accordingly; yet although the investment in plant was carried out to introduce a diaphragm method as swiftly as possible, a vast capital investment was needed, for the producers were forced to reconvert to the ion exchange membrane method, since, at first, in producing caustic soda, the electrolysis of salt emitted a superabundance of chlorine. We should also note that the use of vinyl chloride and chlorinated organic compound as raw material for plastic places a heavier load on the environment.

Kiyoshi Fujikawa has analyzed Japan's environmental measures technology by comparing the fates of different industries, which he sees as the problem of "a change of the industrial structure and the environmental load", and he makes much of a change of the industrial structure triggered by the "Oil Crisis" as one reason for the reduction of Japan's environmental load. During the 1970s, for instance, the rise in the price of energy reduced the proportional output of such former powerhouses as the petrochemical and steel industries, and in the 1980s machine makers like the automobile and electronic industries became the leading engines of Japan's industrial advance. After the yen's appreciation in the 1990s, the tertiary industries began to play a key role in the economy. During these periods, however, while the industrial section developed its technplogy for saving energy, energy consumption in the home and in

transportation increased dramatically. Fujikawa also points out that as a result of the transfer overseas ('outsourcing') of manufacturing industry brought about by the stronger JPY, there was a transfer of environmental loads to those other countries, and this cannot be overlooked (Fujikawa, 2001: 83–99). Consequently, he concludes that improvements in the technological measures designed to protect the environment cannot be the whole cause of the reduction in the environmental load.

The development of Japan's environmental measures technology shows not only that "limitation creates innovation" but also that there are limits to what technology-centered measures are able to do to protect the environment. A proper environmental policy must ensure that technological development and the reform of the system by which people dispose of waste are able to proceed "hand in hand".

4 Environmental management

As we explained in Section 1, the ground rule of CSR (corporate social responsibility) lays down that company participants should seek to realize the goal of sustainable development. Yet, since companies are organizations that seek profit, the conditions that favor a tie-up between environmental preservation and economic activity will be when the steps that companies take to preserve the environment are directly related to their business income, or when such steps will enhance their social fame, thus contributing to their profit in the long run. Three conditions are important if we hope to create an environmental management system: [1] a corporate philosophy for environmental management; [2] a management technique/structure and organization that can execute environmental management; [3] market mechanisms in support of companies that exercise environmental management. (Kokubu et al., 2007: 4–5).

4-1 The corporate philosophy of environmental management and how it works out in reality

Let us now consider how these three elements of an environmental management system — [1] an environment management philosophy, [2] management techniques/structure and organization, [3] market mechanisms — apply in the case of Ricoh, a company that is highly evaluated for its practice of environmental management. Ricoh is a maker of copying machines and other office appliances, having started its business with the production of light-sensitive paper and cameras. It has subsequently grown thanks to its business model of "lease and supplement", a system by which

Ricoh originally leased copiers to establishments and collected used appliance after the leases had ended. While Canon and Fuji Xerox differ in their origins, they also take advanced actions to practice environmental management with similar business models, and such a market structure easily satisfies condition (3).

Ricoh has been a leader, too, in the field of environmental management philosophy, leadership and strategy (Condition 1). The company continues to develop its environmental technology and every employee (70,000) participates in the company's activities to preserve the environment. As for (Condition 2) — appropriate management techniques — the company uses a strategic objective management system, an environmental accounting system and an environmental management information system to estimate the environmental preservation measures taken by each section and every employee, and it uses these systems in combination to assess the company's overall performance.

Let us glance next at an evaluation process of environmental management by considering the key phrase "the co-axialization of environmental preservation and profit creation", which aims to coordinate the interests of business corporations and the general public. In the 1970s, when the price of iron clippings was high, companies were able to cover the costs of waste disposal treatment by selling the clippings. In the 1980s, however, the cost of waste disposal treatment rose and the price of clippings fell. Ricoh at that time was still at the stage of "environmental consideration", that is, it was "responding to pressure" from the regulations, business competitors and customers. In the late 1980s, however, Ricoh moved to the stage of "environmental preservation", and, in response to the demands of society, the company began to work positively on its reuse/recycling strategies. Having declared its high ambitions, the company carried out activities to reduce environmental loads (through resource saving, recycling, energy saving and anti-pollution measures), and sought to raise the consciousness of each employee under the banner of "our mission as citizens of the earth", that is to say, through everyone's acceptance of voluntary responsibility, voluntary planning and voluntary activity. It used as its tool the ISO14001 life cycle assessment (LCA), and advanced the concept of the recycling society and extended producer responsibility. It introduced the concept of "a comet circle", which attempts to carry out recycling activities as near to the source of an outlet as possible. During the stage of "environmental consideration", however, the economic burden is likely to increase, making it hard for a company to move on to the stage of environmental preservation and corporate management, and it therefore becomes necessary to proceed as quickly as possible to the stage of

"environmental management", which aims to achieve the co-axialization of environmental preservation and the creation of profit. Specifically, Ricoh removed a useless function at the stage of product planning and design, while reducing parts, modules, and assembling processes (environmental preservation), with the aim of reducing the cost and thus creating profit. Its recycling design policy planned to reduce the cost through reuse and enhanced product appeal (profit creation) by the reduction and uniform design of the parts, a design for long life (rather than 'built-in obsolescence'), energy saving, and the prohibition of toxic chemicals (environmental preservation). At the stage of production, it cut expense (and so created profit) by the prohibition of toxic chemicals, by process reduction, improvements in the yield rate and material/sub-material use rate, zero waste promotion (environmental preservation), recycling processing, disposal cost reduction, productivity improvement (cost reduction), and improvements in material efficiency (cost reduction) and resource saving. At the stage of selling and service, it performed environmental preservation by simplifying the packaging and by introducing reverse distribution (collection/recycling), while it created profit by reducing the quantity of wrapping paper and resource input (cost reduction).

Canon, another office appliance maker, has planned a ten-fold increase in corporate profit through what it has called its plan to "eliminate what is of no use". It claims that when an office leaves nothing in its 'personal trash box', the factory is able to reach both its environmental and profit goals by "a reduction in defective products", while believing that most profit is potentially buried in distribution and that the most important factor is a 'discharge restraint' in designing and procuring. These are the very features that the present author has repeatedly referred to in this book, which, like the Porter Hypothesis, emphasizes "economy in application of constant capital". Ricoh has set itself a highly ambitious long-term environmental aim, arguing that the detrimental effect that developed countries have on the environment must be reduced dramatically by 2050 to one-eighth of its present load. It also sets, not only for itself, another high aim by suggesting that every company, including the major industries, should work together to improve each country's corporation culture. Ricoh continues to devise innovations for its products in the production process and in its environmental technology, in order to achieve its lofty environmental targets. So, by good energy saving performance, the company will hav low production costs and high product sales.

4-2 The environment business

Every company is responsible for its own environmental management, but

the field of what we may call 'the environment business' is a matter for particular companies with technological expertise. Businesses with environmental expertise provide goods, services and technological developments for environmental preservation, and their influence is spreading, along with corporate work for environmental preservation. The Ministry of the Environment has estimated the market size and employment scale of the environment business in 2000, 2010 and 2020, based on a classification prepared by the OECD (announced in 2003). The result shows that the market size of the environment business was 29 trillion JPY ($290 billion) in 2000, but is expected to be 47 trillion JPY ($470 billion) in 2010 and 58 trillion JPY ($580 billion) in 2020. The employment scale was 769,000 in 2000, is calculated to have been 1,119,000 in 2010, and will be 1,236,000 in 2020. The large-size business operators in this field are the waste disposal treatment services (treatment of general waste, normal disposal treatment of industrial waste, intermediate processing, collection and transportation) and the effective utilization of recycled material/resources (the circulation of various used goods, resource collection), and so forth. The fields with large-scale employment in 2000 were, in numbers of persons employed, repair (93,000), general waste processing (78,000), used goods circulation (71,000), urban greening (63,000), resource collection (59,000), house reform/repair (59,000), industrial waste processing (58,000), intermediate processing (29,000), environment-friendly building materials (28,000), the sewer maintenance business (27,000), paper manufacturing industry (26,000), sewerage treatment (21,000), and analysis (10,000).

As might be expected, the waste collection and processing and the repair-related businesses have the largest effect on employment. Research in 2006 showed that the market size of the environment business was 45 trillion JPY ($450 billion), while the employment scale was 1,010,000. As for the environment-oriented businesses (this includes businesses who have responded to consumers' requests for environmental preservation), the market size was 65 trillion JPY ($650 billion), and the employment scale was 1,440,000. It is generally believed that the market size and the employment scale for the provision of renewable energy are likely to grow.

When, in 2007, the Ministry of the Environment carried out an "Environment-Friendly Company Survey" to record the extent and achievements of the environment business, approximately 40% of the companies answered that they had "already developed their environment business, or had provided service and goods". On the other hand, when asked about the problems they experienced in developing their environment business, they

answered that "consumers still lack interest and concern" (38%), that they had "insufficient expertise or lacked ideas" (25%), and that "developments in technology and extra investment in management resources, such as facilities and human resources, are highly risky" (24%).

4-3 An environmental report and its directionality

An environmental report is an official record of the ways in which a company pays attention to the environment when carrying out its daily activities. It is a basic policy tool by which a business corporation informs its fellow participants, the various stakeholders, of its environmental procedures. Although the practice of writing an environmental report surged in response to the growing environmental awareness of the stakeholders, the early reports were really a feature of the companies' PR strategies. As the practice has spread, however, so has the quantity and quality of information listed in an environmental report improved, but a company is an organization in pursuit of profit and its actions will be based on the social situation and its corporate strategy.

These days, too, we must consider a refinement of the environmental report that is known as "a synthetic environmental report"; this is based on the concept of sustainability, which attaches great importance to the views of each stakeholder and embodies the concepts of both environmental effectiveness and fairness. We recommend it not only for its usefulness in the field of environment-friendly practices but also as "a sustainability report" on the "triple bottom line" (of the economy, society and the environment) that discloses information about a wide range of social and economic activities (Matsuno, 2001).

The frame of an environmental report

Various models have been offered as a framework for an environmental report. The European Union's EMAS (Eco-Management and Audit Scheme) provides an environment management standard, while America's CERES (Coalition for Environmentally Responsible Economies) is another current and socially accepted set of regulations. Nevertheless, they have been criticized for being limited to local conditions and for not working sufficiently in terms of the global economy, for we now understand that any failure to ensure sustainability will affect the whole world — in all its forms, animal, vegetable and mineral. In response, an international NGO, the GRI (Global Reporting Initiative), has laid down certain globally directed guidelines. The GRI sets economic, social, and environmental performance indices for a sustainability

report, and requires that they be integrated and related. The present author believes that this will be the best direction in which to proceed since it is the one most likely to avoid those predicaments that the future seems otherwise to hold in store.

Yet the proposal only suggests our best direction as a general practice, and we shall need careful trials of specific companies who are prepared to adapt the guidelines and an index of feedback from those who make use of the information that we shall acquire by that means. As the GRI correctly recognizes, one must ask whether a unified standard can be developed that is sensitive to social agreements based on culture and history, in which each region and nation differs greatly from every other, yet that will need, nevertheless, to widen the range of a sustainability report to prevent cases of severe juvenile labor in developing countries where it has been the common practice, as well as needing to control the trans-boundary movement of waste and air contaminants. When we consider these problems, we see how necessary it is that we should coordinate the GRI guidelines as a general international framework along with the CERES regulations, the Japanese Ministry of Environment's guidelines, and other such environmental standards as the EMAS and the ISO.

The GRI guidelines are based on the concept of the triple bottom line — namely, economy, society, and environment — and offer, at the present moment, the most advanced concept of sustainability that we have. One possible way to coordinate these schemes would be to fix the GRI concept of sustainability as a general framework, while each individual country would devise its own guidelines as a subsystem in accordance with its own regional characteristics, its culture, its social system, its style of corporate governance, and the general conditions of employment. After this, the framework of an environmental report would be sent out to companies for their consideration and, if possible, for its implementation.

We can now see that the concept of sustainability is not concerned with index development alone: another important factor has emerged: the novel participation of stakeholders in a corporate environmental report. Previously, communication between stakeholders had been carried out in a conventional form that would simply elicit the opinion of the information users, such as a questionnaire attached to an environmental report; but this only aims at improving the environmental report that the company has already written; and if the intention is to provide an environmental report based on the broad concept of sustainability that combines economy, society, and environment, then the opinions of the informant will lack real substance with regard to the

information and the items/contents listed in a report, and a written report will lack effectiveness as a tool for communication about environmental issues. While, on the one hand, companies are required to disclose information that can be adapted to the needs of stakeholders for whom it is provided, the stakeholders, on the other hand, as the users of the information and regardless of whether they are consumers or local residents, should, on every relevant occasion, put pressure on companies to disclose information based on the market/residential opinions of what kinds of information ought to be disclosed. They should then decide to act, where action is needed, on the basis of the information that is provided. In addition, the government needs to standardize a performance index, set the required standard, and play a role in developing a formal framework whose elements should be kept to a minimum. At corporate, governmental, regional, and individual levels, the participants must take responsibility and act in each field, at every level. This is the basic idea of what is required to solve environmental problems, and what we need is a process of writing and/or using an environmental report that involves the desires, intentions and actions of each and every participant.

The writing of an environmental report acts as an incentive to eco-conscious corporate management, but the writing of a high-level environmental report is not in itself the goal; it is the result; and the final purpose of an environmental report is to function as an effective tool for communication about the environment between a company and its stakeholders. In this way, the participation of information users is also a necessary condition, and this is why the third edition of the GRI guidelines (2006) emphasizes the participation of the stakeholders.

The standardization of an environmental report

The characteristic elements of an environmental report are [1] compatibility, [2] reliability, [3] comprehensibility, [4] comparability, [5] adequacy of timing, [6] verifiability, and so forth; among these elements, [4] and [6] are the most important. Comparability [4] requires that companies within the same industry should have a unified understanding of what the calculations and descriptions of a performance index actually involve. Verifiability [6], however, is still an ill-defined condition, for although there are cases in which a third party opinion offering environmental information is attached to an overall environmental report of a Japanese company, definitions of such terms as "verification", "audit" and "third party opinion" remain unclear. We have to recognize that we need to construct an adequate system of representation and provide opportunities for writing practice that will harmonize the style in

which the increasing number of companies write their environmental reports, as well as encouraging the development of an advanced performance index.

The Japanese Environmental Consideration Law (*an Act on the Promotion of Business activity with Environmental Considerations by Specified Companies, etc., by Facilitating Access to Environmental Information, and Other Measures*), a law that took effect in 2005, is in this respect significant. While it requires certain types of public corporation to write and publish an environmental report, it also imposes an institutional frame to ensure the reliability of such a report.

The last major task is to overcome the problem of "eco-camouflage", to improve, that is, the reliability of the environmental information that the companies choose to publish, and build institutional security to bridge the frequent gap between "words" and "actions", while making sure that the definition of standard value and its contravention is clearly understood. Another effective measure for checking pollution control systems and their measurement results is to require companies to submit reports to the local government, while penal strictures are needed to deter any intentional non-recording or manipulation of discharge measurement data.

BOX 8-1 The role of environmental accounting

There are two types of environmental accounting: environmental management accounting for internal management and environmental accounting for public disclosure. The environmental accounting guidelines laid down by the Ministry of Environment for external environmental accounting, for example, specify three types of account: [1] the cost of environmental preservation, [2] the effect of environmental preservation, and [3] the economic effect. The environmental preservation cost [1] includes costs incurred by the business as a business, upstream/downstream costs, management activity costs, research and development costs, social activity costs, environmental damage costs, and so on. The environmental preservation effect [2], on the other hand, requires cost and effect comparability. This will include the effect of a resource load and waste incurred by an operation, of a resource load and waste discharged by an operation, of goods and service produced in an operation, and of transportation and other costs. The economic effect [3] is the corporate profit that environmental preservation measures have brought about, as measured in monetary terms. It is sorted into a substantial effect such as energy saving and income from recycling, and putative effects such as risk aversion (e.g., to avoid fines and lawsuits).

Environmental management accounting is related to environmental cost management in a production process. Although a waste cost accounting system lies within the domain that has been accounted as a blunder or as a reduction in cost accounting, should the waste be reduced, a double saving will be effected by a reduction both in the original material cost and the waste disposal cost. Material flow cost accounting attempts to rebuild a cost accounting system for the whole cost of finished goods as seen from an environmental viewpoint. This system enables us to take hold of an amount of money and the movement of resources (materials) in the process (duality of commodity), and clarify a problem in resource productivity in terms of money. Suppose that to manufacture a certain product costs 10,000 JPY for the raw materials and 6,000 JPY for the processing: in normal accounting practice, the cost of the finished product is 16,000 JPY, and even if out of 100 kg the final product weighs 80 kg while the waste weighs 20 kg, the waste itself will not be valued. This is not the case, however, in material flow cost accounting, which classifies waste as "a negative product". The cost of a "positive product" will, in accordance with its weight, be 12,800 JPY, while that of a "negative product" will be 3,200 JPY, without taking account of the waste disposal treatment cost, which, as we can see, was thrown away. This accounting has the effect of killing three birds with one stone: material reduction, cost saving, and energy saving. It aims at contributing not only to a company's economic activity but also to its environmental preservation strategies by improving resource productivity (Kokubu, 2000, 2008, The Ministry of Environment, 2005).

Summary

The theme of this chapter has been to answer two related questions: what, in the policies of businesses who are major participants in a capitalistic economy, is the place that they give to their responsibility to minimize environmental problems, and how, given that both aims are to be sought, are profit seeking and environmental preservation to be coordinated? The author has sought to show that environmental management is a concept that reinterprets sustainable development from the viewpoint of a participant called a company, a concept that is placed at the heart of CSR. While corporate governance has a social responsibility to satisfy the three domains that we have been discussing — the economy, society, and the environment — it is also responsible to a sub domain, its many fellow stakeholders. The various

participants — the government, the companies, the stakeholders — have consequently worked out and put into practice a system and a technique for environmental management in terms of environmental accounting and a sustainability report, as well as a system of environmental auditing. In order to improve its ability, the participant known as a company needs a strong and forceful management strategy to enhance the ability of its human resource education/development programs and its research and development plans. It is also indispensable that there should, in practice, be close cooperation between environmental governance and environmental strategy.

We can thus see that a company's commitment to its role and activity as environmentally responsible is an essential factor in the equation if we are to solve the problems faced by the environment, and, as the issue that is most likely to dictate trends throughout the 21st century, the development by the automobile manufactures of an environment-related technology has become the most pressing we have to face, while what we require without any delay is a technological solution and the reform of our current wasteful habits of life that will put limits to and subsequently control the total amount of automobile traffic on the roads.

Japan's experience and her technological discoveries with regard to environmental management have supplied abundant evidence of the truth of the Danish saying "limitation creates innovation". Such technological constraints as Japan's small area of usable land and her scarce energy/resources, and such social constraints as the constitutional doctrine of democratic sovereignty and the separation of the three powers, as well as her duty to listen to the opinions and requests of local residents, have all played an important role in effecting these discoveries, and we must always keep this in mind. By facing and tackling these natural/social constraints with determination and creativity, Japan has been able, through her particular experience and her resulting expertise, to produce a technology that is now being used worldwide.