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Environment Protection in Japan: Development and Prospects

by H. Weidner¹

I. Introduction

Especially in the 1950s and the 1960s, the Japanese people had to suffer terrible experiences owing to the effects of environmental disruption, and they still have to cope with many unsolved problems. In a tremendous effort to mitigate damage to health and the environment in the wake of uncontrolled economic growth, the Japanese have, however, developed some internationally unparalleled and, more importantly, feasible and successful political and technical measures which deserve the full attention of other nations.

It would, however, not suffice just to look at Japan's achievements. The tragic experiences and sufferings of the Japanese people resulting from large-scale environmental damage should also act as lessons from which other nations can learn. This also applies to the new ecological problems taking shape in Japan. They could serve to bring about a more speedy recognition of dormant dangers in countries with less intense economic growth and help to evolve a more anticipatory and preventive environmental policy. For Japan, with its advanced pollution control measures and persistent economic expansion, can be seen as a living "research centre" for other industrial countries – or, as Paul R. Ehrlich once put it: "Knowledgeable people in other industrial countries will be watching Japan closely, much as old-time coal miners once watched the canary in the cage" [3].

II. Stages of Development in Environmental Policy

The road from the ecological ignorance of the Japanese government and industry to the active technocratic environmental policy that made Japan a pacesetter in the realm of environmental policy was long and, for the population, often painful. A chronology of environmental pollution in Japan [4] lists pollution events and conflicts that date back as far as the Tokugawa era (1603-1867). There is no other country in which so many diseases and deaths at the beginning of the 1960s were so obviously attributable to environmental pollution; nowhere was the suffering and

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disease so acute as in Japan. A world-wide scandal was sparked by the Minamata and Itai-Itai diseases, both caused by toxic compounds (methyl mercury, cadmium) that industrial plants had discharged into water bodies. Even breathing became increasingly hazardous for the Japanese people as industrial and automobile exhaust gases enveloped the cities in noxious clouds of smog, causing the number of respiratory disorders in the population to soar [23].

Japanese industrial policy after World War II was pursued with such disregard for human health and environmental needs that it turned into predatory capitalism that wasted and destroyed natural resources and eventually led to the annihilation of vast natural areas and to the contamination of many water bodies [15]. Japan's industrial centres came to suffer from serious environmental pollution. The damage rapidly reached such proportions that the country was seen to be on its way to committing "ecological hara-kiri" [2], and Japan's political style was characterized as being deliberately "ecologically ignorant" [30].

The point of departure for Japan's national environmental policy was thus the worst sort of environmental pollution and health hazards of epidemic proportions. The country's conservative government reacted in a variety of ways, whereby three stages of development have become relatively clear thus far. By contrast, the assessment of the present situation and future lines of development must remain rather speculative.

The first stage was that of *ecological ignorance*, which lasted until about the mid-1960s. During that period the government and the responsible authorities did little to improve environmental conditions despite proof that industrial emissions of pollutants were damaging health and property. Business and industry successfully resisted the demands that victims made for compensation and for environmental protection measures; occasionally, extremely modest compensation — "condolence money" — was offered [24].

The government also used force to break up demonstrators. It abstained from environmental policy and did not abandon its ecologically ignorant and socially repressive ways until the frequency and militancy of protests by victims increased and the conflicts came to assume a national dimension. Some grassroots initiatives succeeded for the first time in blocking large industrial projects (in the cities Mishima, Numazu and Shimizu). The ever wider shift in public opinion in favour of taming rampant industrialisation was conveyed by the slogan of one citizen-action group: "We would rather eat rice under blue skies than steaks in the smog" [26]. Taken up around the country, the words expressed a sentiment that made the government end its opposition to nearly every call for environmental protection measures.

In the subsequent stage, that of *symbolic environmental policy*, strictly worded laws were passed but usually not enforced. The result was that environmental pollution, previously restricted to rural and relatively small areas, spread throughout the country in the course of further industrial growth. But most of the population, including ever more local politicians, was no longer prepared to be satisfied with symbolic measures. Resistance continued to grow to projects and activities that were inimical to health and the environment. Even the inhabitants of rural areas, who shortly before had welcomed new industrial settlements, refused to accept a wide range of industrial projects, because many farmers and fishermen saw the basis of their existence increasingly endangered by industrial pollution [6]. The number of

grassroots initiatives climbed rapidly, and environmental problems and scandals were reported almost daily in the media. Even in its rural electoral strongholds, the ruling party – the LDP – steadily lost votes to competitors who had made environmental protection the main plank in their election platforms [13, 22].

For quite some time managers of those companies that were responsible for serious pollution-related health injuries had maintained an unyielding attitude towards the relatively moderate demands of pollution victims. In addition, governmental authorities did not support these demands in any appropriate way. So, as a last resort, some pollution victims took their cases to court. This turn of affairs began in 1967 when four lawsuits were initiated which became widely known as the "Four Major Pollution Trials" [29]. The suing parties were strongly supported by "progressive" or leftist groups, by lawyers who in most cases developed close personal relationships with the plaintiffs and began to play a central role in the (extra-judicial) antipollution movement, by local politicians, independent researchers, and journalists.

The pollution victims became the centre of national uprising against pollution because in their fates the moral failure of big business and government institutions was particularly evident:

"Indeed, by the late 1960s and early 1970s many Japanese considered pollution that endangered health as a fundamentally immoral act. Against mindless economic growth the average citizen now advanced new concerns: the sanctity of human life, individual dignity, and integrity of local communities. This transformation in values influenced all subsequent judicial and administrative policies" [1].

The four environmental pollution trials involved two cases related to the Minamata disease (methylmercury poisonings), the Itai-Itai case (cadmium poisonings), and one case dealing with respiratory diseases caused by sulphur dioxide emissions from several plants in the industrial city of Yokkaichi (so-called Yokkaichi asthma). The plaintiffs in the civil cases were suing for compensation because of health damage and, in some instance, death. They won all four trials.

Legally, the victims were at a disadvantage at first. Environmental law was rudimentary at best. Except for the Itai-itai case, in which it was possible to base the lawsuit on liability as legally defined in the mining industry, the plaintiffs had to resort to civil tort action, meaning that their only grounds for suit were the general provisions of the Japanese civil code. They, in turn, are based on two legal principles that are virtually impossible for victims to comply with. For one, polluters are obliged to compensate the victim only if they are guilty of violating the law; for another, the burden of proof lies with the plaintiff, meaning that victims must document all the conditions that would entitle them to compensation.

The Japanese courts, however, pioneered legal approaches that largely, if not completely, dismantled the material and procedural barriers that had confronted victims who had lost their health because of environmental pollution. The judges presiding over the four great pollution trials departed from precedent and from prevailing legal opinion changing it in favour of the victims.

Some of the new legal principles that were developed in the four trials and that have marked Japanese environmental policy ever since are:

1. the use of statistical (epidemiological) *proof of causality* instead of strictly scientific proof in establishing the cause-effect relationship between a certain concentration of toxic substances and the damage being claimed;
2. the nonconsideration of fault or negligence in deciding liability (*the principle of strict liability*);
3. the recognition of each polluter's broad liability for interacting emissions (*the principle of joint liability*);
4. the introduction of rigorous standards of caution to be applied even to company activities that only *might* pose danger (*the principle of prevention*); and
5. a far-reaching alleviation of the victim's burden when it comes to establishing the legal and actual bases for a claim to compensation (*the principle of reversing the burden of proof*).

On the whole, the judges in all four of the great pollution trials ruled in favour of the plaintiffs. In some cases, the firms involved had to pay quite enormous sums in compensation. Moreover, it was of fundamental importance for the victims that the responsible executives of the defendant firms publicly confessed their wrongdoings and asked to be forgiven [29]. The country was stirred by a nationally televised scene in which the president of Nippon Chisso knelt before Minamata victims during a turbulent stockholders' meeting and sought forgiveness for the suffering that his company had brought upon them.

Accordingly, the four great environmental pollution trials had profound political impact – not just the rulings themselves but also the very proceedings and the publicity they generated about the extent of the injuries that environmental pollution had inflicted on health and about the passive, uncooperative response of the national government and business. The Japanese government's environmental policies of the 1950s and 1960s were classified as repressive and, at best, symbolic [33]. The refusal of the purely growth-oriented business community to accept even a minimal amount of ecological responsibility was all too obvious.

All this lent great weight to the calls that the environmental movement, the opposition parties, and individual local governments made for a change in Japanese environmental policy. Deteriorating electoral results for the ruling party and continued mass protests against large public and private projects were to be expected. Ultimately, the government and business feared that the stricter principles of liability could flood the country in a wave of damage suits that would seriously hamper corporate decision-making and make long-term planning of industrial policy all but impossible.

The government responded to these changes and prospects with a relatively radical switch in its environmental policy, thereby ushering in the third stage of development, that of *active technocratic environmental policy* [31]. This stage, which is still in progress, began with a flurry of parliamentary activity in which fourteen environmental protection bills and regulations were passed in a special session of the Diet as measures for rapid reductions in the emissions of pollutants became top priority in environmental policy.

III. Effective Instruments of Environmental Policy

Starting in the 1970s, a fundamental reversal of environmental policies took place, especially in spheres where the urgency of the problems was great. With the rise of active technocratic environmental policy, stricter environmental laws were not only passed but applied as well. Cooperating closely, the central government administration and the relevant industrial sectors established short-term objectives for improvements in environmental quality and the required strategies for achieving them [10]. Some of the world's most innovative regulatory instruments were created [33], including the Area-Wide Total Pollution Load Control System for air pollutants and for discharges that pollute water bodies, a modern law on environmental chemicals, a cost-apportionment scheme for firms involving preventive and remedial measures at the national or local level, very strict standards for environmental quality and emissions, and a compensation system for health impairments caused by environmental pollution (the arrangement being linked to fees charged for emissions of sulphur dioxide). Responsibility for developing environmental policy was given to the Environment Agency which was established in 1971. However, much of the control power in this area remained with other ministries, especially the Ministry of International Trade and Industry and the Ministry of Construction.

Aside from regulatory types of policy instruments, Japanese environmental policy employs several other "instruments" that are worldwide unique. Because of their key role in Japan's environmental policy system three of these instruments, namely antipollution agreements, environmental monitoring and reporting, and the damage compensation system, will be outlined in greater detail in the following subsections.

1. Compensation System

Japan is still the only country with a special law to regulate a comprehensive compensation system for health impairments caused by environmental pollution. This law, which went into effect as early as 1974, provides for certain injuries to health to be compensated on a graduated scale reflecting the severity of the disability [1]. On the basis of this law, compensation payments and other benefits were received by over 99,000 persons in 1987, 97,000 of them because of respiratory disorders.

For damages due to air pollution, the approach to apportioning costs is highly interesting because it is based in part on the polluter-pays principle. Costs are covered out of a compensation fund financed from fees charged to sulphur dioxide emitting firms exceeding a specific size. The rates they pay depend on the affected area and the number of certified pollution victims. Air polluters in polluted areas must pay considerably higher fees per unit of emission than their counterparts in less polluted areas.

In addition to providing purely compensatory payments to victims, the system had first served another function of special importance. The official acknowledgment of the relationship between air pollution and respiratory disorders sharpened public awareness about the consequences that environmental pollution has for health and thus about the risks of half-hearted environmental policy [33]. The

chemical industry in particular was prompted by the law to take preventive environmental protection measures, especially since the two firms whose pollutants were responsible for the Minamata and Itai-Itai diseases had to pay very high compensation settlements. Chisso, once one of the largest companies in its sector, has thus far had to pay over half a billion dollars in compensation to Minamata patients and their survivors and was able to stave off bankruptcy only through public subsidies.

2. Antipollution Agreements at the Local Level

The ecological responsibilities of Japanese firms derive not only from conditions imposed by the government. The environmental policy system also gives prefectures, local governments, and citizen groups broad leeway to enter into direct negotiations with representatives of planned or existing plants and, so to speak, to strike private agreements concerning environmental measures, many of which go far beyond what is legally required.

There were isolated antipollution agreements of this kind as early as the 1950s, the first significant one being that concluded between the city of Yokohama and the Electric Source Development Corporation with regard to a coaloperated power plant that was planned to be built within the city limits. This approach was the only way to avoid massive protests by citizens. Grassroots groups took part in the final negotiations of the agreement, the text of which was published. Thereafter, the number of such agreements grew rapidly throughout Japan from 854 in 1970 and 8,923 in 1975 to 24,273 in 1984.

In most cases the parties to these agreements are firms and authorities of local governments and prefectures in whose jurisdiction the plant in question is sited. In many cases grassroots groups are involved as third parties (in an advisory role or as co-signers). There are also antipollution agreements concluded exclusively between grassroots groups and firms, and their number climbed rapidly from 37 in 1969 to 1,113 in 1974. By 1984 there were 3,187 such agreements. Grassroots groups are the independent contracting party also when agreements on such matters as incinerators and water treatment plants are concluded with communities.

Unlike antipollution agreements prior to 1970, those concluded as of that year not only contain blanket obligations but also spell out very detailed, specific responsibilities. For example, some clauses stipulate maximum permissible emission levels, conditions for monitoring and sanctioning, supplementary measurement, and liability agreements. In many cases firms are also required to use state-of-the-art technology. Such obligations are generally "dynamised" by the fact that recent agreements usually run for three to five years, after which period new provisions are negotiated.

Local Japanese authorities and grassroots groups consider the antipollution agreements as the most appropriate means to supplement national environmental law according to specific local needs and desires. They offer local authorities and inhabitants in particular the latitude necessary to consider local conditions (meaning the environmental situation and special political and social preferences) and the economic and technical capacities of the respective firm. In this regard, such agreements are the expression of decentralised "on-site environmental policy".

The agreements are not legally binding in the strict sense of civil or public law; they are gentlemen's agreements. Even so, it is relatively rare that the firms fail to honour them. According to the Japanese Environment Agency, individual contractual commitments are said to be disputed in two-hundred to three-hundred cases a year [33]. The great degree to which the contractual parties abide by their agreements is due in large part to the comprehensive system of environmental monitoring and reporting, through which plants polluting the environment run a high risk of being detected. Faithful compliance also has to do with the fact that breaking an agreement reached through consensus leads to "loss of face", still a very potent type of sanction in the Japanese culture. One must also recognise, however, that failure to comply with the terms of an agreement can result in "genuine" sanctions based on the provisions already made in the agreements themselves and on more general but nonetheless quite effective resources. For example, executives of firms not honouring their agreements have experienced local social discrimination, while their firms have experienced consumer boycotts and informal political pressure (such as requirements that work be done exactly according to the book and rigorous use of bureaucratic practices and red tape with firms).

Japanese experts have no doubt that antipollution agreements have had a decisive influence on environmental policy at the national and local levels. The decentralisation that this process has achieved in environmental policy has neither led to chaos in federal planning and control functions nor appreciably stunted economic development. Frequently, regulations worked out in agreements at the local level have later been incorporated into national environmental law. To this extent, one can say that Japanese municipalities have been leaders in environmental policy.

Antipollution agreements as an expression of decentralised environmental policy that is responsive to the needs and desires of the citizenry are able to offset shortcomings in federal environmental policy, fill some of its gaps, or supplement regulations in it that are too general. Nearly all of Japan's major polluters, especially those in the ecologically problematic sectors of the economy, have concluded agreements committing them to antipollution measures that are more rigorous than what is required by law.

3. Environmental Monitoring and Reporting

The successes of Japanese environmental policy cannot be fully explained without mentioning the comprehensive, highly modern system of providing environmental information. The gathering, processing, and publishing of environmental data, including information on health impairments and damage to nature, had already begun at the end of the 1960s. At present, the nature and scope of the Japanese information system, especially that for air and water quality control, is probably unique in the world [32].

The most important reason for the rapid development of a comprehensive information system was the massive protests by citizens and the aforementioned court rulings against industrial polluters of the environment. The government and industry subsequently decided to reduce the environmental conflicts through an-

tipollution measures that would take effect quickly. To achieve that goal, the data and information base had to be drastically improved in order to allow the rational planning of countermeasures and the monitoring of their effects and in order to meet the population's demands for realistic information about the state and development of environmental pollution. Lastly, companies wanted credible data that would document the considerable effort they were now making to reduce environmental pollution.

The heart of the Japanese system of environmental monitoring and reporting is the information system for air and water pollution. At present, nearly 1,700 air quality monitoring stations are in continuous operation. Since about 1970, automatic emission measuring devices using remote data communication known as the telemeter system have been installed at major stationary source of emissions in industry and at power plants. These monitoring stations primarily measure fuel consumption, the sulphur content of fuels, and the content of nitrogen oxides and sulphur dioxides in flue gas. The data are continuously transmitted to the responsible environmental authorities. Since 1970 thirty-four Japanese municipalities have established such systems at more than seven-hundred plants.

Water pollution control is organised in a similar way, though not as comprehensively as air quality control. In both domains, the companies themselves bear the investment and operating costs of the emission monitoring stations. The monitoring and maintenance of the measuring devices, which are sealed, takes place under the supervision of the local authorities. There is no legal basis for the installation of emission monitoring station; they exist solely because of antipollution agreements.

IV. Achievements and Remaining Problems

Empirical studies [33] on the impact of the instruments used in Japanese environmental policy indicate that the country's most outstanding achievements – domestically as well as internationally – have come primarily in the areas in which the legal position of the victims has been improved by the decisions handed down in the four great pollution trials. The positive impacts of the measures introduced in response to that court action were made possible primarily by the rapid increase in antipollution agreements. Of course, other regulatory instruments also helped to relieve the environment, but not to the same degree.

Japan's environmental protection regulations are to a large degree stricter than those of many other industrialised nations; moreover, investments in environmental protection are much higher in Japan than elsewhere and have had favourable effects on her national economy in general. Negative impacts on economic growth, employment, currency stability, technological progress, and exports are either unknown or extremely slight [17]. Overall, the benefits to the national economy outweighed negative effects. The strict limits on emissions, for example, gave industry and utility companies a powerful incentive to conserve energy, an outcome that worked especially well in Japan's favour during the crises in oil prices in 1973 and 1979. Court rulings and the grassroots opposition against heavily polluting industrial sectors forced a general shift in industrial policy. Previous strategy was

scrapped in favour of modern sectors that protected resources and energy. Aging industrial plants, too, were subjected to a wave of modernisation. Japanese cars were equipped with catalytic converters at a very early date. The strict environmental measures strengthened Japanese economic power and greatly stimulated a structural change in industry that allowed Japan to weather global economic crises better than many other industrialised nations [25].

Despite considerable reductions in the emissions of important pollutants, undeniable improvements in environmental quality, and pace-setting achievements in environmental protection technology, there are still several unsolved problems in Japan [14]. The country's water bodies still contain a very high level of organic substances, and noise pollution occurs almost everywhere. Domestic and industrial waste is mounting, and disposal sites are rare in densely populated Japan. Wildlife conservation and protection of the landscape has made little progress, with no notable successes to show for the greater attention given this area of environmental policy in recent years.

A wide array of tasks thus still confronts Japanese environmental policy. Furthermore, there are increasing signs that the success rate of environmental policy is levelling off in some spheres; there are even indications that new challenges are developing. In spite of the introduction of very strict standards for car exhausts, air pollution from nitrogen oxides is still high, partly even increasing, in large cities, mainly because the development of abatement techniques (catalytic converters) cannot keep pace with the continuously growing traffic volume. The highly effective flue gas scrubbers, for example, lead to increases in byproducts and wastes, some of which are deposited or discharged into water bodies, thereby shifting problems from one environmental medium to others.

Despite the Japanese population's "nuclear allergy" and the numerous scandals in the Japanese nuclear power industry, the government and the country's utility companies continue to bet on nuclear energy, even despite Chernobyl, ostensibly so as to reduce the great dependence on foreign sources of energy [19]. A shift of the environmental problem is largely preprogrammed into this stance, for in Japan, too, the crucial question for industrialised nations – what is to be done with the nuclear waste – has thus far remained unanswered in ecological terms. Radioactive wastes are dumped into the ocean, deposited within Japan itself (a country plagued by earthquakes), or transported to other countries for recycling.

Generally, problems are shifted in this way when environmental policy measures fail to deal with the underlying causes, when environmental measures merely mean using clean-up technologies rather than preventing the creation of pollutants in the first place. A strategy that does not address the production of risks in order to forge ecologically sound procedures and behaviours as part of preventive environmental policy is what I call a technocratic strategy [31]. Since the beginning of the 1970s, Japanese environmental policy can be described as such.

Whether in waste disposal, clean air and water, nature conservation, town planning, or energy policy, there are shortcomings in and limits to technocratic environmental policy. The Japanese government's foot-dragging thus far indicates that the lessons to be drawn from the past results of environmental pollution have not been completely learned – that an *ex ante* approach is the best environmental medicine and that selective and peripheral measures, no matter how progressive they may be in technological terms, fail in the long run.

V. Outlook

An assessment of Japanese environmental policies reveals that much has been done to reduce emissions of "traditional" air pollutants from industrial and mobile sources. However, a preventive environmental policy *per se*, as a general concept applied to all sectors of public policy-making and private enterprise, does not yet exist. OECD's 1977 report on environmental policy in Japan summarized the situation with the following statement: "Japan has won many pollution battles, but has not yet won the war for environmental quality" [17]. Now, eleven years later, this statement still holds true.

In its 1983 report on environmental quality, the Japanese Environment Agency draws an almost identical conclusion and calls for a more integral approach in environmental policies with a broader consideration of the requirements of the ecosystem. It even speaks of a "mission" in which we should see to it that nature, both priceless and finite, be handed down unadulterated from generation to generation [7]. This view resembles closely that of Karl Marx when he postulated that presentday societies do not possess the earth but merely hold it in trust to then pass it on in an improved state to future generations as "*boni patres familias*" should [12].

One must, however, concede as true that there are many obstacles on the road to preventive environmental policy. As yet, there is – not only in Japan but in other countries as well – no refined theoretical concept of how to get there. Moreover, one cannot adequately assess how interest groups that are firmly anchored within the existing power structures would respond to far-reaching changes associated with a preventive strategy [5]. One thing, however, is certain: on the part of industry and some administrative departments (usually those that are closely associated to economic interests), resistance against new and substantial environmental protection measures has increased.

There already have been several incidents illustrating successful opposition against attempts at expanding the existing approach of environmental policy towards an active policy of conserving and improving environmental quality on the basis of an integrative and preventive concept of environmental policy [27]. For several years, for example, environmentalist groups and organisations – supported by the Environment Agency – had fought for the enactment of a law on environmental impact assessment. Owing to the strong opposition of industry and influential ministries (above all, the Ministry of Construction and the Ministry of International Trade and Industry), the proponents of this law eventually had to give up. In 1984, the Environment Agency had made a last attempt to achieve a positive Cabinet decision on the respective bill, but did not succeed [8]. Instead of a law a much weaker guideline was passed, determining a uniform procedure of an environmental impact assessment for large-scale projects with public involvement that are likely to significantly affect the environment.

Especially the air pollution related health damage compensation system (established in 1974) was exposed to criticism by business organisations, which finally led to an inquiry at the Central Council for Environmental Pollution Control. In 1983, this advisory body was asked to review the compensation system and recommend changes. In October 1986, the Council submitted its report to the Environment Agency proposing several substantial alterations of the compensation

system. Among other things, the Council recommended that certification of further persons entitled to compensation should stop [27]. In September 1987, a corresponding law to abolish class I regions, i.e. regions in which those suffering from air pollution were entitled to compensation, was passed by the Diet and enforced in March 1988. Therefore, it can be expected that demands by environmental groups and interest organisations of those suffering from air pollution to broaden the existing system by including other pollutants, especially nitrogen oxides, will not stand a chance.

As early as 1978, the Japanese government lowered considerably the then very strict ambient air quality standard for nitrogen dioxide in response to pressure from both industry (especially the steel and electric power industries) and some public agencies. This step made new investments in air polluting industries as well as construction of new highways possible which would not have been permitted under the old air quality standard [14]. Furthermore, attempts at reducing nitrogen oxide emissions by cars were more or less futile because an increase in traffic volume and the number of cars was indirectly stimulated. Although in 1981 government introduced a new control system ("Are-wide total pollutant load control") to cope with the problems in urban areas, car exhaust increasingly contributed to air pollution, in particular photochemical smog, in metropolitan areas. This problem is still not solved. The countermeasures as proposed by Environment Agency, e.g. promotion of electric and methanol fuelled vehicles and traffic flow improvements, seem to be much too weak for improving the situation, all the more so, as car traffic is expected to continue to increase in the future [9].

With respect to energy policy, the Japanese government still puts strong emphasis on nuclear power, which will inevitably lead to increasing amount of nuclear waste, although present storage facilities are already exhausted. Problems of waste management exist in other areas, too. The amount of waste from households and certain industries is ever increasing, and changes in the composition of waste (e.g. a rising share of plastic materials in households waste) pose a great problem for an environmentally sound waste disposal or incineration. Furthermore, improvements in waste water treatment have led to increasing amounts of sewage sludge with rising concentrations of toxic substances. This makes it difficult to dispose of sewage sludge in landfill sites or to use it as fertilizer [8].

The rapid change in the industrial structure, that is the shift from resource-intensive and polluting industries (textile, pulp and paper, chemicals, iron & steel and petrochemicals) to so-called processing and assembling industries has entailed serious challenges for Japanese environmental policy. This shift was generally favourable for the environment because emissions of "traditional pollutants" (sulphur dioxide, nitrogen oxides, phosphorous effluents, etc.) decreased. However, the rapid expansion of the high-tech sector (integrated circuits, biotechnology, and new materials) has been accompanied by changes in the types of chemicals used, some of which are highly toxic and present a new threat to human health and the environment [9]. Additionally, waste and effluents discharged by high-tech industries contain a wide range of substances which are not yet covered by government regulations.

In April 1987, after a three-year period of study, the "Convergence on Environmental Technology" (an advisory body to Environment Agency) published a

report entitled "New Direction of Environmental Protection in High-Tech Age". The report contains proposals for new regulatory, organisational and strategic measures to cope with the environmental problems arising from high-tech industries. These proposals are still under debate, and it can be expected that their implementation will take some time because other ministries and agencies – aside from Environment Agency – have to be involved in the decision making process [27].

All in all, this tardy response to environmental problems, which have been obvious for quite some time, is indicative of a development already noticed by critical observers several years ago. Kenichi Miyamoto, one of the pioneers of environment-related economic research in Japan, comes to the result that "the ideal of 'Environmental Protection First' which seemed to be established as a consensus throughout Japan in the 1970s has disappeared" [16]. One reason why this could happen is the visible success of environmental policy in former years which has eventually led to decreasing environmental awareness and less action by citizens and local authorities. There are still some relevant groups calling for a more stringent environmental policy but compared to former times they are considerably fewer in number [28]. Considering the present political and economic climate and the low public attention, it seems relatively unlikely that Japan's government and industry will start designing and implementing new environmental political strategies on their own which might, once again, make Japan the pace-setter in environmental policy. Instead, there are many indications that at present Japan experiences structural economic modernisation without simultaneously pursuing systematic ecological modernisation. Even more sceptical observers [20] are afraid that only a severe environmental catastrophe might create the necessary impetus for Japan to give up primarily technocratic anti-pollution policy (which undoubtedly had its merits in the 1970s) and to enter into the new phase of an "anticipate-and-prevent" policy.

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