



Chapter 4

Japan's Contribution towards Establishment of a Sustainable Society



As discussed in Chapters 2 and 3, in order to realize a rich and sustainable society, it is important to utilize sustainably ecosystem services supported by the stock of biodiversity, and at the same time proceed with technological innovations in the field of environmental and work to bring about a new economic and social system that would generate a positive cycle between the environment and the economy. Japan has accumulated outstanding technologies and systems in the field of environment, and can contribute to improvement of global sustainability and the realization of better life in both Japan and the rest of the world, by further developing those technologies and systems and expanding them

worldwide.

In Chapter 4, we will first look at the international trends in relation to realization of a sustainable society, and then review the efforts in Japan for the growth through green innovation, including the basic aspects of funds/financing and education that would become the foundations for such growth. We will also give a more specific introduction of efforts towards a material-cycle society and low-carbon society, which are particularly important to the realization of a sustainable society, focusing on innovation of technologies and systems and their international expansion.

Section 1 The Road to a Sustainable Society

In this section, first, we will look at the efforts that are being promoted by the world's major international organizations towards establishment of a sustainable society. We will then review Japan's efforts towards a sustainable society through green innovation and give an analysis of the environmental policies required in such

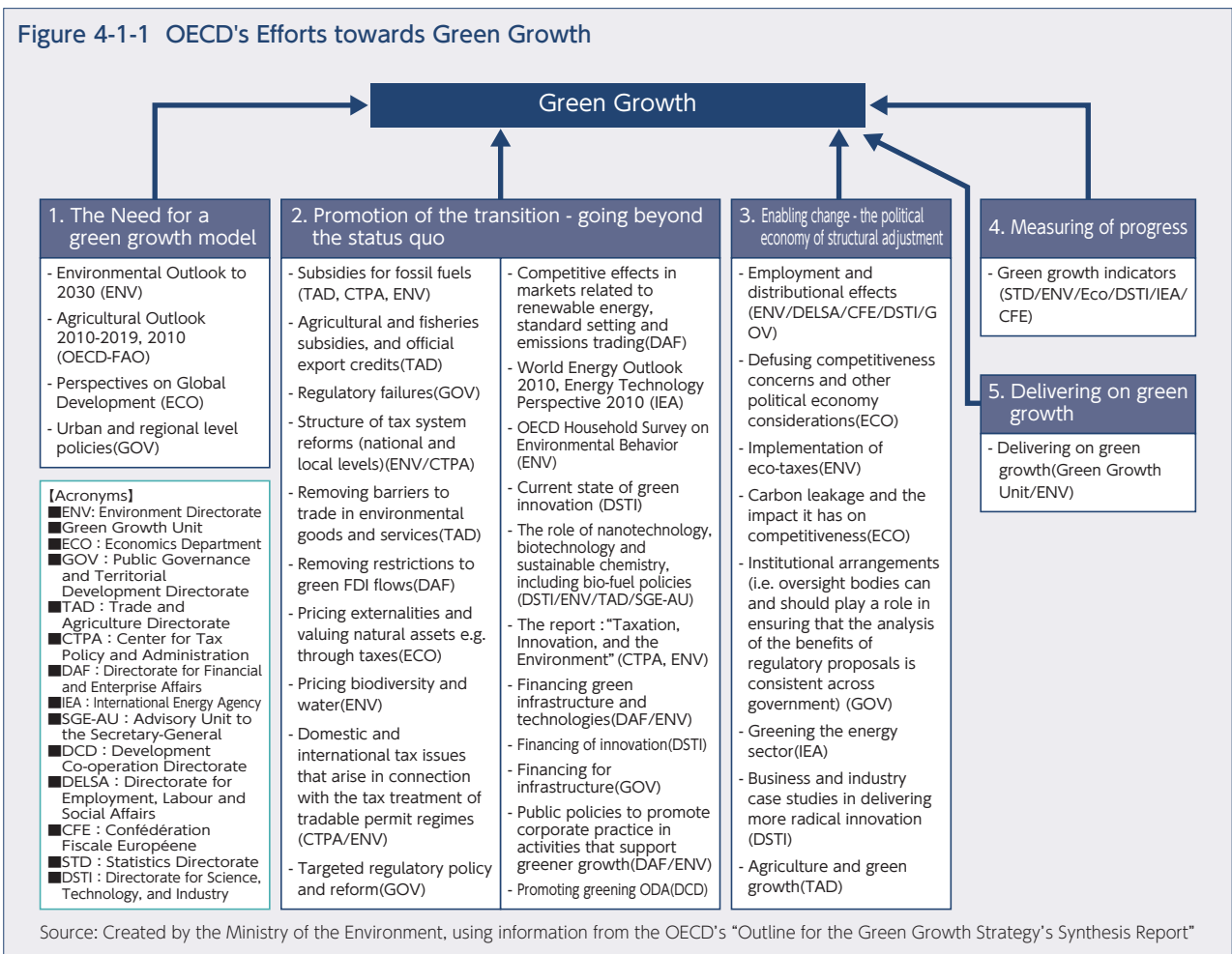
activities. Also, we will also look at the government's efforts towards the requirements for the promotion of green innovation, such as financing for research and development, environment finance, and development of human resources.

1. Actions for Establishment of a Sustainable Society: Global Trends in Green Growth

International efforts for a sustainable society are being actively made. The Meeting of the Council at the Ministerial Level of the Organization for Economic Cooperation and Development (hereinafter in this chapter referred to as the "OECD") adopted the "Declaration on Green Growth," agreed to develop a "Green Growth Strategy," and strengthen the efforts towards the development of the Strategy. The "Interim Report of the Green Growth Strategy: Implementing our commitment for a sustainable future" (OECD, May 2010; hereinafter in this section referred to as the "Interim Report"), which was released based on the Declaration on Green Growth, stated that "growing concerns about the environmental unsustainability of past economic growth patterns and increased awareness of a potential future climate crisis have made it clear that the environment and the economy can no longer be considered separately." The Report presents tentative conclusions for a number of key issues that policymakers are currently facing in transitioning to greener growth. Under such circumstances, the OECD has been making organization-wide efforts aimed at green growth (Figure 4-1-1).

The Interim Report says that, from the viewpoint of how production and consumption should be changed in order to realize greener growth, green growth strategies will require a mix of policy instruments, including market-based approaches, regulations and standards, tax benefits given to R&D, and information-based instruments to facilitate consumer choices. The Report also says that a central element of the policy mix is to develop ways of creating economic payoffs through taxation for pollution and use of scarce resources, so as to emit clear market signals. However, the Report also says that market-based instruments alone will not be enough to bring about a shift to greener consumption and production patterns, and that regulations will be required in case the market fails and as a result price signals are weak. The Report also says that there are other approaches, such as voluntary measures and information-based measures including energy-saving ratings and well-designed eco-labeling that can play an important role in raising the awareness of consumers and producers on the environmental impact of specific activities as well as of the availability of clean alternatives. Also, regarding the role of innovation, the

Figure 4-1-1 OECD’s Efforts towards Green Growth



report says that innovation will be a critical driver of green economies and job creation. Policies to accelerate the development and the diffusion of clean technologies and related knowledge will be another key part of the policy mix.

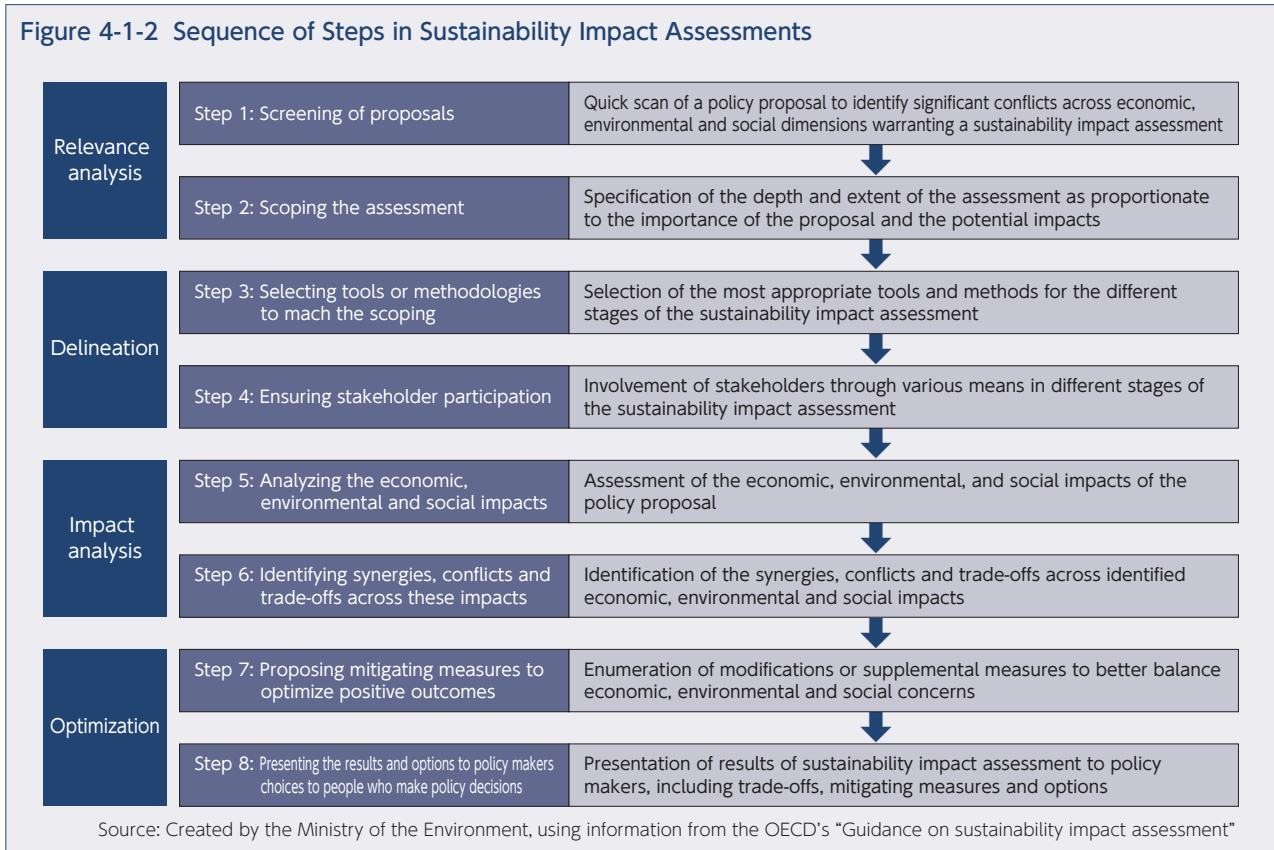
In addition, regarding the establishment of a sustainable society the OECD is working on a new approach called Sustainability Impact Assessment (SIA). According to the OECD, SIAs have two main functions: (1) a methodological soft policy instrument for developing integrated policies which take full account of the three sustainable development dimensions, environmental, economic and social, and which include cross-cutting, intangible and long-term considerations; and (2) a process for assessing the economic, social and environmental effects of policies, strategies, plans and programmes before they have been formulated. There is still no real consensus on procedures or framework for using SIAs, and OECD says that SIA consists of eight steps (Figure 4-1-2). In the Report an example using Belgium was given to show how this SIA was used in policy-making. In Belgium the SIA was only introduced in 2010 and although there are still problems, the law stipulates that it is necessary to conduct assessment of impact on sustainability in advance for some of federal laws, and, when assessing, it is necessary to review and consider the necessity of assessment for those laws and desirable alternatives.

The United Nations (hereafter in this section referred

to as the “UN”) is also proceeding with reviews related to world sustainability. In order to promote sustainable development and discuss solutions aimed at the challenge saving the people of the world from poverty, the UN launched the “High-Level Panel on Global Sustainability,” and its first meeting was held in September 2010. Japan’s participant in this panel was a former prime minister, Yukio Hatoyama. At the first meeting, the UN Secretary General, Ban Ki-moon, made an appeal for the “50 -50 Challenge,” which says that although by 2050 the population will grow by approximately 50% over the current population, it is necessary to reduce greenhouse gases by 50% by that year. The final report of that meeting is to be made by Secretary General Ban Ki-moon at the end of 2011.

In addition, in 2012, the United Nations Conference on Sustainable Development (hereinafter in this section referred to as “Rio+20”) is scheduled to take place. Rio+20 will mark the 20th anniversary of 1992 United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, and will focus on a “green economy in the context of sustainable development and poverty eradication” and on “the institutional framework for sustainable development.” Preparatory meetings are currently being held and preparations are now in progress for the meeting in 2012.

The Asian Development Bank (hereinafter in this section referred to as the “ADB” in this Section) is also making efforts aimed at the promotion of sustainable



development in the Asia-Pacific region. In 2008 the ADB established Strategy 2020, which stipulated three main strategies, including "promotion of environmentally sustainable growth". Strategy 2020 says that since Asia's robust economic growth is leading to the depletion of the region's natural resources, accelerating environmental degradation, both in urban and rural areas, and impacting climate change, only growth that is environmentally sustainable can eliminate poverty, since many of the poor depend on natural resources for their livelihoods. Based on this understanding, in order to realize environmentally sustainable growth in harmony with the environment the ADB is working to support the use of eco-technologies,

adoption of measures to protect the environmental safeguard measures, and the establishment of institutional capacities to strengthen their enforcement. ADB also sets targets for operational goals in Strategy 2020. For instance, ADB will progressively increase its assistance for "environmentally sustainable development," including efforts to address reduction of carbon dioxide emissions and climate change.

The world's major international organizations are thus making various efforts with the understanding that the sustainable development premised on sustainability is an important task, and that efforts aimed at an environmentally sustainable society is a global trend.

The OECD's Environmental Performance Review Program

The OECD is an international organization where the governments work together to improve environmental policies through performance reviews of member countries, and to conduct assessment and make recommendations to improve the reviewed country's policies and programs. OECD Environmental Performance Reviews began in 1992, and every year the environmental policies and programs of approximately four countries are reviewed by other member countries. The main objective of this effort is to have member countries and related cooperating countries improve environmental performance of governments individually and collectively. So far Japan was reviewed twice, first in 1994, again in 2002, and the third review was conducted in May 2010 by the OECD Working Party on Environmental Performance of the Environment Policy Committee. The Performance Review covering Japan was released in November 2010 and the Review included a total of 38 environmental recommendations such as green growth, climate change, waste management, and biodiversity. The Report found that Japan has strong focus on energy efficiency and research and development, which Japan has effectively integrated with energy and climate policies, and that Japan is a world leader in climate-related research and development. At the same time, the OECD included following recommendations for Japan in order to further promote environmental policies. Since this reviews the implementation status of environmental policies and the status of the environmental improvement and publishes the result, it is expected

Japan's Environmental Performance Review



Source: Ministry of the Environment

An event to announce the report on the Japan's Environmental Performance Review



source: Ministry of the Environment

that environmental policies suggested will be actively promoted in each of the member countries.

Overview of the Recommendations in the Third Environmental Performance Review of Japan

- Review and update the 1993 Basic Environmental Law in order to consolidate, streamline, and make the existing body of laws more coherent.
- Clarify linkages and priorities among plans in different sectional plans and basic environmental plans.
- Mainstream environmental considerations in the 2011 tax reform, with a view to broadening the use of environmentally related taxes and reducing incentives and subsidies that have adverse environmental effects, or that contravene the polluter-pays-principle.
- Expand the use of economic instruments, for example trading schemes and user charges, to increase the economic efficiency of environmental policies; review the cost-effectiveness of regulatory instruments and agreements negotiated with industry.
- Review transport-related taxation and pricing, with a view to directly linking taxes on the purchase and ownership of vehicles to their fuel efficiency, and to better targeting pollution related to vehicle use through fuel taxes and road pricing.
- Put a consistent price on carbon through emissions trading in combination with climate-related taxes; transform the trial emissions trading system (ETS) into a mandatory cap-and-trade scheme that is compatible as far as possible with trading schemes in other countries.
- Continue to promote the 3Rs strategies at the national and local levels, and implement fundamental plans for establishing a sound material-cycle society ([1] setting of targets on resource productivity by sector, and [2] continual support towards support analysis of resource productivity by sector and material flows, including better assessment of trade-related flows and their associated environmental impacts.
- Develop a strategy for biodiversity corridors, particularly in forests and rivers, taking account of possible impacts of climate change.

2. Growth through Green Innovation and Environmental Policies

(1) The Necessity of Green Innovation and Japan's Targets

Economic growth has contributed to health and education that are required for humans' prosperity. Looking at examples from around the world shows us that average life-spans, literacy rates, and percentages of people pursuing higher education have all grown in proportion to economic development. On the other hand, the world has not always given sufficient consideration to the environment in order to achieve economic growth. If the 9 billion people living in the world pursue today's EU average income and the income level equivalent to an annual growth each year of 2%, the basic units of emitted carbon must be reduced by more than an average of 11% per year in order to stabilize the climate. That would be equivalent to a rate of the reduction 16 times faster than the one improvement achieved since 1990.

In order to realize greater economic growth under environmental restrictions, it will be essential to bring about technological innovations in environmental fields, to achieve a low-carbon society through comprehensive policy mixes of new system design or system changes and new regulations or easing of deregulations, and also to support rapid dissemination of environmental technologies and products. It is necessary to disseminate Japan's top-level environmental technologies throughout the world, leading to the achievement of global environmental and economic sustainability. Such efforts will promote economic growth and secure employment.

With the "New Growth Strategy" established in 2010, Japan is creating and disseminating world leading environmental technologies through the promotion of green innovation, with the aim to become an "environmental and energy superpower" of the world. Based on this New Growth Strategy, the government launched 21 National Strategy Projects. For green innovation, three National Strategy Projects were launched, including "rapid expansion of renewable energy through introduction of a feed-in tariffs system," "eco-friendly future cities initiatives," and "forests and the forestry revitalization plans" For these three innovation projects, goals and timetables were set for a target year of 2020 and followed (Figure 4-1-3).

(2) Various Ways Forms and Methods of Green Innovation

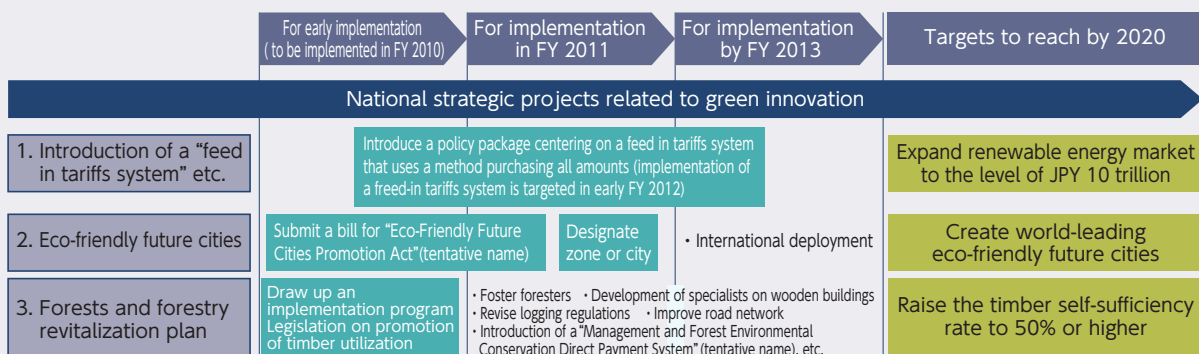
Green innovation would take place in varied ways in many industrial sectors.

According to the case study of green innovation conducted by the OECD green innovation activities would be analyzed via two dimensions: "targets" and "mechanism" (Figure 4-1-4). "Targets" can be classified into the following areas "process" and "product" in producing, "marketing method," "organization" of the producer, and "systems and institutions," which are broad and societal and go beyond a single company. "Mechanism" can be divided into following areas: small-scale technological "modification," "re-design" due to a major change of a product, "alternatives" that introduces materials totally different from those in the past and substitute functions, and "creation" that introduces an entirely new product or production processes. It is believed that the effects of green innovation are brought about by the both "targets," and "mechanism," and the interaction between these two. The effects of green innovation would depend on the social and technological context, and in general, when focusing on a specific "target", "creation" has more potential for environmental benefits than "modification" does.

According to this OECD study in the automotive and transport industry sector for example, in responding to climate change, the CO₂ emissions reduction caused by use of fuel is the target of general measures. The green innovation in this sector would target mainly the "process" and the "product," and efforts would be made to progress technological development through "improvement" and "re-design" as methods. In the electronics sector, efforts would be made through the product "modification" and "re-design" for green innovation aimed at controlling use of energy consumption when products are used, while the innovation may occur if the organization reconsiders the promotion of product recycling to accommodate the increased demand for electronics. Based on analysis of this example in individual industries, the study found that it is the best approach to achieve ideas and activities for green innovation in the framework that goes through

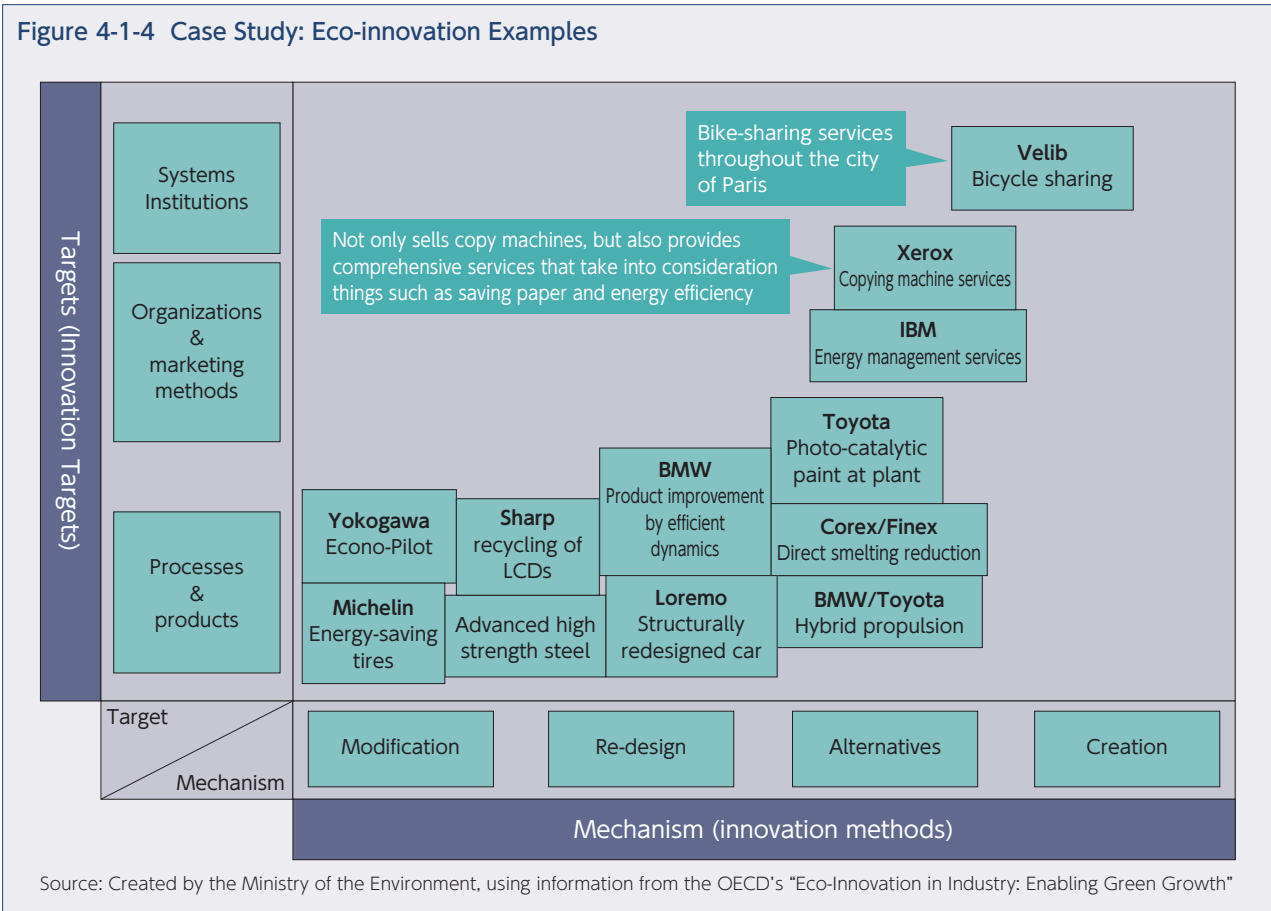


Figure 4-1-3 Timetable for 21 National Strategic Projects under New Growth Strategy (Extracts)



Source: Created by the Ministry of the Environment, using information from "New Growth Strategy" (Cabinet decision of June 18, 2010)

Figure 4-1-4 Case Study: Eco-innovation Examples



the sequence of the “mechanism” from “modification” to “creation,” and the sequence of the “target” from “product” to “system.”

(3) Concepts behind Environmental Policies that Contribute to Green Innovation

Environmental policies play an important role in promoting green innovation.

According to the OECD’s study, environmental policies related to innovation are broadly divided into two categories: supply-side policies and demand-side policies. Supply-side policies include capital support through setting up venture capital funds in the early stages of research, and support for research and development (R&D) that provides funds to universities and basic research organizations (Figure 4-1-5). Demand-side policies include establishment of regulations and standards, and policies for public procurement that the public sector, also a main consumer, purchases materials and services that have a low environmental impact (same Figure 4-1-5). The research also found that in order to efficiently promote innovation, it is necessary to consider collaborative approach of policy measures on the demand side and the innovation policies on the supply-side that have traditionally been carried out.

These innovation policies need to include 5 policy characteristics; “Stringency,” “Stability,” “Flexibility,” “Incidence,” and “Depth,” because these characteristics have a different effect on innovation while it is generally believed that market-based approaches are more effective

than direct regulation (Figure 4-1-6).

In disseminating fields that include new technologies, such as the field of renewable energy, it is necessary for policy makers to approach appropriately according to the stage of development of the technologies in the market. As a main policy measure for achieving green growth, the OECD summarized its tentative assessment results in the “Interim Report.” One of its findings was that in order to realize dissemination of renewable energy technologies for a low-carbon society, innovation policies should be made according to the stage of development in the market for renewable energy technologies. The report also said that the degree of competition in the market must be encouraged according to the degree of maturity and dissemination of such technologies.

Focusing on policies related to dissemination of renewable energy technologies, the “Interim Report” discussed stages of development in the renewable energy technologies by dividing stages into the four stages of “prototype and demonstration stage,” “high cost-gap stage,” “low cost-gap stage,” and “mature stage” (Figure 4-1-7). In the discussion, continuous research and development with supports of subsidies and tax will be necessary in the “prototype and demonstration stage” or the high cost-gap stage,” because they are the early stages of disseminating renewable energy technologies. In the “low cost-gap stage,” it will be necessary to set technology-neutral policies such as emissions trading, strengthen competitive status against other technologies and gradually defer to consumer demand and competition in the market, because dissemination of the renewable energy technology has made progress and the

competitiveness gap with other technologies has become relatively small in this stage. In the “mature stage,” various types of assistance measures should be eliminated and the situation should be left to development derived from the spontaneous demand, because it has become possible to compete with other alternative technologies and preparations have been made to disseminate such technologies on a large scale in this stage. The discussion

also said that, in addition to the development stages, it is necessary to remove non-economic obstacles such as lack of relevant information and education, and to have a predictable and transparent framework for support in order to ensure the function of the market and policies.

As seen thus far, for policies aimed at green innovation, the government plays an important role; providing high-cost facility investment, incentive programs to encourage long-term investment for the technologies that take a long time for commercialization, measures to increase demand, and subsidy programs in addition to the support for research and development. So policy decisions for green innovation and methods for economical

Figure 4-1-5 Taxonomy of Innovation-related Environmental Policies

Supply-side policies	Demand-side measures
<ul style="list-style-type: none"> • Equity support (support for commercial and financial risks that cannot be always addressed by market mechanism) • R&D (support programs and research funding of government and university organizations) • Pre-commercialization (support from the R&D stage to successful commercialization) • Education and training (development of skills and talent to boost innovation) • Network and partnerships (inducing open innovation by utilizing knowledge networks) • Information services (provision of information related to support measures, related policies, legislation and regulations, etc.) • Provision of infrastructure (provision of transport infrastructure and networks for 	<ul style="list-style-type: none"> • Regulations and standards (regulations and institutions that encourage new product development) • Public procurement and demand support (supporting and boosting of demand through government procurement) • Technological transfers (export and transfer of technologies from companies in industrialized countries to developing countries, as well as domestic or local transfer from large companies to SMEs)

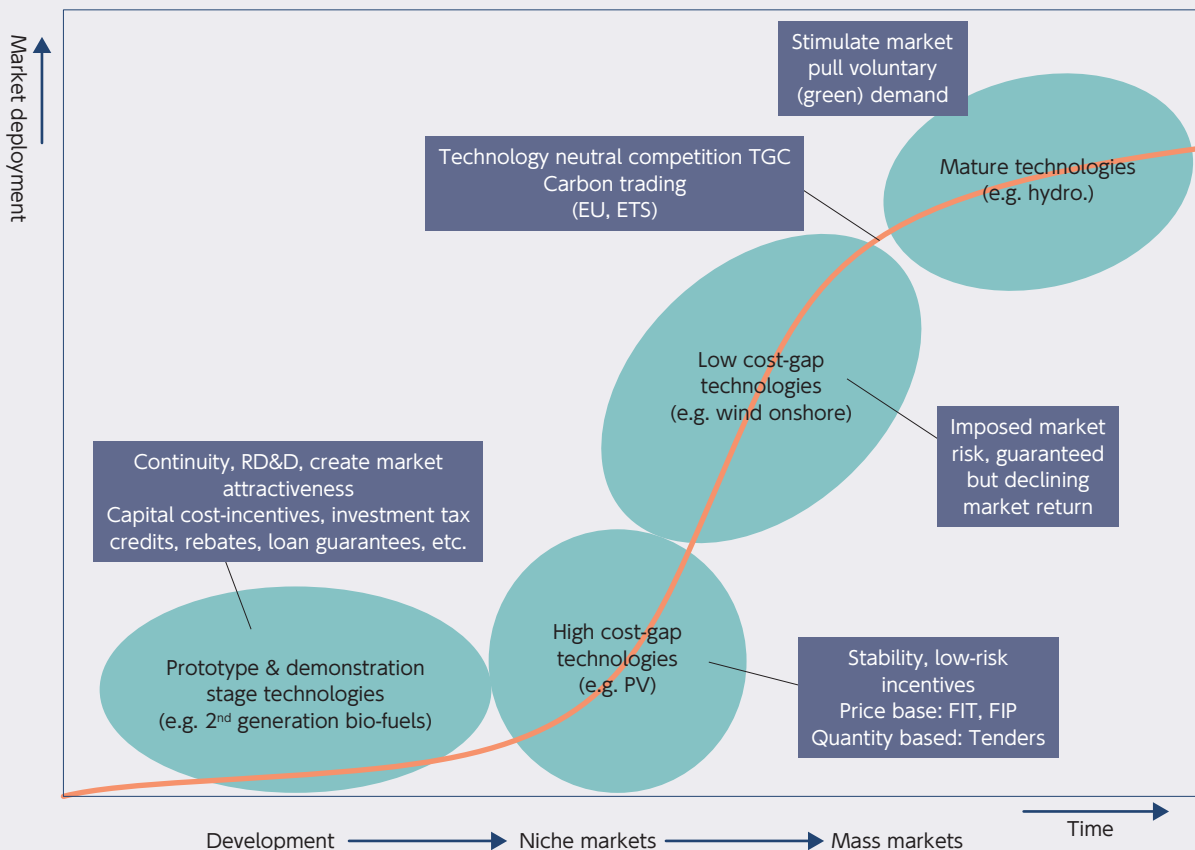
Source: Created by the Ministry of the Environment, based on information from the OECD's "Eco-Innovation in Industry: Enabling Green Growth"

Figure 4-1-6 Characteristics of Environmental Policies Likely to Induce Innovation

- Stringency: How ambitious is the environmental policy target, relative to the 'baseline' trajectory?
- Stability: What effect does the policy measure have on investor uncertainty; Is the signal consistent, foreseeable, and creditable?
- Flexibility: Does it let the innovator identify the best way to meet the objective?
- Incidence: Does the policy target directly the externality (e.g. CO₂), or is the point of incidence a 'proxy' for the pollutant (e.g. energy efficiency)?
- Depth: Are there incentives to innovate throughout the range of potential objectives?

Source: Created by the Ministry of the Environment, based on information from the OECD's "Environmental Policy Framework Conditions, Innovation and Technology Transfer"

Figure 4-1-7 Renewable Energy Market Deployment, and Necessary Environmental Policies



Source: Created by the Ministry of the Environment, based on information from the OECD's "Interim Report of the Green Growth Strategy: Implementing Our Commitment for a Sustainable Future"



assessment are necessary for planning and promoting the measures. In addition, identifying the trends of government environmental policies and analyzing the competitiveness of Japan’s businesses and industries would help increase environmental policy options. Based on such understanding, the efforts mentioned in Figure 4-1-8 are accelerating for achieving a new technological and economic paradigm that will support a sustainable development.

Figure 4-1-8 Efforts Aimed at Green Innovation

- Carrying out technological innovations and systems reforms through long-term policies
- Actively utilizing current technologies being that disseminated in an ICT paradigm that reduces environmental load using information communication technology
- Giving direction for long-term technological innovations through active policy guidance, although both radical and gradual innovation are necessary
- A network-type approach that targets many and various actors is necessary.
- Promoting resource allocation that goes beyond the framework among ministries, and research and development conducted collaboratively among industry, the government, and academia
- Actively promoting collaboration with other countries and securing the pluralism and competition that are essential for innovation

Reference material: Ministry of the Environment’s “Policy Study on Environmental Economics” (Professor Atsushi Sunami, National Graduate Institute for Policy Studies)



Column

Economic Survey of Environmental Industries

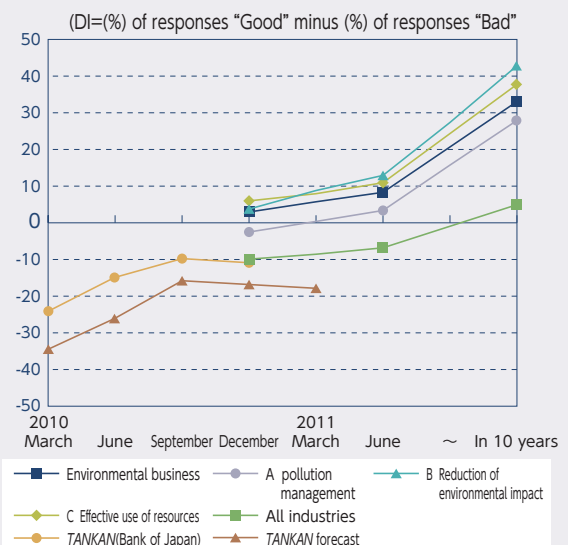
When making environmental policies, it is necessary to take the status of the environment technology market into consideration and estimate the future trends of the environment related markets. The Ministry of the Environment has been conducting a new statistical study “The Economic Survey of Environmental Industries” from 2010. This study is intended to continuously review trends of the business confidence of environmental businesses through a survey every six months. The purposes are to utilize the result as basic information for planning policies related to promoting environmental business and assessing the performance of measures. The study contributes to the broader awareness of environmental businesses, and the results are published in order to accelerate the development of environmental businesses.

Asking companies about the current condition of operating environmental businesses, and comparing the responses with the conditions of overall other industries, environmental industries are stronger than other industries in December 2010. The DI (Diffusion Index, indicating the response “bad” minus percentage of response “good”) of environmental industries was higher than that of whole businesses/industries in all categories, including “present,” “in 6 months” and “in 10 years” There is a tendency for DI to be stronger in the “in10 years” category (see figure).

While companies have positive views on the future development of environmental business, the leading industry of environmental business varies from time to time. For example, “at present,” energy-efficient appliances that are supported by the “eco-points

system” and high efficiency water heaters that are supported by subsidy programs rank at the top. The eco-points system would end in 6 months, but the trend shows that the DI of other businesses will gradually improve due to the expectations of economic recovery (see table). As for the business prospect in 10 years, the DI of most environmental businesses shows positive figures, and the ratio of companies

Business Confidence DI of Environmental Businesses



Note: TANKAN (The Bank of Japan’s quarterly survey) of business sentiment is a total of all scales and covers all industries. Source: Ministry of the Environment’s “December 2010 Economic Survey of Environmental Industries”

expecting “good” surpassed the ratio of those anticipating “bad.” Energy saving products, such as LED lighting and insulation materials, and energy saving consulting services, such as ESCO projects, ranked at the top (see table).

Recent activities of consumers and corporations are considered to adapt to environment, so they need information and expect acceleration of renewable energies such as wind power, hydraulic power, and biogas power generation will also increase. Companies will make decisions for R&D, facility investment and hiring based on such mid- and long-term business forecasts. There will be many cases that require serious decisions for high-cost investment and management resources (see table). Forecasting the future is uncertainty and inevitable, but for stability in developing environmental business,

it will be important to provide policy guidelines and support for cooperation with industries and financial sectors, and then we can achieve growth of environmental businesses.

Business Confidence of Environmental Businesses (Top-Five DI Businesses)

Present		In 6 months		In 10 years	
Energy-saving home appliance (government-designated eco-points merchandise,)	41	Wastewater management services	24	Energy saving and energy management	54
Wastewater management services	27	High efficiency water heaters	22	Energy saving consulting services	50
High efficiency water heaters	21	Lease and rental	20	Education, training, and information-provision services	50
Water supply	20	Energy saving consulting services	19	Reduction of environmental impact, resource-saving technologies, processes	49
Renewable energy facilities	18	Energy-saving vehicles	18	Renewable energy facilities	47

Note: Excluded business categories for which the number of responses were 10 or less
Source: Ministry of the Environment's "December 2010 Economic Survey of Environmental Industries"

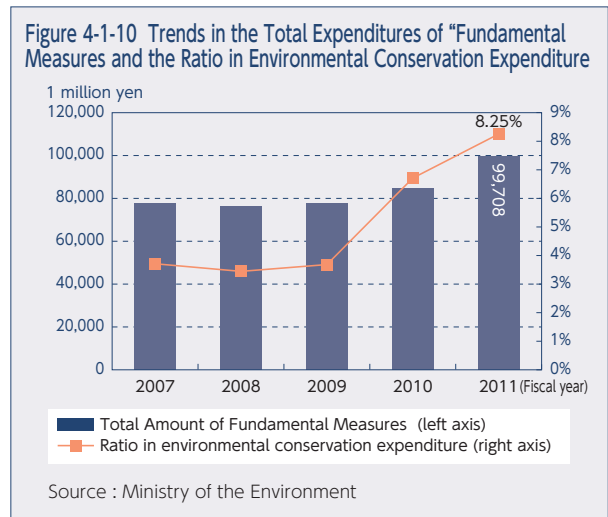
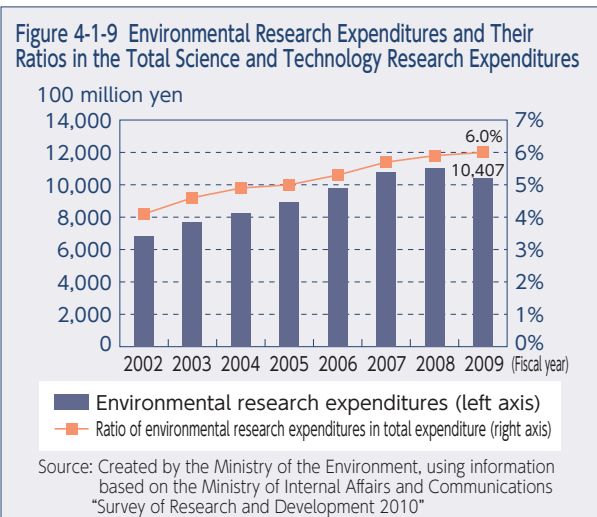
3. Funding and Environmental Finance to Support Technologies that Contribute to Creation of a Sustainable Society

(1) Expenditure of Research Costs in Environmental Fields in Japan, and Related Trends

As discussed in the previous subsection, new technologies that would contribute to solution of environmental problems could not be achieved without active efforts by each participant. Private-sector companies are investing large amounts of money for research and development and education of employees to secure and strengthen technological competitiveness in the market. Such actions indicate that, in order to promote the technological development that is required to

address environmental problems, it is necessary to make investment in research and development accordingly.

Looking at science and technology research expenditures in Japan, the research expenditures in the environmental field have been given more priority than other areas. The research expenditures in the environmental field show a steadily rising trend since FY 2002 and had increased by approximately JPY 400 billion by FY 2009 (Figure 4-1-9). In addition, the ratio that the expenditures in the environmental field makes up of the total amount of science and technology research expenditure has been consistently rising since FY 2002 (Figure 4-1-9). It should be noted that in FY 2009 the entire science and



technology research expenditure declined in comparison to the previous year, reflecting an economic crisis, and research costs for environmental fields also declined (Figure 4-1-9). This is because the research expenditure of private businesses, which presents approximately 70% of the total for science and technology research expenditure, showed a significant drop of 12.1% compared to the previous year. However, even though the research expenditure in the environmental fields declined, the rate of decline was relatively smaller in comparison to the reduction rate of the entire science and technology research expenditure. This indicates that research in the environmental field is regarded as more important than the other areas.

In addition, looking at the environmental conservation expenditures, which are government expenditure related to conservation of the Earth’s environment, prevention of pollution, and protection and maintenance of the natural environment, it can be seen that in recent years the budget amount of the general measures supportive of specific measures which include the budget of comprehensive promotion of R&D is increasing. In FY 2011, total amount of the fundamental measures in environmental conservation expenditures was approximately 99.7 billion yen, which makes up approximately 8.25% of the total environmental conservation expenditure (Figure 4-1-10). The budget amount of the fundamental measures has a tendency to increase since 2008, and the amount in FY 2011 has increased by approximately 18% from the previous fiscal year.

The environmental research and development supported by the science and technology budget have yielded a number of successful results. For example, the Ministry of the Environment has been promoting the research and development on high-capacity laminated lithium ion batteries. At the end of 2010, electric vehicles equipped with high-capacity laminated lithium ion batteries were launched to the market, which was an example of the outcomes of governmental environmental R&D leading to commercialization in the private sector (Figure 4-1-11). In addition, these batteries can be used in various storage batteries and power systems beyond their original applications in electric vehicles such as HEVs and plug-in HEVs. It is expected that application of this battery technology will help further significant reduction of carbon dioxide emissions. Specifically, the technology can be applied to industrial electric equipment, and in addition, the batteries can be operated together with the distributed power system to enhance the CO₂ reduction. The technology also has potential to be applied in machinery such as forklifts and construction machines. Thus government investment in research and development for science and technology has brought about significant results that contribute to creating a society that does not rely on non-renewable resources.

Figure 4-1-11 Example of Commercialization of Lithium Ion Batteries for Electric vehicles



Source: Automotive Energy Supply Corporation

(2) New Roles of Environmental Finance

In order to solve environmental problems, it is necessary to change all of the mechanisms in a society to sustainable ones. Since all economic activities use money as a medium, in order to change society’s mechanisms we should also need to change the flow of money. This would be the responsibility of the financial sector to the society. In a report released in June 2010, the Expert Committee on Environment and Finance of the Central Environment Council defined the term environmental finance as a “mechanism that changes the actions of corporations and individual actors to take environment into consideration via financial markets that offer appropriate incentives to induce eco-actions.” The Council further specified the following two roles that are expected of the financial sector: (a) to supply generous funds baked by more than JPY 1,400 trillion yen of Japan’s individual households financial assets towards commercial activities and environmental businesses that contribute to environmental conservation, and (b) to assess and support commercial activities of companies that work towards environmental protection. The report also made new proposals to promote socially responsible investment (SRI) efforts through pension funds and corporate environmental information disclosure.

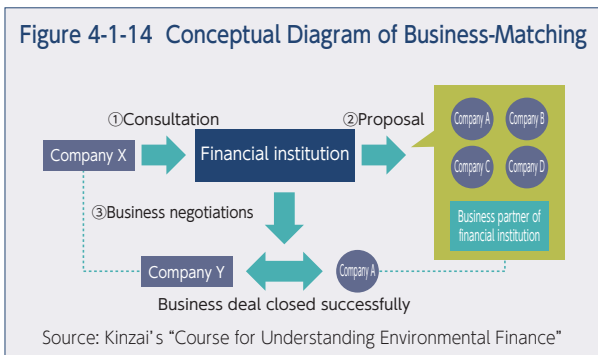
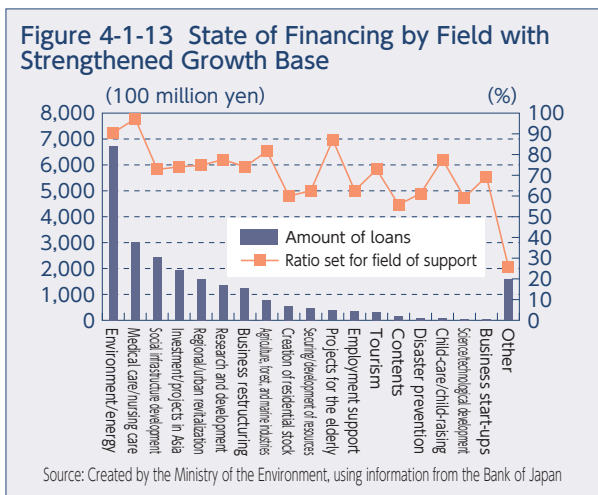
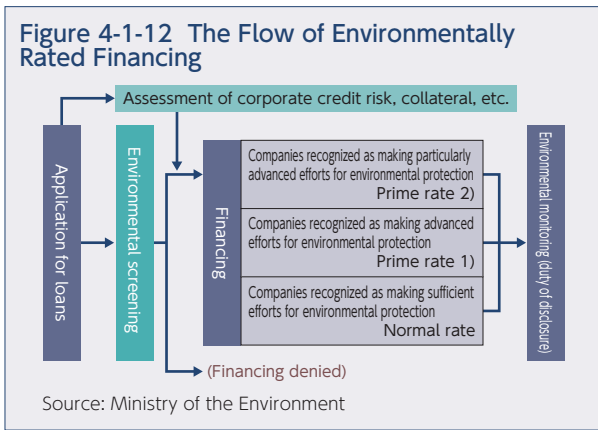
As an example, the eco-lease project, a measure to reduce the initial investment burden of residences and small- and mid-size businesses for purchasing low-carbon equipments, will be implemented beginning in FY 2011 (refer to Section 3-2 (1) F).

Environmental finance is operated through various instruments such as investment, loans, and insurance. In the field of indirect finance, which has much weight in Japan, financial institutions such as banks are making a variety of efforts in the environmental fields (Table 4-1-1). One such effort is the financing employing environmental ratings that the Development Bank of Japan provides following the guidelines of Ministry of the Environment (Figure 4-1-12). Even though corporate efforts for environmental conservation are considered socially desirable, the level of effort tends to remain low since they do not directly improve corporate earnings in many cases. Environmentally rated financing, on the other

Table 4-1-1 Environment-related Projects of Depository Financial Institutions

Deposits	Eco-deposits	“Donation-type”
		“Higher deposit interest rate type”
Finance	Personal loans	Financing for purchases of eco-cars, eco-residences, eco-reforms, etc.
	Corporate finance	Financing for environment-related facilities Financing for environmentally considerate companies (rated financing, etc.)
	Project finance	Financing for environmental businesses (renewable energies, etc.) Restrictions on project financing based on Equator Principles, etc.
Others	Business-matching	Individual handling, exhibit format, etc.

Source: Created by the Ministry of the Environment based on the Report “The New Role of Finance for a Low-Carbon Society,” by the Expert Committee on Environment and Finance, General Policy Committee, Central Environment Council, the Ministry of the Environment



hand, takes the view that the reduction of environmental pollution risk do contribute to the company's management stability, and preferential loans are made on this basis. Regional financial institutions such as local banks are thought to seek regional development together with local businesses. Under the system of environmental rating finance, on the other hand, the customer, the financial institution, and the whole society that these actors exist should all become stakeholders, thereby raising the level of efforts made by companies contributing to sustainable development.

In order to promote financing employing environmental rating, since 2007, the Ministry of the Environment has been subsidizing for the financial institutions conducting environmental ratings if their loan customers pledge to reduce their carbon dioxide emissions. This contributed to the increase of environmental rating financing; and

as of April 2011 there were 47 financial institutions employing environmental rating financing, a significant increase from 33 in the previous year.

The Bank of Japan also began a measure, "Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth" in June 2010, with the objective of expanding the mid- and long-term path to growth in order to overcome deflation. This is a measure to provide low-interest funds to the financial institutions that have submitted policies for efforts in the 18 fields set forth in the New Growth Strategy, based on their track record of financing. The total amount of investments and loans from April through December 2010 shows that the amount of financing for environmental and energy fields was the highest, at 671.9 billion yen, amounting to nearly 30% of the total, reflecting substantial expectations of growth in this field (Figure 4-1-13). It is hoped that financial institutions will find new prospective projects, play the role of a "good judge" with their accumulated experience and provide funds for new technological development and new businesses, especially which may involve risks, in environmental and energy fields, thereby supporting development of businesses to be taken on by the next generation.

Banks and credit associations are also strengthening their roles of not only financing but also of information offering, through business-matching. When financial institutions build relationships with their client companies, there would be many opportunities for them to share not only financial issues but overall business-related issues. In such cases, they are often asked to provide advice. It is in those cases that they conduct business-matching that introduce partners for tasks such as sales and purchases, technological development, and consulting about taxes and operations (Figure 4-1-14). Such business-matching includes business negotiations in one-to-one meetings, or depending on the circumstances, collaborative match-making in exhibitions and exchanges conducted by multiple financial institutions. These companies would exchange information aimed at future transactions. Efforts are being made to increase the ratio of contracts signed and to improve the effects of matching, by narrowing the theme of such exchanges down, for example, to the environment. The Ministry of the Environment launched a campaign called "Challenge 25 Caravan across Japan," and in May and June of 2010 they held eco-business-matching events at 7 venues throughout the country with the cooperation of regional financial institutions.

For the future development of environmental finance, the previously mentioned report released by the Expert Committee on Environment and Finance included a proposal to develop a Japanese version of "Principles for Sustainable Finance Action" (tentative name) by a voluntary group of financial institutions. In August 2010, responding to a call made by Mr. Takejiro Sueyoshi (Special Advisor to the United Nations Environment Programme Finance Initiative) to create the Japanese version, a drafting committee was set up by voluntary financial institutions. During 2010 a number of discussions were held about the preamble and general introductory sections that would stipulate the concept of the action principles and the fundamental principles that



should be taken by individual financial institutions. Signing of the action principles is scheduled to begin in 2011 after formulation of guidelines for each type of business. It is anticipated that a wide variety of financial

institutions of various sectors and scales will participate in these action principles and that they will serve as a base for discussion about environmental finance in Japan in the future.

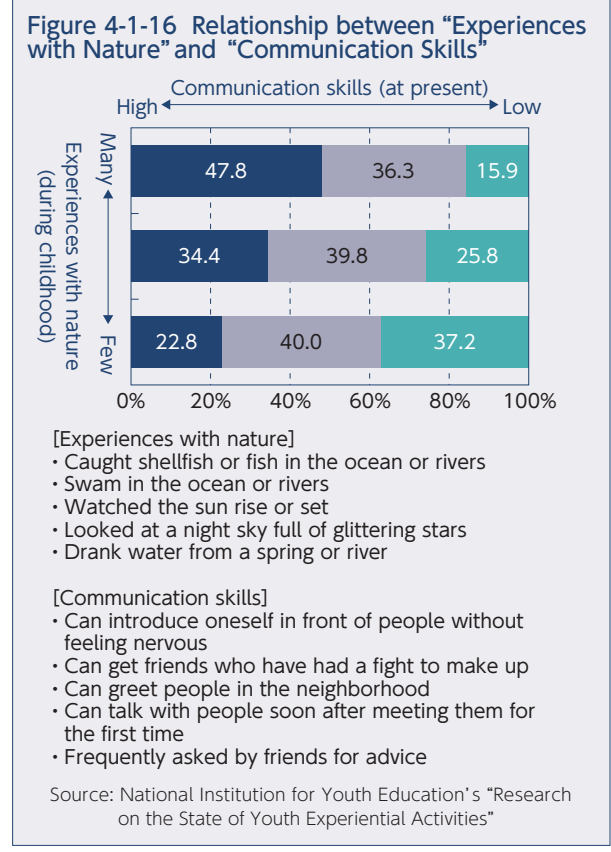
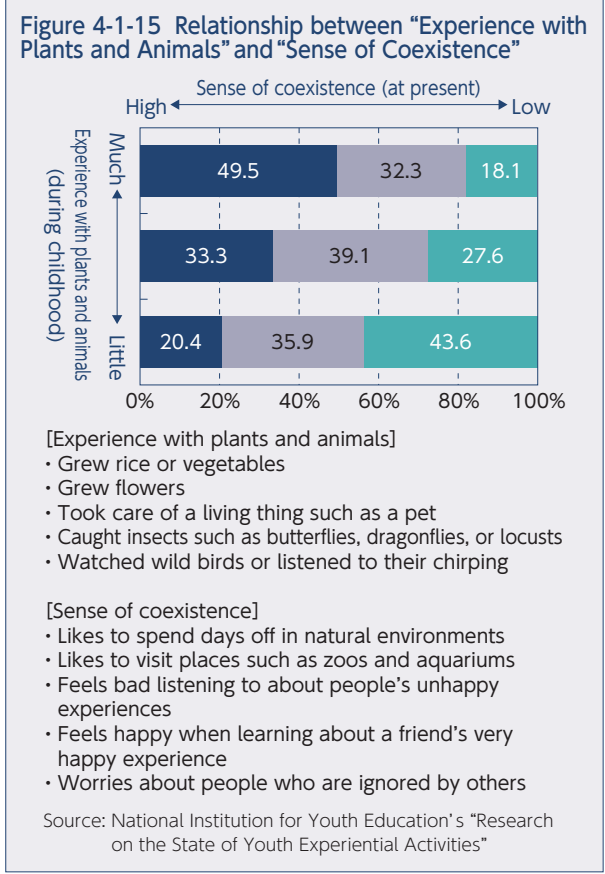
4. Education: the Foundation of the Wisdom that Contributes to Development of a Sustainable Society

(1) Development of People and Solution of Environmental Problems

From an international standard, Japan has fewer students pursuing doctoral programs than in other countries. There are 75,000 students pursuing doctoral programs in Japan, significantly less than the approximately 530,000 in the EU and the approximately 460,000 in the United States. However, in order to solve environmental problems it is necessary to have people with advanced expert knowledge and broad perspectives to conduct research and development, and disseminate new technologies aimed at creating a sustainable society. In addition, in order to achieve a green economy in a green society, including various sectors such as companies, government, and NGOs, it is also necessary to have “T-shaped” human resources that have a vertical axis of knowledge in specialized fields such as law, economics, or engineering, and a horizontal axis of cross-sector knowledge about the environment and sustainability, with a bird’s-eye perspective.

Various efforts are being made to cultivate the “T-shaped” human resources in environmental fields in

Japan. For example, in order to develop the environmental human resources envisioned in the “Vision for Environmental Leadership Initiatives for Asian Sustainability” the Ministry of the Environment has been supporting establishment in March 2011 of a consortium to develop environmental human resources by industry-academia-government collaboration including universities, corporations, NGOs. The consortium was established in March 2011, and the Ministry of the Environment is planning to collaborate with the consortium in the future. In addition, with the aim of creating a network of Asian graduate schools that are working to develop environmental human resources, the Ministry of the Environment collaborated with the United Nations University Institute of Advanced Studies and launched a network commonly known as ProSPER.NET in 2008. The purpose of this effort is to integrate education and research about sustainability in education and research at the graduate school level. As of March 2011, the members include 21 higher education institutions in Japan, China, South Korea, ASEAN countries, India, and Australia.



(2) The Importance of Environmental Education for Children, and Education for Sustainable Development (ESD)

In order to solve environmental problems, development of environmental technologies and cultivation of human resources with expert knowledge alone are not sufficient. It is also important that individual citizens understand environmental problems. The report “Research on the State of Youth Experiential Activities” (by the National Institution for Youth Education, 2010) studied the relationship between various experiences at each age from early childhood through the age of completion of compulsory education and the qualities and abilities gained through such experiences. The study found that adults who had the more “familiar with plants and animals” during childhood had more of a “sense of coexistence,” or a likelihood to spend days off in natural environments. And the adults who had more “familiar with nature” such as swimming in the ocean or rivers during childhood tended to have more “communication skills” such as being able to introduce themselves in front of people without feeling nervous (Figures 4-1-15 and 4-1-16). As the results of this study show, it can be said that experiences during childhood have an influence on later life. In light of this, environmental education plays an important role in increasing individual citizens’ understanding of environmental problems and working toward public awareness of environmental problems.

Environmental education and experiences during childhood are so important that the government has been making various efforts for environmental education. For example, in order to contribute to environmental education for children the Ministry of the Environment has been carrying out the following: 1) creation of an information database site that provides environmental education and learning materials from around the country, 2) the “*Kodomo Hotaranger* (kid ranger to protect Japanese fireflies)” program that encourages children’s water environment conservation activities with

the aim of protecting fireflies and activities the Minister of the Environment Prize, and 3) development and provision of nature experience programs to offer children opportunities to experience the duties of rangers for nature conservation and to learn about the importance of the natural environment. Further, since it is vital that individuals have thorough awareness of the importance of environmental conservation and take actions accordingly in order to truly solve environmental problems, it would be necessary to reorganize the measures and policies for environmental education, from philosophy to actual procedure of policy implementation, and examine methods of formulating measures and policies for future. These findings should be reflected in current measures and policies, with cooperation of key figures of related ministries and outside the Ministry of the Environment. For that reason, the Ministry of the Environment is collaborating with the Ministry of Education, Culture, Sports, Science and Technology to launch a “study team to examine future environmental education and public awareness” led by the parliamentary secretary of the Environment, and though this team it is working with key external experts to review the direction of environmental education and public awareness.

Through collaboration with NPOs and NGOs, the government is promoting education for sustainable development (ESD) in local regions. For example, in order to promote ESD, the Ministry of the Environment launched an ESD activity registration system (+ ESD Project) as a mechanism to introduce region-based ESD actions to the general public in Japan. This action is based on results of model studies, with the participation of a wide range of regional entities and the cooperation of related ministries and organizations.

Promotion of the development of human resources and ESD activities will also lead to promotion of a “new public” in which industry, government, academia, and the private sectors participate in activities such as education and child-rearing, town-development, crime and disaster prevention, medical care and social welfare, and consumer protection with a spirit of mutual assistance.



Column

Efforts of Local Public Organizations - Solar Cars and Elementary and Junior High School Students

In order to deal with environmental problems such as global warming, it is important to promote research and development and make efforts for environmental education. Local public organizations are also making efforts forward with various efforts based on this perspective.

One of these efforts is a “Solar Car Challenge Plan” that is being conducted in Tokyo’s Koto Ward to tackle the Earth’s environmental problems through production of solar cars mainly by elementary and junior high school students. This effort is being promoted based on a “proposed project” that is part of the “Tokyo Municipal Assistance System for Promoting Global Warming Countermeasures” which was created by the Tokyo Metropolitan Government in FY 2009. This project assists the proposals that are recognized as the most trailblazing and as having the highest spillover effects among all the efforts against global warming proposed by those within Tokyo’s municipalities.

The “Solar Car Challenge Plan,” which started in 2009, is a plan that aims for participation in the Suzuka Solar Car Race in 2011. It is carried out mainly by elementary and junior high school students from within the Koto ward, and it is being promoted with cooperation of universities and private businesses. In 2009 ten seminars and training sessions were held during summer vacation, and an exhibition was held to present completed solar cars and their planning processes. In 2010, Japanese universities and private companies conducted collaborative research, went to study the world’s leading solar car that won a solar car race held in Australia, made an interim announcement of the plan, and proceeded with building car bodies. It is anticipated that such efforts by local municipalities that tie together environmental education for children and the application of science and technology will lead to a locally-based awareness and diffusion of environmental problems.

Collaborative work with Shibaura Institute of Technology



Source: College of Engineering Akatsu Laboratory, Shibaura Institute of Technology

Field Trip to Study the World’s Leading Solar Cars



Source: Koto Ward, Tokyo