Column Financial Institutions' Efforts on the Environment

We introduced the "Equator Principles" as an example of efforts by financial institutions to voluntarily integrate environmental issues in their lending operations. Aside from institutional efforts, it is also important for individuals to act by altering their consciousness about the environment.

For example, a major international financial institution encourages employees to take part in volunteer activities by treating their participation in environmental practices of a non-profit organization (NPO) as "business trips." In volunteer activities, this financial institution supports a project, among others, to investigate a linkage between climate change and coastal ecosystems, helping the collection and analysis of data on seaweed beds for marine plants and rocky intertidal zones, which play important roles as habitats for animals and plants in coastal areas in temperate marginal zones.

Environment-friendly financial flows may be expected to accelerate going forward if financial institution employees become more conscious about the environment and loans to finance initiatives that contribute to environmental conservation and sustainable development become commonplace practices.

A Scene of Financial Institution Employees Participating in Volunteer Activities

Source: HSBC Holdings plc, "HSBC Community Activities"

Section 4 Global Environment and Economic and Social Activities

The environment provides the foundation for sustainable development of the economy and society. Hence, a variety of environment problems are important challenges that threaten stable economic and social activities and at times, even their continuation. The Japanese economy, meanwhile, remains under difficult circumstances, though it is recovering from the latest economic crisis. The progressing decrease in the labor force and the declining savings rate are feared to have adverse impacts on Japan's economic growth going forward, while the Japanese economy is exposed to competition not only from longstanding rivals in the developed world but also from China, India and other emerging economies that have moved into the global market on the back of cheap and abundant labor and the large-scale introduction of foreign capital.

In order to overcome these difficulties concerning the environment and the economy, it is necessary to maintain and reinforce the international competitiveness of the environmental industry, the strong point for Japan, by striving toward further development and spread of environmental technologies through creative innovation. With these environmental technologies and the environmental industry as the driving power, it is also necessary to sever the linkage between economic growth and increases in resources/energy consumption accompanied by environmental loads, and strive to reduce environmental loads while sustaining economic growth.

Along the line of this approach, in this section, we give an overview of policies necessary for the development of the environmental industry going forward, centering on the promotion of innovation in the environmental field (green innovation) and consider a new socioeconomic system that creates a virtuous circle for the environment and the economy.

1 Promotion of Green Innovation by Environment Policy

(1) Environment policy that creates green innovation

Internalization of social costs of environmental loads (external diseconomy) through environment policy should increase demand for environmental technologies and lead to the creation of green innovation. As demonstrated by the dramatic advance in low carbon technologies since the adoption of the Kyoto Protocol in 1997, it is important to send clear messages to the market for business investment decisions in research and development for low-carbon technologies in the private sector (Figure 5-4-1).

When multiple policies can be considered for the identical goal, it is desirable to take flexible policy approaches to allow options to develop and introduce various new technologies. Given this point of view, for the promotion of green innovation, it is important not only to introduce direct regulations specifying the reduction

levels of environmental loads but also to promote an effective policy mix that includes economic approaches that allow room for ingenuity in countermeasures and lead to greater advantages in accordance to the extent of reductions in environmental loads.

Furthermore, in recent years, particularly among major corporations, environment-friendly business management (environmental management) has become an important element of corporate management principles as part of corporate social responsibility (CSR). Coupled with the rising environmental consciousness among consumers and the markets, there are movements among many companies to capture market shares by developing products with strong environmental performances and, by extension, enhance the brand value and enterprise value, let alone cost reductions and avoidance of environmental risks through energy-saving and resources-saving efforts. The progress in environmental corporate management is making the causal relationship between environment policy and the creation of innovation and environmental improvement effects (Figure 5-4-2).

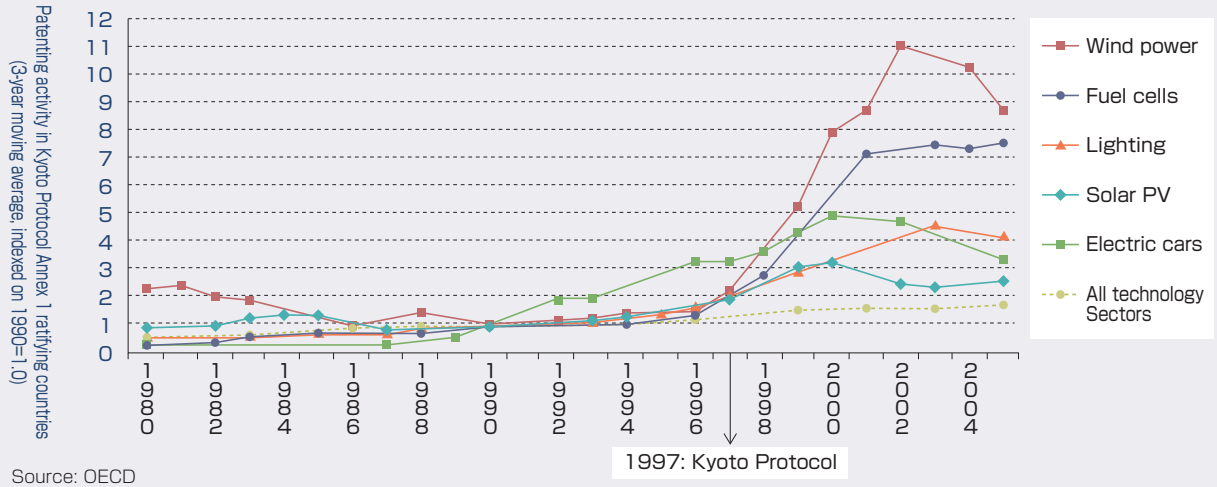
For this reason, in considering environment policy, it is necessary to make a detailed analysis of the mechanisms of how environment policy influences environmental management of companies, through what generation process innovation is created, and what roles (stakeholders), including financial institutions and investors, play in innovation in order to realize more effective environment improvement effects through innovation.

(2) Blending with innovation policy

In addition to the above environment policy, it is necessary to accelerate green innovation by strengthening the development of new technologies by researchers as well as innovation policy needed for the spread of developed technologies.

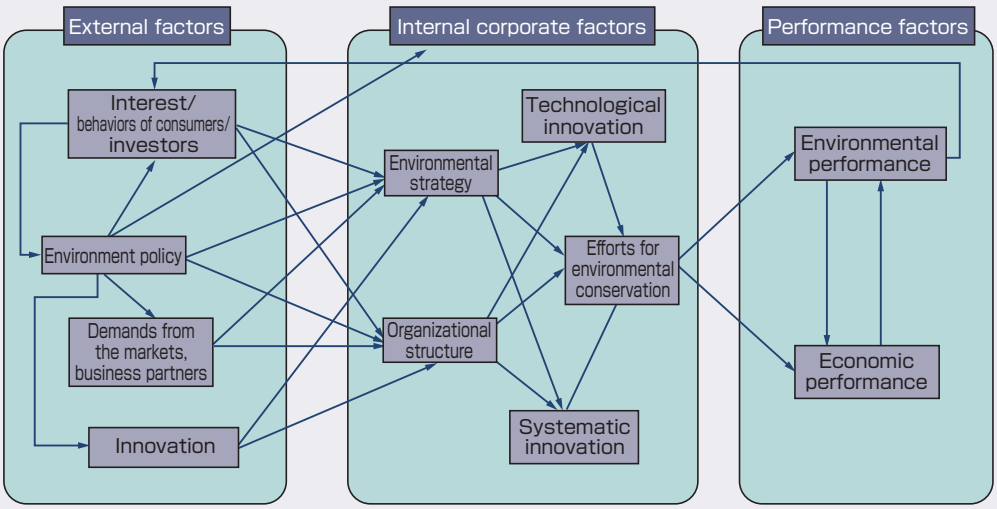
There are barriers in the process of creating innovation: "Devil River" that arises from the difference in the direction of vectors between academic research conducted out of academic curiosity and technological development for commercialization; "Death Valley" that stems from the lack of support in between technological

Figure5-4-1 Innovation Trend in Climate Mitigation Technologies



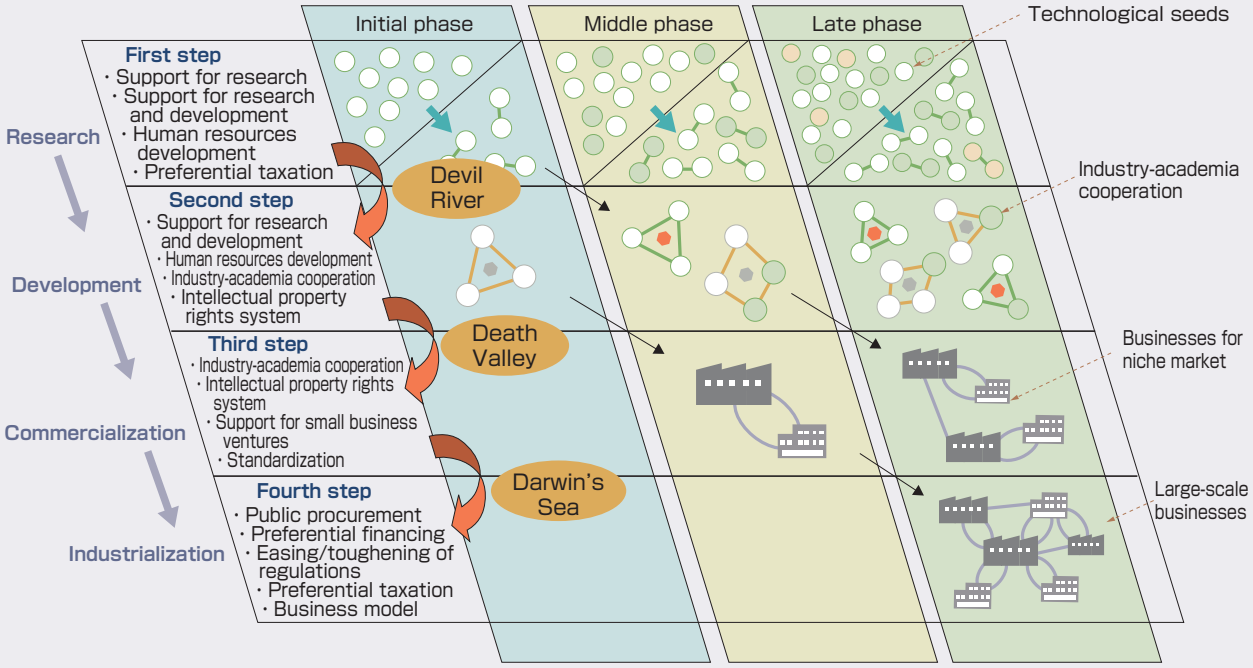
Source: OECD

Figure5-4-2 Impact of Environment Policy on Environmental Corporate Management



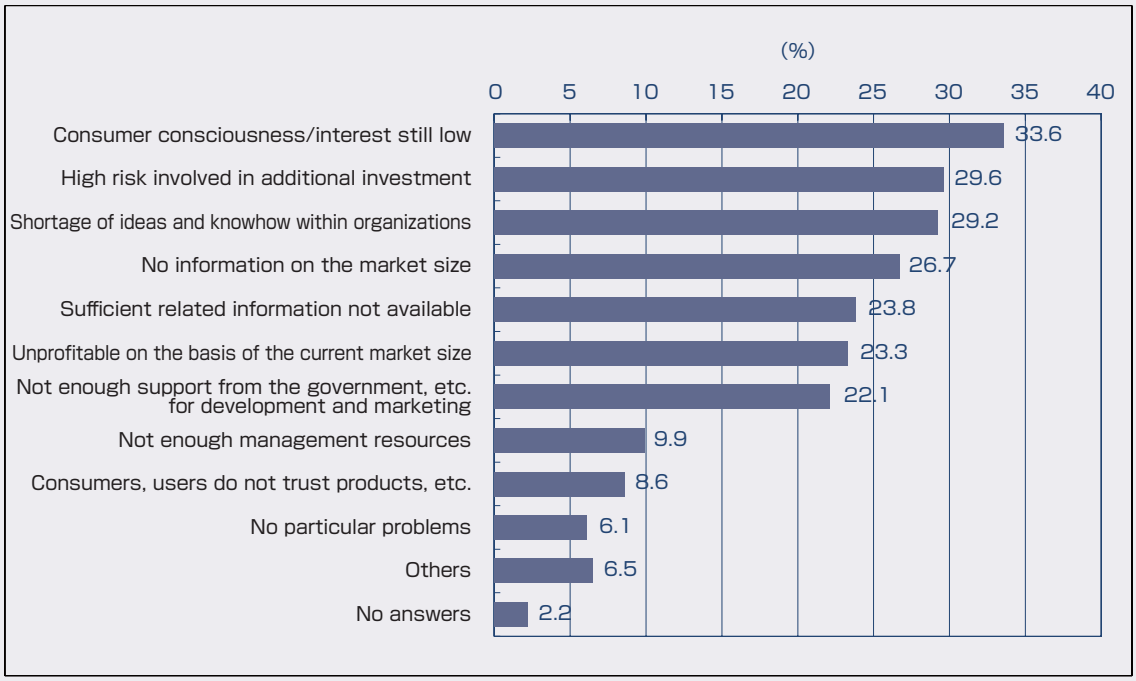
Source: Ministry of the Environment, "Policy Study on Environmental Economics" (Professor Shinji Kanko of Hiroshima University Graduate School, etc.)

Figure5-4-3 Processes to the creation of innovation and various support measures



Source: Prepared by Ministry of the Environment based on Mizuho Information & Research Institute, Inc., "FY 2006 Research on the Exit Side of Innovation"

Figure5-4-4 Problems Involved in the Development of Environmental Businesses

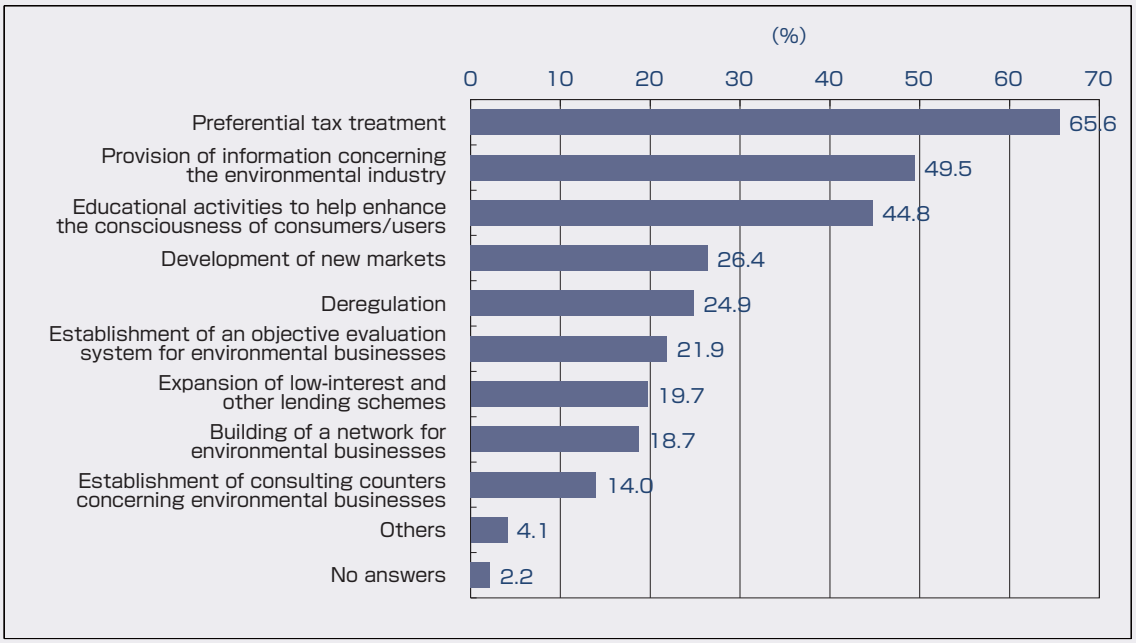


Source: Ministry of the Environment, "FY 2008 Survey on Environmentally Friendly Corporate Behaviors"

development and the commercialization phase; and "Darwin's Sea" where punishing competition is fought with rivals for a success as an industry (Figure 5-4-3).

This process toward industrialization is no exception for the environmental industry. For example, according to the Regional Economic Report (October 2009, the Bank of Japan), while businesses have been expanding and accelerating moves to change the line of business or diversify into the environmental industry on its potential and in hopes of public support, current conditions surrounding the environmental industry are tough, as demand remains in the doldrums in the aftermath of the sharp economic slowdown both at home and overseas after the Lehman Shock autumn in 2008, the market size is still small with many related businesses still in the initial phase of development, and competition is already intensifying on both the domestic and global markets. Further, in a survey on environmentally-friendly corporate behaviors conducted by the Ministry of the Environment, many respondents cited "low level of

Figure5-4-5 Support Measures Wanted to the Government for the Development of Environmental Businesses



Source: Ministry of the Environment, "FY 2008 Survey on Environmentally Friendly Corporate Behaviors"

consciousness/interest among consumers, etc.," "high risk involved in additional investment," "shortage of internal ideas and knowhow" and "shortfall of information related to the environmental industry, such as the market size" (Figure 5-4-4). As for support measures businesses want from the government, many respondents cited "preferential tax treatment," "provision of information on the environmental industry" and "educational activities to help enhance consumer consciousness" (Figure 5-4-5).

In order to create the environmental industry through green innovation, not only public financial assistance and preferential taxation measures but the implementation of measures for human resources development, public procurement and industry-academia cooperation comprehensively and in a meticulous manner in accordance with industry characteristics and market sizes throughout the series of processes from research and development to commercialization and industrialization.

① Support for research and development and venture businesses, etc.

In research and development, since the development of new technologies benefits not only developers but parties other than developers, developers may underinvest in research and development for fear that they may not obtain sufficient first-mover advantages (the so-called "technological spillovers"). It is also conceivable that since research and development work requires a long period of time and involves risks of failure, people cannot make decisions to go ahead and make research and development investment. In addition, as discussed in Section 1, while research and development investment in the environmental field has been increasing, overall research and development investment has been on the decline in the wake of the latest economic crisis. For this reason, the government is providing active support for research and development instead of just leaving it to the private sector, such as preferential tax treatment for private-sector research and development activities, and in particular, subsidies for basic research whose results are unlikely to directly lead to actual businesses. As the New Growth Strategy (Basic Policies) states that "Japan will increase public- and private-sector investment in research and development to over 4% of GDP by 2020," it is expected that research and development investment, including investment in green innovation, will expand further going forward.

In order to foster and support venture businesses that embark on the industrialization of new technologies, etc., the fruits of research and development activities, the government has taken such measures as the angel taxation system (preferential tax measures for investment in venture businesses) and venture funds (capital investment in venture firms in the early stage). The government also submitted to the 174th session of the Diet the bill for the "Act on the Promotion of Businesses to Develop and Manufacture Energy and Environmental Friendly Products (Low Carbon Investment Promotion Act)" for launching a new insurance program aimed at providing low interest rate, long-term funds for developers and manufacturers of low carbon products, such as electric cars, storage batteries and solar panels, and also at encouraging small and medium enterprises to introduce low carbon equipment through leases.

② Development of environmental human resources

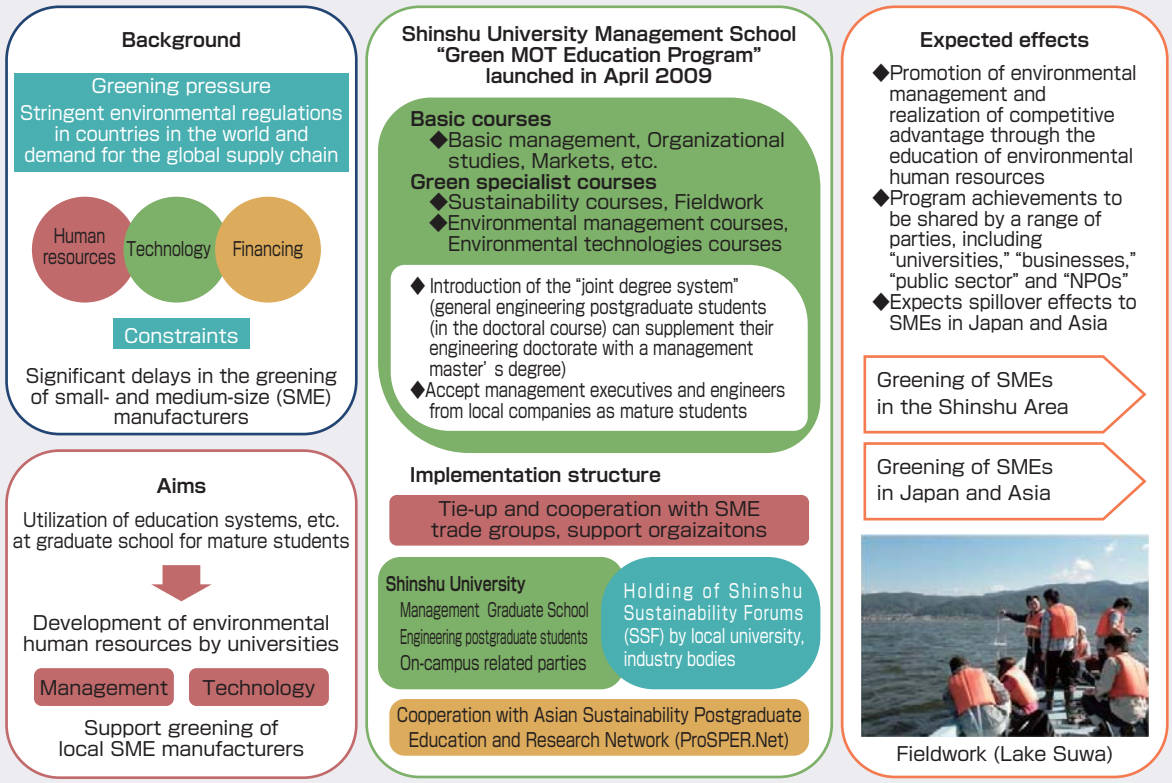
As it has been often pointed out that the large increase in science and technology-oriented human resources in the 1960s successfully provided the foundation for innovation in Japan in the high growth period, it is extremely important to secure research and technological human resources with science and technology expertise in order to promote technological innovation through green innovation. On the other hand, in addition to the falling birthrates and the aging of the population, the ongoing phenomenon of the so-called "alienation from science" among young people could result in a qualitative and quantitative shortage of research and technology human

Column Development and Spread of Higher Education Model Programs

The Ministry of the Environment, as part of the Environmental Leadership Initiatives for Asian Sustainability (ELIAS), has been undertaking "projects to develop environmental leader university education programs" since FY 2008 to support the development and demonstration of practical programs for environmental leadership training in close cooperation and collaboration with companies, government agencies and NGOs, etc. that actually accept environmental human resources. Currently, such projects are under way at a total of 11 universities, including "Green MOT Education Program" (Shinshu University) that focuses on management of technology (MOT) at small- and medium-sized manufacturers in the region and "Low Carbon Design Course" (Keio University) that is designed to cultivate students who can contribute to establishing a low carbon society.

At present, preparations are under way for the establishment of a "consortium for fostering environmental leaders," another effort under the Environmental Leadership Initiatives for Asian Sustainability. It is hoped that many universities carry out practical education to help the fostering of environment leaders in close cooperation with program development efforts by these universities, and environmental leaders educated at such institutions play active roles in a broad range of fields in the future.

Outline of "Green MOT Education Program for the Management School" at Shinshu University



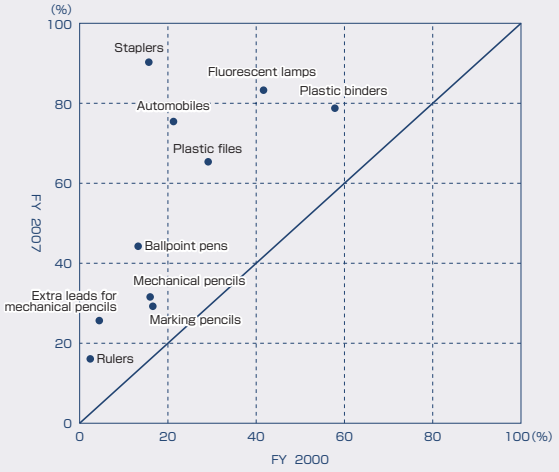
Source: Shinshu University

resources in the future and is feared to seriously undermine the international competitiveness of Japanese industry. Given this situation, the New Growth Strategy (Basic Policies), as part of the science-and-technology-oriented nation strategy, cited the targets to be achieved by 2020: "Increase the number of universities and research institutions that lead the world in respective fields. Ensure full employment for all those who have completed doctoral courses in science and technology." It is expected that through the achievement of these targets, measures will be taken to foster and utilize environmental human resources that support green innovation.

The creation of a new environmental industry and greening of economic activities also require the fostering and utilization of environmental human resources in fields other than the science and technology field. At present, however, we probably cannot say sufficient efforts are being exerted to nurture environmental human resources at universities, etc. While companies have the need to hire environmental human resources, they appear to be having hard time securing enough of such human resources.

The action plan for the "United Nations Decade of

Figure5-4-6 Trends of Market Shares of Specified Goods Procured around Enforcement of the Law on Promoting Green Purchasing



Source: Ministry of the Environment

Education for Sustainable Development (UN-DESD) in Japan," an initiative related to "Education for Sustainable Development (ESD)," calls for the promotion of efforts in higher education. In line with this, a panel of the Ministry of the Environment worked out the "Vision for Environmental Leadership Initiatives for Asian Sustainability in higher education (Environmental Leadership Vision)" in March 2008. The Vision defines environmental leaders as "those who look at environmental problems in light of their own experience and moral values, are committed to leveraging their area of expertise to realize sustainable development in their professional and private lives, and exercise leadership in fulfilling their social responsibilities," and then maps out the ideas and measures to foster environmental leaders at universities, etc. in order to ensure a sustainability in Asia. Putting teeth into the Vision, the Ministry of the Environment, under the "Environmental Leadership Initiatives for Asian Sustainability (ELIAS)," is proceeding with (a) the development and dissemination of model higher education programs; (b) the establishment of a multi stakeholder consortium for developing environmental leaders," a framework of cooperation among all stakeholders from industry, academia, government and civil society for the purpose of developing environmental leaders; and (c) the development of network of universities in the Asia-pacific region committed to developing environmental leaders.

③ Stimulation of demand by promotion of green purchasing, etc.

It is also important to implement policy measures to stimulate demand for environment-friendly products in order to create an environmental industry.

As one of such measures, in Japan, the central government and other public-sector institutions are taking the initiative in green purchasing to promote the procurement of eco-friendly goods (goods and services that contribute to reducing environmental loads). Comparison between FY 2000, before the enforcement of the Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (hereinafter referred to as the "Law on Promoting Green Purchasing"), and FY 2007 shows the rises in market shares for many eco-friendly goods. For example, staplers (hotchkiss) with the recycled plastic content of over 40% in the weight of plastics, saw its market share skyrocket from less than 20% before the enforcement of the Law on Promoting Green Purchasing to around 90% in FY 2007 (Figure 5-4-6). In FY 2007, the "Law concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities (Green Contract Law)" was enforced with the mechanism under which the national government and other public entities in their procurement make a comprehensive evaluation to include environmental performances in addition to prices and conclude purchase contracts with suppliers that offer the best goods and services, etc. At present, environmental conditions are required in contracts for the purchases of electricity, vehicles and ships, etc. and energy-saving renovation businesses (ESCO businesses) as well as designs for construction of buildings or large-scale renovation work.

In order to reduce greenhouse gas emissions from households, which have increased considerably in recent years, the Ministry of the Environment has been undertaking "Eco-Action Point model projects" since FY 2008, under which points (Eco-Action points) are issued for the purchase of goods and services and actions contributory to global warming countermeasures and accumulated points can be exchange for a variety of goods and services. In FY 2009, three nationwide projects and six regional projects were adopted. The projects for the penetration of eco-action points are aimed at establishing business models at the initiative of economically independent private businesses and thereby promoting the utilization of goods and services that contribute to a broad range of measures to cope with global warming.

Furthermore, beginning in FY 2009, in light of the economic and employment conditions in Japan, eco-points for home electric appliances, housing eco-points and the so-called eco-car tax reductions were introduced for the purposes of global warming countermeasures and reinvigoration of economic activities. Eco-points for home electric appliances, exchangeable for a variety of goods and services, are issued for the purchase of green electric appliances (air conditioners, refrigerators and TV sets for digital terrestrial broadcast reception with four or more of the unified energy-saving label ☆) to encourage replacement demand. The validity period for the eco-points for home electric appliances was extended until December 31, 2010, under the "Emergency Economic Countermeasures for Future Growth and Security" (adopted in December 2009 by Cabinet decisions) and the second supplementary budget for FY 2009 enacted in the 174th session of the Diet. With some changes in the structure, including improved application procedures for the higher convenience for users, tougher energy-saving standards for TV sets and promotion of the use of white LED bulbs, etc., these eco-points made a fresh start as a new system on April 1, 2010. For construction of eco-friendly new houses and eco-friendly home remodeling, a new system of housing eco-points was created, with housing eco-points exchangeable with a

Column Eco-City Initiatives in China

China is making intensive investment in the environmental field as a national project. The most exemplary case of this initiative is the Tianjin Eco-city (Tianjinshengtaicheng). The Tianjin Eco-city, the first environmental city plan led by the Chinese government, was launched in 2007 as the joint project with the government of Singapore. The project, set to be completed 10 to 15 years, calls for a total investment of 250 billion yuan (about ¥3.2 trillion), and 350,000 people are expected to live in the city with a site area of some 30 square kilometers. Environmentally, condominiums, office buildings and all other buildings to be set up in the city are required to comply with energy-saving standards, and the Tianjin Eco-city is to become a model city for energy-saving and environmental conservation, with 20% of electricity supply coming from renewable energy such as photovoltaic and wind power generation. China has also designated the "Gangzhuxiang" group of cities made up by Gangsha, Zhushou and Xiangtan cities in Hunan Province and another group of cities led by Wuhan City in Hubei Province as the demonstrative experimental group of cities for the "two-type society" (the society that is resource-saving type and at the same time environment-friendly type). In the group of cities led by Wuhan, a total of 459 environmental conservation projects are set to be implemented over a period of 10 years from 2010 with a total investment of some 500 billion yuan (about ¥6.5 trillion).

Rendering of "Tianjin Eco-city" (Tianjinshengtaicheng)

Source: Sino-Singapore Tianjin Eco-city website

As seen above, efforts to deal with environment problems are now being made at the city level in China, which will likely mean a further intensification of competition over the environmental industry going forward. Amid these developments, it is hoped that Japanese companies, armed with their environmental technologies at the world's highest levels, will proactively advance into China's environmental market.

variety of goods and services in the same manner as eco-points for home electric appliances.

Eco-car subsidies are designed to subsidize the purchase of new vehicles with high environmental performance (environment-responsive cars), including replacement. Together with eco-car tax reductions already in place, the eco-car subsidization scheme is producing the significant economic and environmental conservation effects. The subsidization scheme was also extended to remain effective until September 30, 2010.

In part because of the impacts of the eco-points for home electric appliances and eco-car subsidies, personal consumption began to show some signs of recovery, with these systems underpinning the business conditions and employment in the home electronics and automotive industries. The market shares of environment-conscious products expanded, with, for example, hybrid vehicles capturing the biggest share in domestic sales of passenger cars in FY 2009, for the first time ever.

④ Market expansion overseas, particularly in Asia

Other countries, in particular the Asian region, which has close geographical and economic ties to Japan, accounts for over half of the world's population and is seeing rapid economic growth, but also is confronted with serious environmental problems, including air pollution, water contamination, inappropriate disposal of wastes and deforestation. And sharp increases in greenhouse gas emissions and increased waste discharges in the region are impacting the environment on a global scale.

Japan can conceivably help facilitate Asia's sustainable development by sharing Japan's experiences and wisdom to have overcome pollution problems while sustaining economic growth and also proactively extending Japan's excellent environmental technologies to the region. This can be expected to lead to an expansion of exports to Asia, which has the massive environmental market.

As seen above, the environmental market is expected to expand further, centering on Asia, European countries such as Denmark, Spain, Finland and Germany, are also moving to actively promote exports of environmental products and services by placing the environmental industry at the core of their export strategies, with their governments fostering and supporting the environmental industry (Table 5-4-1).

In Japan, for example, the "Hatoyama Initiative" announced at the 15th session of the Conference of the Parties to the Framework Convention on Climate Change (COP 15) in Copenhagen in December 2009 as assistance to developing countries grappling with global warming says Japan, with the public and private sectors as one, will make a fair share of contributions by leveraging Japan's excellent environmental technologies in line with the basic thinking that support with private-sector financing and technologies is essential to push forward with powerful efforts to reduce greenhouse gas emissions in developing countries. This initiative can place Japan ahead of the world's other countries by further polishing its technologies to cope with climate change and also can help spread Japan's technology and knowledge about both mitigation and adaptation to the entire world, which may

Table5-4-1 Environmental Industry Promotion and Export Strategies of Other Countries

Country	Denmark	Finland	Spain	Germany
Name	Eco-efficient technology promotion strategy	Technological development program: Business opportunities in mitigating climate change	Technological research promotion program (priority areas in environmental innovation)	German environmental technology master plan
Description	○Nine initiatives to promote eco-innovation ①Building up partnerships for innovation ②Specific and active export promotion linked to the government's diplomacy, etc. ③Promotion of environment-friendly R&D at research institutions/universities ④Ministry of the Environment's initiative to promote eco-efficient technology ⑤Promotion of eco-efficient technology at the EU level ⑥Promotion of introduction of climate-related and energy technologies ⑦Promotion of livestock farm-derived technology to reduce environmental loads ⑧Qualitative and quantitative conservation of the water environment ⑨Promotion of technology to reduce contamination in the environment	○Program to identify and maximize opportunities for Finnish companies in the international market in technologies and services related to climate change mitigation ○Prioritized budget allocation to clean energy fuel, technology to enhance energy efficiency and technology to reduce greenhouse gases other than carbon dioxide (budget of 70 million euros executed between 2004 and 2008)	○5 areas of climate change, sustainability of cities, improvement of production processes, water management/conservation and energy designated as priority areas, and identified under the technology research promotion plan, etc. ○The plan's targets include the participation of Spanish companies in international R&D cooperation	○In order to enhance Germany's position in the environmental technology market, the master plan shows the direction of environmental technology development policy for each area, including water-related technology, technology for enhancing resources productivity, and technology to prevent climate change ○The master plan emphasizes the high level of environmental regulations as Germany's competitive edge in the global market, showing the policy of creating demand for environmental technology by "exporting" Germany's advanced environment policy within the framework of support for system construction in developing countries not limited technological development in each area ○Government-led export promotion structures have been formed (water: German Water Partnership; waste and recycling: ReTECH), backing up German firms' advances into overseas markets as the country as a whole

Source: Prepared by Ministry of the Environment based on OECD Environmental Outlook to 2030, OECD ENVIRONMENTAL INNOVATION AND GLOBAL MARKETS, and governmental websites of countries concerned

bring significant opportunities for the Japanese economy.

As seen in water-related businesses, developing countries, in increasing instances, place comprehensive project orders covering a whole range of construction, fund-raising and operations. While Japan has the world's most advanced element technologies and knowhow, major overseas players are currently controlling the global water business market because Japanese technologies cannot be accepted in most developing countries due to cost reasons and also because Japanese companies owning advanced element technologies and knowhow are not necessarily in full partnership for development of overseas businesses. To cope with such a situation, the "Global Water Recycling and Reuse System Association, Japan" was established in January 2009 to consolidate Japanese firms' excellent technologies and knowhow as a "system" and acquire cost competitiveness. This initiative is beginning to display a successful showing.

As seen in this example, in order for Japan to strengthen the international competitiveness in the global environmental market that is expected to grow further centering on developing countries, it appears important for individual companies to create new environmental technologies through green innovation and for the public and private sectors and companies to cooperate to bring together their environmental technologies as the "system" to win out international competition.

2 Idea of New Economic Development in Consideration of the Global Environment

(1) Economic development indicators in consideration of the global environment

The root cause for the emergence of global environmental problems lies in that economic activities have grown enormous to overwhelm the capacity of the natural environment that has been previously thought to be infinite. Therefore, in order to realize sustainable development, we need to recognize the finiteness of available resources and environmental capacity and consider how we should conduct economic activities within the limitations. We believe that the environmental industry is capable of not only developing new technologies but also becoming the driving power to transform the economic society into a sustainable one by bringing about changes in conventional production methods and our lifestyles.

The traditional indicator we use in Japan is gross domestic product (GDP) that covers only goods and services traded on the domestic market and does not evaluate the loss or improvement in environment values that do not go through the markets, and thus is not necessary an appropriate indicator to measure the quality and sustainability of life such as welfare and the sense of happiness. Given these consideration, the Organization for Economic Cooperation and Development (OECD), the European Union (EU), the World Bank and some other international institutions as well as NGOs are developing sustainability indicators to supplement GDP for the realization of a low-carbon society and further a sustainable society. In France, the "Commission on the Measurement of Economic Performance and Social Progress" (CMEPSP) was established at the request of President Nicholas Sarkozy under the chairmanship of Professor Joseph Stiglitz of Columbia University. The Commission, noting that GDP has its limitations as an indicator to reflect the well-being, considered an

indicator or a group of indicators that can replace GDP, and summed up its considerations in a report released in September 2009.

As seen above, research is being carried out on sustainability indicators in various quarters. Here, we look at some endeavors that have already reached the stage of actually developing and using new indicators.

One of them is the green GDP. The green GDP is the GDP that incorporates environmental deterioration and consumption of natural resources into national accounting, and many countries devised their respective green GDP calculation methods. But the green GDP index is said to some deficiencies, such as the difficulty in accurately reflecting the depreciation of natural resources by consumption in monetary terms.

Another example is the "Genuine Savings" indicator developed by the World Bank. The genuine savings indicator is calculated by deducting consumption of fixed capital form gross national savings, adding current expenditure on education as an investment in human capital, and also deducting the value of depletion or reduction of natural resources and damages from carbon dioxide emissions, etc. Negative genuine savings, for example, mean an overall decline in wealth and suggest the current level of consumption cannot be sustained (Figure 5-4-7).

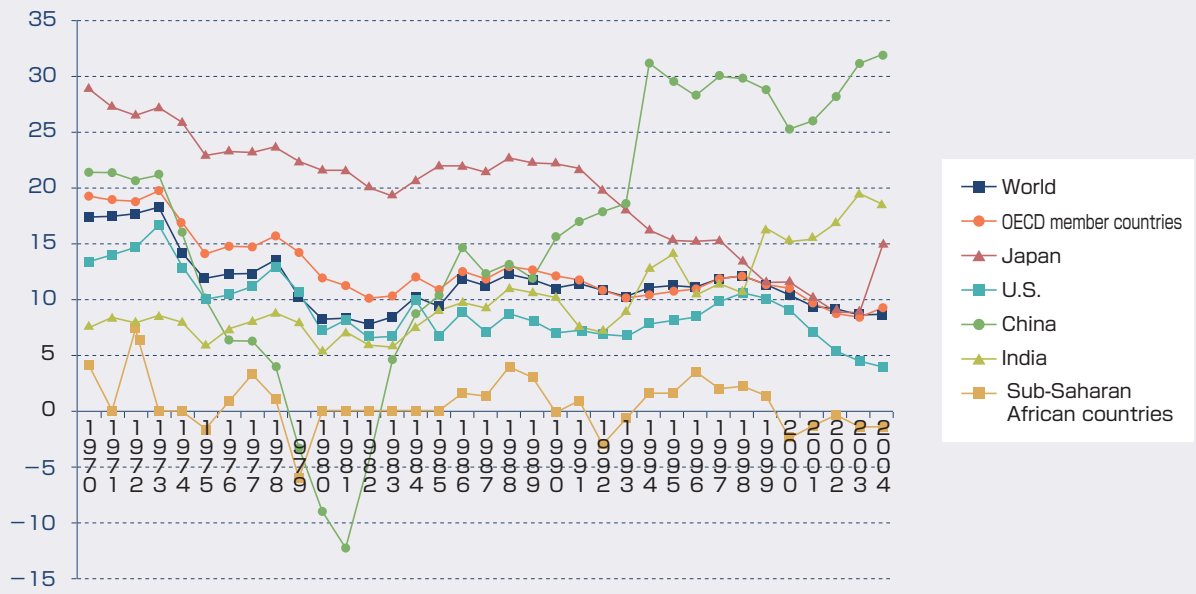
In Europe, OECD and Eurostat developed a group of indicators to assess sustainability in 2005 (revised in 2007) in line with the EU "Sustainable Development Strategy." For each of nine objectives under the Sustainability Development Strategy, the group of indicators systematically organizes various indicators at three levels in accordance with relevance and deep connections with the Strategy objectives. More specifically, sustainability is to be captured by 11 indicators at Level 1, 33 indicators at Level 2 and 78 indicators at Level 3 (Figure 5-4-2). According to a survey by the National Institute for Environmental Studies, at least 26 other countries and international organizations, etc. have developed their respective sustainable development indicators to measure development by sustainability (Table 5-4-3).

The human development index (HDI) announced by the U.N. Development Program (UNDP) is an indicator to show the quality of life and the degree of development. The HDI is calculated by taking into consideration the literacy rate, per-capita GDP and the average life expectancy, etc. When we use the HDI to assess the degree of development of industrialized countries, many countries obtain figures close to perfect score. This means that industrial nations have already achieved the level of development to be sought under the HDI. Given this, in measuring the state of development in industrial nations, it is necessary to establish indicators more commensurate with the conditions of industrial nations to measure the degree of their development. The HDI uses GDP, but it is conceivable to capture the state of development of industrial nations by incorporating the environmental conservation conditions in industrial nations by replacing GDP with GDP per emission of carbon dioxide. The recalculation with the above replacement result in big changes in the rankings, with Japan placed tenth in the HDI-based assessment moving up to sixth (Table 5-4-4).

In Bhutan, the gross national happiness (GNH) is used as the substitute indicator of progress. The GNH, first proposed by Bhutan in the 1980s as a better indicator to replace GDP, represents the principles to guide the country's development in a manner suitable for its unique culture and values. Since 2004, Bhutan is promoting the GNH actively, including the hosting of an international conference on the indicator. At any rate, Bhutan's initiative to measure a nation's richness not by the "economy" but by the "happiness" and set "how to enhance the happiness of the nation" as the state's policy objective deserves merit as a valuable attempt.

Above, we reviewed a variety of indicators, including sustainability indicators that exhaustively capture

Figure5-4-7 Genuine Savings by Country/Region



Source: Prepared by Ministry of the Environment based on materials provided by the World Bank

Column The Stiglitz Report

CMEPSP, with the problem consciousness that "existing indicators as represented by GDP may not be able to capture the actual state of the economic society," set up the three themes of "Classical GDP Issues," "Quality of Life" and "Sustainable Development and Environment" for consideration from the standpoint that it is necessary to have a method to measure both economic performance and social progress more appropriately. The Commission's report put together in September 2009 set forth the following recommendations on 12 elements that it believes are needed concerning a future indicator or a group of indicators.

1. Classical GDP Issues -From production to well-being

(1) When evaluating material well-being, look at measures of household income and consumption rather than GDP, a measure of production;
(2) When looking at household income and consumption to evaluate well-being, take account of taxes and other payments while household income and consumption should also reflect in-kind services provided by government, such as subsidized health care and educational services;
(3) Consider income and consumption jointly with wealth, as sustainability is measured by what is carried over into the future (physical, natural, human and social capital);
(4) Average income, consumption and wealth do not tell the whole story about living standards, as, for example, a rise in average income could be unequally shared across groups. Average measures of income, consumption and wealth should be accompanied by indicators that reflect their distribution;
(5) Broaden income measures to non-market activities, such as services produced in households;

2. Quality of life

(6) Quality of life depends on people's objective conditions and capabilities. Steps should be taken to improve measures of people's health, education, personal activities and environmental conditions. In particular, substantial effort should be devoted to developing and implementing robust, reliable measures of social connections, political voice, and insecurity that can be shown to predict life satisfaction;
(7) Quality-of-life indicators in all the dimensions covered should assess inequalities in a comprehensive way;
(8) The loss of quality of life of a person who is poor and also sick may far exceed the simple sum of the losses of quality of life of a person who is poor but healthy and a person who is sick but not poor. Thus, surveys should be designed to assess the links between various quality-of-life domains for each person, and this information should be used when designing policies in various fields;
(9) Statistical offices should provide the information needed to aggregate across quality-of-life dimensions, allowing the construction of different indexes;
(10) Measures of both objective and subjective well-being provide key information about people's quality of life. Statistical offices should incorporate questions to capture people's life evaluations, hedonic experiences and priorities in their own survey;

3. Sustainable development and the environment

(11) The assessment of sustainability is complementary to the question of current well-being, and must be examined separately. Sustainability assessment requires a well-identified dashboard of indicators that inform us about the change in quantities and qualities of natural resources, and of human, social and physical capital. A monetary index of sustainability has its place in such a dashboard but, under the current state of the art, it should remain essentially focused on economic aspects of sustainability; and
(12) The environmental aspects of sustainability deserve a separate follow-up based on a well-chosen set of physical indicators. In particular, there is a need for a clear indicator of our proximity to dangerous levels of environmental damage

changes in economic, environmental and social conditions, to supplement and replace GDP in capturing the progress in the new socioeconomic system and setting targets. It is hoped that Japan will also promote relevant research further and play an active role in international discussions.

Table5-4-2 List of Sustainable Development Indicators in Europe (Level 1)

Theme	Indicator (Level 1)
1: Socioeconomic development	Growth rate of real GDP per capita
2: Sustainable consumption and production	Resource productivity
3: Social inclusion	At-risk-of-poverty rate, by gender
4: Demographic changes	Employment rate of older workers
5: Public health	Healthy life years and life expectancy at birth, by gender
6: Climate change and energy	Greenhouse gas emissions
	Share of renewable in gross inland energy consumption
7: Sustainable transport	Energy consumption of transport relative to GDP
8: Natural resources	Wild bird index
	Fish catches taken from stocks outside safe biological limits
9: Global partnership	Official development assistance (ODA)

Source: Prepared by Ministry of the Environment based on Eurostat,2007 (http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-77-07-115/EN/KS-77-07-115-EN/PDF)

Table5-4-3 Major Sustainable Development Indicators Developed by Countries, International Organizations

Region/type	Countries/institutions, etc.	Number of indicators	Year of issuance
International institutions	UNCSD	58	2001
International institutions	UNDG	52	2003
Europe	Ireland	30	2002
Europe	Austria	52	2002
Europe	Denmark	101	2002
Europe	Germany	25	2002
Europe	Luxembourg	27	2002
Europe	Switzerland	163	2004
Europe	Czech Republic	24	2004
Europe	France	53	2004
Europe	U.K.	162	2004
Europe	Belgium	44	2005
Europe	Sweden	99	2006
Europe	Norway	18	2006
Europe	Finland	33	2006
Asia	Taiwan	42	2002
Asia	East Asia	71	2003
Asia	Thailand	39	2005
Asia	Hong Kong	27	2005
Latin America	Mexico	61	2000
Latin America	Latin America	38	2002
Latin America	Argentina	90	2006
North America	U.S.	39	2001
North America	Canada	8	2003
Oceania	New Zealand	62	2002
Oceania	Australia	110	2006

Source: Prepared by Ministry of the Environment based on data provided by the National Institute for Environmental Studies

Table5-4-4 Estimated Indicators Showing Development State of Developed Economies

HDI 2009 (2007)		
1	Norway	0.971
2	Australia	0.970
3	Iceland	0.969
4	Canada	0.966
5	Ireland	0.965
6	Netherlands	0.964
7	Sweden	0.963
8	France	0.961
9	Switzerland	0.960
10	Japan	0.960
11	Luxembourg	0.960
12	Finland	0.959
13	U.S.	0.956
14	Austria	0.955
15	Spain	0.955

HeDI 2007 (Human-environment Development Index)		
1	Sweden	0.888
2	Switzerland	0.888
3	Norway	0.852
4	Hong Kong (China)	0.785
5	Iceland	0.777
6	Japan	0.755
7	Denmark	0.740
8	Netherlands	0.704
9	U.K.	0.703
10	Austria	0.687
11	France	0.678
12	Singapore	0.676
13	Finland	0.675
14	Luxembourg	0.674
15	Germany	0.668

Source: Prepared by Ministry of the Environment based on UNDP, "Human Development Report 2009" ; IEA, "CO2 Emissions from Fuel Combustion 2009" ; and World Bank, "World Development Indicators 2009"

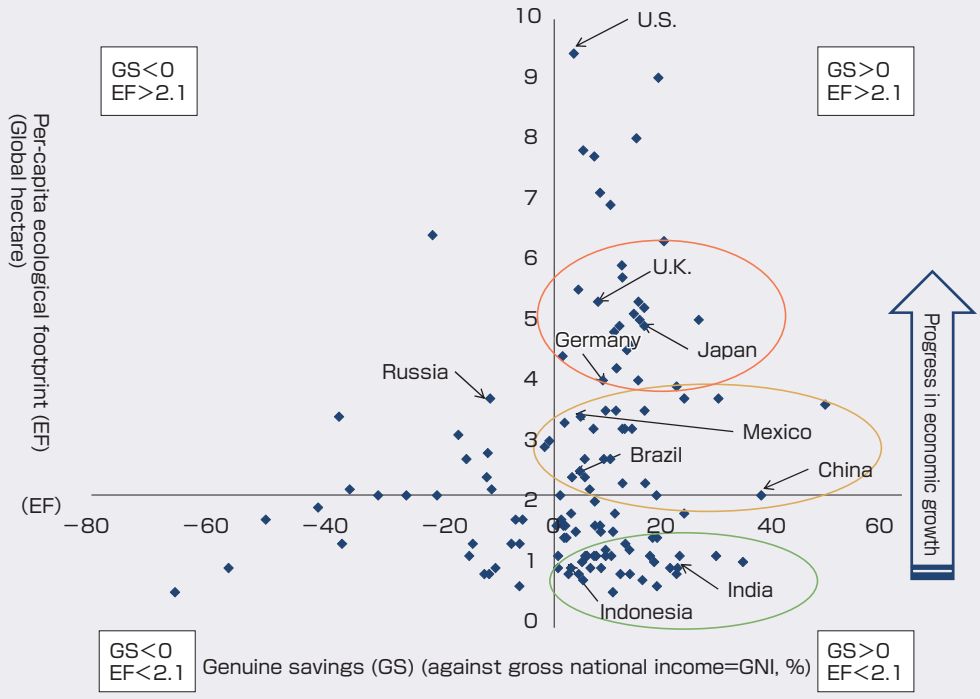
Column Assessment of Sustainability Using Multiple Indicators ~ Genuine Savings and Ecological Footprint ~

Besides genuine savings, there is another indicator to assess an economy's sustainability, called the ecological footprint. It measures the demand of human activities on the earth by the amount of land and sea area required to regenerate resources humans consume and to absorb and render harmless the corresponding wastes. By comparing the ecological footprint and the amount of biologically productive land and sea area needed to regenerate, or biocapacity (the earth's limited environmental capacity), we can capture whether our livelihood is in a sustainable condition more easily and sensuously.

In a research project commissioned by the Ministry of the Environment ("Policy Research on Environmental Economics, Masayuki Sato, Field Science Education and Research Center, Kyoto University, etc.), two indicators, genuine savings (against gross national income) and the ecological footprint, were used to make an analysis of sustainability of 128 countries. The research found that while many developed countries (encircled by the red line) and emerging economies with high growth, including Mexico, Brazil and China (encircled by the yellow line) have positive genuine savings figures, the ecological footprint exceeds the global biocapacity per capita in 2005 (about 2.1 global hectares; "global hectare" is the virtual unit set up to level differences in productivity between plots of land with the same area, with one global hectare equivalent to one hectare of land and sea area with the average biologically productive capacity), indicating that they are not necessarily in the sustainable state. In terms of sustainability, it is desirable that genuine savings figures are positive and the ecological footprint does not exceed the biocapacity (encircled by the green line). Countries in this category are mostly developing countries, which on the other hand are confronted with the problem of improving the basic quality of life. Japan is engaged in socioeconomic activities through trade with numerous countries. If some of those countries supporting Japan's socioeconomic activities are found to be countries whose sustainability is questioned with the high ecological footprint and negative genuine savings, it should be recognized that it is desirable for both Japan and those countries to take actions in consideration of the earth's sustainability.

As seen above, sustainability should be assessed comprehensively with the use of multiple indicators instead of a single indicator. Amid the progressing globalization of economic activities, it is also necessary to interpret the indicators in light of relationships among countries and make use of such interpretations in formulating environment policy going forward.

Sustainability Assessment in Terms of Genuine Savings and Ecological Footprint



Source: Ministry of the Environment, "Policy Research on Environmental Economics" (Masayuki Sato, Field Science Education and Research Center, Kyoto University, ect.)

Column Green Growth Declaration of OECD

In June 2009, the OECD Council Meeting at Ministerial level declared that OECD countries strengthen efforts to pursue green growth strategies and encourage green investment and sustainable management of natural resources. The ministers also expressed their resolve to make further efforts to use "efficient and effective climate policy mixes" and encourage "domestic policy reform," with the aim of avoiding or removing environmentally harmful policies that might thwart green growth, such as subsidies. Further, the Ministers invited OECD to "develop, as a horizontal project, a Green Growth Strategy in order to achieve economic recovery and environmentally and socially sustainable economic growth."

Declaration on Green Growth (Excerpt)

WE, THE MINISTERS REPRESENTING THE GOVERNMENTS of Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States and the European Community:

CONSIDERING that:

1. Economic recovery and environmentally and socially sustainable economic growth are key challenges that all countries are facing today ... Green growth will be relevant going beyond the current crisis, addressing urgent challenges including the fight against climate change and environmental degradation, enhancement of energy security, and the creation of new engines for economic growth. The crisis should not be used as an excuse to postpone crucial decisions for the future of our planet.
2. In order for countries to advance the move towards sustainable low-carbon economies, international co-operation will be crucial in areas such as the development and diffusion of clean technologies, for example carbon capture and storage, renewable energy technologies, and application of green ICT for raising energy efficiency, and the development of an international market for environmental goods and services …

DECLARE that we:

4. STRENGHTHEN our efforts to pursue green growth strategies … , acknowledging that "green" and "growth" can go hand-in-hand.
5. ENCOURAGE green investment and sustainable management of natural resources. In this respect, we are resolved to make further efforts to use efficient and effective climate policy mixes, including through market-based instruments, regulations and other policies … We will consider expanding incentives for green investment, in particular in areas where pricing carbon is unlikely to be enough to foster such private sector responses … Approaches to recognize the value of biodiversity should be encouraged … We are resolved to share information on green investment flows and policies, and best practices.
6. ENCOURAGE domestic policy reform, with the aim of avoiding or removing environmentally harmful policies that might thwart green growth, such as subsidies: to fossil fuel consumption or production that increase greenhouse gas emissions; that promote the unsustainable use of other scarce natural resources … We also work towards establishing appropriate regulations and policies to ensure clear and long-term price signals encouraging efficient environmental outcomes …
7. ENSURE close co-ordination of green growth measures with labor market and human capital formation policies …
8. STRENGTHEN international co-operation. In this respect:

8.1. We recognize that special efforts need to be made at the international level for co-operation on developing clean technology …, fostering market mechanisms, and augmenting, streamlining and accelerating financing and other support to developing countries in their fight against climate change and the loss of biodiversity, and support in their water management …

8.2. We are resolved to make every effort to reach an … international post-2012 climate agreement at COP15 in Copenhagen in December 2009, by which all countries will take measurable, reportable and verifiable nationally appropriate mitigation commitments or actions as well as adaptation actions …
…

INVITE the OECD to:

9. DEVELOP, as a horizontal project, a Green Growth Strategy in order to achieve economic recovery and environmentally and socially sustainable economic growth ... The Strategy will analyze green growth measures in OECD as well as in major non-member countries, ... An interim report on the progress should be delivered to the 2010 MCM.
…

(2) Toward realizing a new economic society that creates a virtuous circle for the environment and economy

As the latest global economic crisis encouraged countries around the world to introduce "green new deal policy," environmental measures, including environment-related investment, are now considered as the driving force for economic growth. In other words, expenditure for environmental measures is considered to lead to the creation of new demand for environmental improvements and energy-saving technologies and services. If the new market for such technologies and services is created ahead of other countries and Japan's environmental technologies are nurtured on that market, Japan should be able to establish comparative advantage on the environmental market where demand is expected to markedly increase globally, and Japan's environmental industry should grow into a strong export industry in the Japanese economy in the future.

These moves are spreading globally. The OECD Ministerial Council in June 2009 adopted the "Declaration on Green Growth." The declaration encouraged OECD to develop a Green Growth Strategy in order to achieve economic recovery and environmentally and socially sustainable economic growth. An interim report is scheduled to be submitted to the OECD Ministerial Council in 2010. Further, the APEC Economic Leaders' Meeting in November 2009 agreed to develop a comprehensive and medium- and long-term growth strategy, including "sustainable growth" compatible with the environment, including climate change and energy. The growth strategy's specific contents are set to be discussed at their meeting to be held in Japan in 2010.

As discussed in Chapter 2 and Chapter 3, it is required to make lifestyles, infrastructure development and the industrial structure low-carbon in order to reduce greenhouse gas emissions by 80% by 2050. Though the Japanese economy still remains in a difficult situation, it is deemed necessary for Japan to strive to create the environmental industry through innovation by actively investing in research and development at an early stage instead of putting environmental measures on the back-burner, and build a low-carbon society, thereby strengthening the Japanese economy's constitution and contributing to the global environment and sustainable growth of the world.

Conclusion

In Chapter 5, we addressed the need to develop the environmental industry as the driving force of the economic society. While Japan has the excellent technological strength at the highest global standards, including registered patents in the environmental field, this has not necessarily led to the full penetration of the global market or development of new products. As many other countries support their environmental industries with full force, Japan also needs to extensively support green innovation from the standpoint of national interests, including research and development, human resources development, matching between the needs and technological seeds, and development of social systems. Japan is most rapidly moving toward the aging society with falling birthrate. But there is no country with experiences Japan can learn from, and rather other countries watching what Japan will do. Given these circumstances, preliminary calculations of various indicators designed to comprehensively assess the development of the environment, society and economy suggest that these indicators reflect the set of values and outcomes of efforts of respective countries that have developed them.