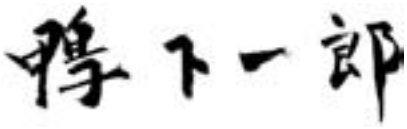
Annual Report on the Environment and
the Sound Material-Cycle Society in Japan 2008

Towards a Low Carbon Society and a Sound Material-Cycle Society

2008

Ministry of the Environment

Greetings



Kamoshita Ichiro
Minister of the Environment, Japan

With environmental issues at the top of its agenda, the G8 Hokkaido Toyako Summit is slated to take place in Japan this year. In regard to the global warming issue, the world is now undergoing an important transition, as evidenced by the Bali Action Plan (adopted at the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change in December last year), that aims at drastically reducing greenhouse gas emissions responsible for global warming. With the support of all major emitting countries, as well as the developing countries, the Bali Action Plan is gaining momentum and influence.

The international community is also making steady progress in dealing with the waste and resource issues. For example, the 3R Initiative proposed by Japan in 2004 has spread into many countries. Efforts to build a sound material-cycle society can be seen not only in developed countries but also in developing countries.

Japan, with the world's most advanced energy conservation technology and the experience of having overcome pollution and waste problems, must set an example for other countries as an environmentally progressive nation. As the chair of the G8 Hokkaido Toyako Summit, Japan must lead the world's discussions in this direction. However, Japan also has its own issues to resolve, including the increase in greenhouse gas emissions compared to the base year. With these issues in mind, Japan's Annual Report on the Environment and the Sound Material-Cycle Society of this year presents the initiatives taken by Japan and other countries in the world in their attempt to build a low carbon society and a sound material-cycle society.

To build a low carbon society, Japan must take the lead in not only fulfilling its Kyoto commitment of reducing greenhouse gas emissions by 6%, but also achieving further reduction of any significance. This would require Japan to make fundamental changes in the patterns of investment, production, and consumption with the participation of all actors that make up the society. Besides spearheading efforts to arrest global warming within the framework of international cooperation, Japan must also make an international contribution by sharing its experiences with the developing countries. For this reason, the report offers a broad introduction to world trends and initiatives taken by Japan to create a low carbon society as well as assistance measures that Japan has adopted to help developing countries.

Japan needs to build a sound material-cycle society based on the Second Fundamental Plan for Establishing a Sound Material-Cycle Society in concert with initiatives for building a low carbon society. All actors of the society, including the national and local governments, businesses, and citizens, shall work closely to accumulate experience and expertise and utilize them to build a stock-based society that cherishes quality and durability. From the perspective of revitalizing local communities, it is also important to establish sound material-cycle blocks. Furthermore, Japan needs to show the international community the way to create a global scale sound material-cycle society by utilizing Japan's experience to establish a sound material-cycle society in Asia. With this as a backdrop, the report takes a retrospective look at Japan's history in advancing towards a sound material-cycle society from the Edo Era and describes how Japan is utilizing its experience to assist developing countries through international cooperation.

This report is the Overview section of the Annual Report on the Environment and the Sound Material-Cycle Society in Japan 2008 approved by the Cabinet and submitted to the Diet of Japan on June 3, 2008. We would be happy if this publication could communicate to readers Japan's enthusiasm for environmental policies and measures and the initiatives it has taken.

Thank you.

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The World Has Reached a Turning Point in the Creation of a Low Carbon Society, and Japan's Efforts

Chapter 1

Countries Joining Forces to Tackle Global Warming

The Bali Action Plan and other agreements were concluded at the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change (hereinafter referred to as "UNFCCC"), held in Bali, Indonesia in December 2007. It was agreed upon by the global community to make efforts so that an agreement will be reached by the Conference of the Parties to be held in 2009 regarding global warming measures for 2013 and beyond, following the end of the Kyoto Protocol's first commitment period. The Bali Action Plan has especially an important meaning. It is the first step for countries in the world to work together in overcoming conflicting interests and in forging effective agreements to combat global warming.

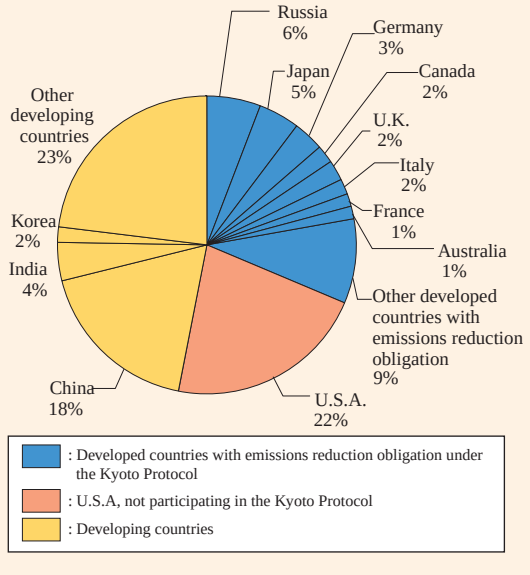
The Inter-governmental Panel on Climate Change (IPCC) predicts that the effects of global warming will bring many changes to the world's climate system and will have a tremendous impact on the future of humankind. As the chair of the G8 Summit, Japan will take up environmental issues, including global warming, as an important agenda item at the G8 Hokkaido Toyako Summit, slated for July this year. It needs to take the initiative in tackling global warming in line with the Bali Action Plan.

Section 1 Significance of the Bali Action Plan

In December 2007, the 13th Conference of the Parties to the UNFCCC and the 3rd Meeting of the Parties to the Kyoto Protocol (hereinafter referred to as "Bali Conference") were held in Bali, Indonesia, as the Kyoto Protocol's first commitment period (2008-2012) under the UNFCCC was about to start. It was also in the year 2007 that the IPCC confirmed with high confidence the serious impact of greenhouse gases (GHGs) on the global environment. According to the Fourth IPCC Assessment Report "Climate Change 2007," most of the increases in global average temperature observed in the second half of the 20th century are likely caused by the increase in GHGs resulting from human activities. This assessment had tremendous influence on deliberations at the Bali Conference.

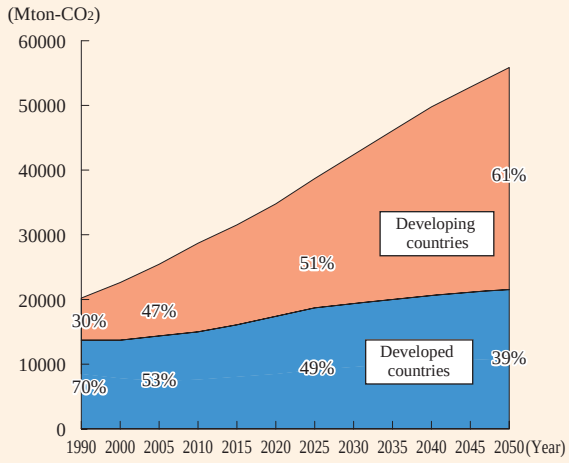
The Kyoto Protocol, which was adopted in 1997 and entered into force in 2005, was a groundbreaking achievement. It committed developed countries and countries in transition (hereinafter referred to as "Annex I countries") to GHG emissions reduction obligations. Based on the "principle of common but differentiated responsibilities and respective capabilities," it obliged Annex I countries

Figure 1-1-1 World CO_2 Emissions from Fuel Combustion



Source: IEA, *CO_2 Emissions from Fuel Combustion*, 2007

Figure 1-1-2 Projections of Future CO_2 Emissions



Source: Compiled by the Ministry of the Environment from the data of the United States Department of Energy

to take initiatives but did not go as far as to require non-Annex I countries to reduce emissions. Furthermore, since the United States, the world's largest single emitter, did not ratify the Protocol, the countries that have committed to emissions reduction under the Kyoto Protocol account for only about 30% of the world's overall emissions (Figure 1-1-1). The world has undergone and continues to undergo many changes since the adoption of the Kyoto Protocol in 1997. Developing countries, which do not have GHG emissions reduction obligations under the Kyoto Protocol, have experienced an increase in emissions because of economic growth. As their GHG emissions are expected to rise further in the future (Figure 1-1-2), to drastically reduce GHG emissions and avert dire consequences as called for by the IPCC and other concerned parties, it is critical that all major GHG emitting countries work together.

At the Bali Conference, the timeline, course of action, and agenda for the creation of a new international framework for 2013 and beyond (hereinafter referred to as "post-2013 framework") were discussed. The negotiation made little headway due to considerable differences in the opinions among nations. Developing countries had long held the position that developed countries were responsible for the increase in GHG emissions since the Industrial Revolution. They are strongly opposed to sharing the same responsibility as the developed countries, believing that it is the developed countries that must first be obliged to the emissions reduction. The United States, on the other hand, argued that participation of the developing countries in the framework would be crucial for it to be effective. Against this backdrop of differences in opinions among countries, Japan made clear its basic stance, which was based on its "Cool Earth 50" initiative, and proactively

Adoption of the Bali Action Plan

(Photo: Courtesy of the UNFCCC Secretariat)

mediated among the Parties for the post-2013 framework. Japan emphasized the need 1) to build consensus by 2009, and 2) to set up a new special working group under UNFCCC with the participation of all major GHG emitting countries and to continue collaboration and negotiation with special working groups under the Kyoto Protocol.

All parties hoping to iron out an agreement continued their efforts even after the sessions ended on December 14. On December 15, H.E. Susilo Bambang Yudhoyono, President of the Republic of Indonesia, and H.E. Mr. Ban Ki-Moon, Secretary General of the United Nations, attended the plenary meeting and appealed to the Parties to make concessions. The negotiations finally ended with the adoption of the Bali Action Plan that afternoon.

It was agreed upon in the Bali Action Plan that in order for all parties to the UNFCCC to participate in deliberations on a post-2013 framework, the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (hereinafter referred to as "AWGLCA") should be set up to work in conjunction with the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (hereinafter referred to as "AWG-KP") toward the adoption of a new framework by 2009. As the agreements are in line with the basic stance of Japan, we can compliment ourselves on having made a significant contribution to the adoption of the Bali Action Plan.

The AWG-KP adopted conclusions referring to some of the key findings of the IPCC Working Group III. The AWG-KP noted the following: IPCC pointed out that in order to stabilize atmospheric GHG concentrations at the lowest level presented in its scenarios, the global GHG emissions need to peak in the next 10-15 years and then be reduced drastically to well below half of 2000 levels by the middle of the 21st century. The AWG further recognized the following: IPCC pointed out that to achieve that level, Annex I parties as a group would be required to employ all possible means to reduce GHG emissions up to

25–40% of the 1990 levels by 2020. It was decided that by 2009, the same year when the AWGLCA presents the outcomes of its work, the AWG-KP should also come up with new emissions reduction targets for the Annex I countries for 2013 and beyond.

At the 3rd Meeting of the Parties to the Kyoto Protocol, a decision was made on an operating system for managing the "Adaptation Fund," including the establishment of the Executive Board of the Adaptation Fund. The Adaptation Fund is to be financed with 2% of the proceeds from clean development mechanism (CDM) projects. It was set up to support adaptation projects (measures to avert/reduce the unavoidable impacts of global warming) in developing countries.

These agreements aimed at seeking maximum protection from the impacts of global warming through the creation of an effective framework that will enable all countries with different positions and opinions to participate. Besides developed countries, such as Japan and the EU, that have already committed to emissions reduction under the Kyoto Protocol, the framework will include the United States, the biggest emitter that has not ratified the Kyoto Protocol; China and India that have seen a drastic increase in emissions in recent years; small island states that are concerned about the submersion of their countries under water; and African countries that are suffering from drought. As science has shed light on the fact that it will not be possible to arrest the progression of global warming without the developing countries also making effort to reduce emissions, the developing countries have started to take a more cooperative stance in accord with the UNFCCC principle of "common but differentiated responsibilities and respective capabilities" and under the condition of receiving assistance from developed countries. In this way, a new venue has become available for parties to the UNFCCC to discuss the emissions reduction target for 2013 and beyond and the means for achieving it. It can be said that global warming policies and measures worldwide have entered a new stage.

Section 2 The World Has Reached the Turning Point and the Days Ahead

1 The Road to the Bali Action Plan

(1) Actions Taken by the International Community in Tackling Global Warming Issues

A United Nations Conference on the Human Environment

The international community first took up discussion of environmental issues in 1972, at the United Nations Conference on the Human Environment (hereinafter referred to as "Stockholm Conference").

The conference was called for by Sweden, a developed country that had started to notice damages from pollutants such as acid rain, caused by soot and smoke emitted from coal fired power plants in far-away Western European countries. At the time, similar problems were also causing serious social issues in other developed countries. Since then, developed countries have taken note of the destruction of nature by pollution from industrialization and development, and their serious impacts on the global environment. On the other hand, developing countries also came to realize that underdevelopment and poverty were the most challenging issues to the human environment and that development of their countries offered the solution. This stance put the developing countries and the developed countries in direct opposition to each other. While the Stockholm Conference made the international community realize for the first time that environmental problems are indeed international problems, it also illustrated a deep divide in the handling of global environmental problems due to the income gap between the northern and southern hemispheres.

At that time in society, there was the idea that all elements on "Spacecraft Earth" (the earth was called as such then), including populations and resources, were interrelated in a complex and subtle way as one entity and that all countries should cooperate to protect it. It was with this kind of idea that the Declaration of the United Nations Conference on Human Environment (Stockholm Declaration) and the Action Plan for the Human Environment were adopted. These statements, however, included the widely divided assertions made by the developed and developing countries.

B Concept of "Sustainable Development"

The concept of "sustainable development," advocated by the Brundtland Commission in its final report "Our Common Future" in 1987, was an answer given to provide a framework that integrates environmental policies and development strategies. The concept of "development

that meets the needs of the present without compromising the ability of future generations to meet their own needs" has served as an important guidepost for global environmental conservation ever since.

This concept found its voice in the Rio Declaration on Environment and Development (Rio Declaration) and its comprehensive action plan adopted at the United Nations Conference on Environment and Development, also known as the "Earth Summit," in 1992, twenty years after the Stockholm Conference. Ten years later in 2002, the concept again emerged in the Johannesburg Plan of Implementation and the Johannesburg Declaration adopted at the World Summit on Sustainable Development.

C UNFCCC and the Kyoto Protocol

The first world conference on global warming issues was an international conference convened in Villach, Austria in 1985 to sort out scientific findings on climate change. Thanks to its statement calling for policymakers to start cooperating on policies to prevent global warming, a specific target for cutting GHG emissions by 20% of the 1986 level by the year 2005 was declared three years later (1988) at the Toronto Conference on the Changing Atmosphere (Toronto Conference).

The UNFCCC, an international framework designed to prevent the various adverse effects caused by global warming, was adopted in 1992 and came into force in 1994. Recognizing that the per-capita GHG emissions in developing countries is less than that in the developed countries, that the developed countries are responsible for most of the increase in the world's overall GHG emissions after the Industrial Revolution, and that there are differences among countries in their respective situations and capabilities for implementing global warming measures, the UNFCCC based on the basic principle of "common but differentiated responsibilities and respective capabilities" agreed that all parties, including developing countries, developed countries, countries of the former Soviet Union, and East European countries, take responsibility for implementing global warming measures at different levels. A total of 189 countries, including the United States, participate in the convention.

As the first step to achieve the objective of the UNFCCC, the Kyoto Protocol, which incorporated binding targets of GHG emissions reduction for developed countries, was adopted in the 3rd Conference of the Parties to the UNFCCC held in Kyoto, Japan in 1997. Since the United States refused to take part and international negotiations on operational details stalled, the Kyoto Protocol did not go into effect for quite a while.

In the meantime, Japan actively appealed to countries that had not ratified the Protocol, including the United States, and tenaciously continued international negotiations in order to put in place the conditions for the Protocol to enter into force. As a result, the Marrakesh Accords, which provided detailed operating regulations, were adopted in 2001, creating the environment for the ratification of the Protocol by various countries. After Russia decided to ratify the Protocol in 2004, the Kyoto Protocol entered into force in 2005.

(2) Future Challenges

As described above, in the thirty-some years since the Stockholm Conference in 1972, the international community has held many conferences to try to resolve global environmental issues. Numerous discussions have been held, covering differences dividing the northern and southern hemispheres. For example, in the discussion about a post-2013 framework at the 2002 Johannesburg Summit (attended by heads of States from 104 countries and representatives from over 190 countries), while the developed countries sought a framework that would require the participation of all countries, the Group of 77 (G77) and China (a group of developing states in the UN) were worried about missing out on their countries' opportunity for economic development and took an opposing stance, saying that until the developed countries could fully implement the Kyoto Protocol, they should not ask other countries for new commitments.

The difference in position and opinion also exists within the camps of the developed countries and the developing countries. Among the developed countries, there were debates on how to formulate a post-2013 framework, including methods to determine the national emissions targets and the base year. The developing countries, represented by the G77 and China, are made up of many groups; namely, emerging economies such as China, India, and Brazil; OPEC countries that export oil to developed countries and Arabian oil-producing countries; the Alliance of Small Island States (AOSIS) that are most vulnerable to the impacts (rise in sea level) of global warming; and African countries that have low GHG emissions but are most susceptible to the impacts of global warming. Thus, the groups advocated different claims based on their different positions. For example, the AOSIS, wary of the rise of the emerging economies, asserted that differentiated responsibilities among developing countries should be incorporated into the post-2013 framework.

The position and opinion held by different countries are becoming increasingly complicated. As a result, interna-

tional negotiations of global warming issues have also become extremely difficult. In order to reduce GHG emissions drastically on a global scale and find a solution to global warming issues, the post-2013 framework must have the participation of all major GHG emitting countries for it to be effective. To this end, developed countries must step up their efforts and developing countries, especially the emerging economies, must cooperate.

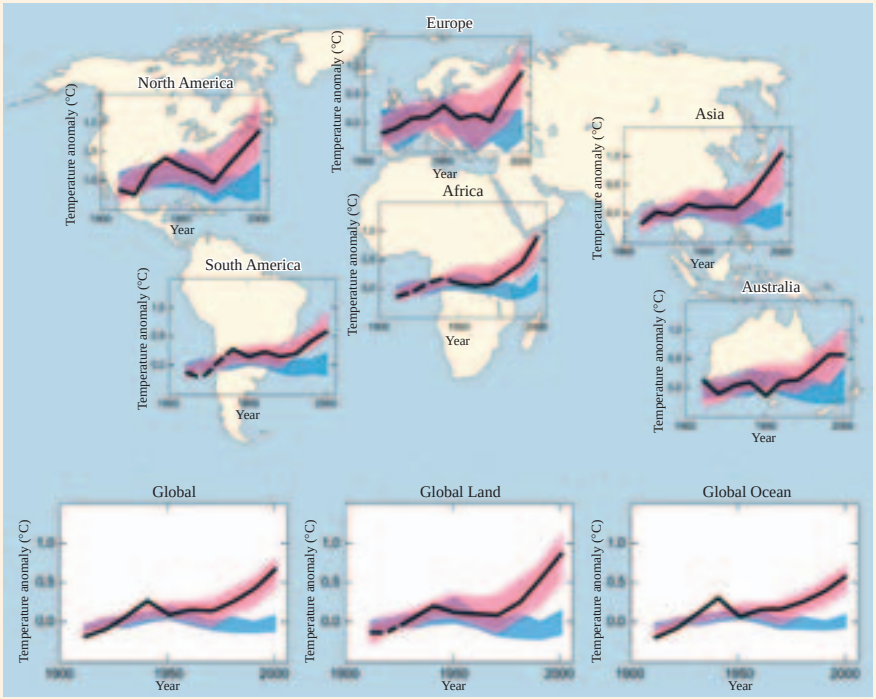
2 A Call for Immediate Action

The IPCC is an organization established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 to conduct comprehensive assessment of climate change resulting from human activities. It evaluates the impacts of climate change and recommends adaptation and mitigation measures from the scientific, technical, and socio-economic perspectives. Its assessment is widely used by policymakers and the public. So far, the IPCC has issued four assessment reports.

The IPCC First Assessment Report, published in 1990, declared that the continued emissions of anthropogenic GHGs into the atmosphere at the current rate might cause climate change that would seriously affect ecosystems and humankind. The 1995 Second Assessment Report pointed out that ample evidence suggested a discernible influence of human activities on the progression of global warming. The 2001 Third Assessment Report mentioned that findings in recent years showed that most phenomena related to global warming that were observed in the last fifty years were caused by human activities. As knowledge and data with greater accuracy are accumulated, the relationship between human activities and global warming has become ever more apparent.

Stating the following– “Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level,” “Anthropogenic greenhouse gas concentrations in the atmosphere now far exceed the levels

Figure1-2-1 Global and Continental Temperature Change



Note 1:
: Models using only natural radiative forcings
: Models using both natural and anthropogenic radiative forcings
: Observations (Lines are dashed where spatial coverage is less than 50%.)

Note 2: Comparison of observed changes in surface temperature for the period 1906-2005 (decadal averages) relative to the corresponding average for 1901-1950 with results simulated by climate models.

Note 3: Radiative forcing is a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism. The radiative forcing produced by increasing concentrations of greenhouse gases is a positive forcing of climate, tending to warm the surface.

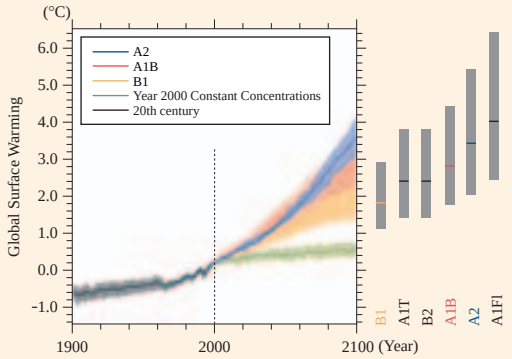
Source: *IPCC Fourth Assessment Report (AR4)*

before the Industrial Revolution," and "Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." – the 2007 Fourth Assessment Report could almost confirm scientifically that global warming is advancing and that it is caused by human activities. Figure 1-2-1 shows that natural causes such as solar activities and volcanoes alone are not enough to scientifically explain the rise in world temperatures that has taken place so far.

Among the simulations compiled by the IPCC to predict future climate change, even the most optimistic scenario (B1: a society that can balance environmental protection and economic development on a global scale) says it is inevitable that the average global temperature at the end of this century (2090~2099) will rise approximately 1.8˚C (1.1-2.9˚C) from the average seen at the end of the 20th century (1980-1999) (Figure 1-2-2) because the GHGs emitted in the past will not stabilize immediately and will remain in the atmosphere. The IPCC pointed out that mitigation measures alone, such as reducing GHG emissions, would not be able to avert the risk of climate change. Adaptation measures must also be taken to help alleviate the negative impacts of climate change, including the construction of protective walls against high tides, adjusting the sowing time for agricultural production, and appropriate water management such as efficient use of water.

The Fourth Assessment Report pointed out clearly the imminent risks of global warming. In order to avert the risks that might bring irreversible consequences, the world as a whole must take immediate, concrete, and effective measures based on a precautionary approach. Humankind is called to action, now!

Figure 1-2-2 Projections of Global Warming



Note: The Emission Scenarios of the IPCC Special Report on Emission Scenarios (SRES)

A1. The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil-intensive (A1FI), non-fossil energy sources (A1T) or a balance across all sources (A1B) (where balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end use technologies).

A2. The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing population. Economic development is primarily regionally oriented and per capita economic growth and technological change more fragmented and slower than other storylines.

B1. The B1 storyline and scenario family describes a convergent world with the same global population, that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives.

B2. The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population, at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.

An illustrative scenario was chosen for each of the six scenario groups A1B, A1FI, A1T, A2, B1 and B2. All should be considered equally sound.

The SRES scenarios do not include additional climate initiatives, which means that no scenarios are included that explicitly assume implementation of the United Nations Framework Convention on Climate Change or the emissions targets of the Kyoto Protocol.
Source: *IPCC Fourth Assessment Report (AR4)*

Column

Stop! Global Warming Children's Message Relay

Team Minus 6% is exhibiting panels related to the impact of global warming and hosting the "Stop! Global Warming Children's Message Relay" events that invite children to write messages about preventing global warming, at the environmental event forums and facilities held for children throughout Japan from February 2008 up until the beginning of July, just before the start of the G8 Hokkaido Toyako Summit. At these events, a "Red Globe," representing the earth with progressing global warming, is set up and is made to turn blue by attaching blue seals as messages (declarations) increase. As of May 7, 2008, there are messages from 4,086 children. The atmosphere of the Message Relay Campaign at each location can be seen on the Team Minus 6% website.

Children attaching blue seals on the "Red Globe"
(Photo: Ministry of the Environment)

3 Towards the Establishment of Low Carbon Society

At the Bali Conference, the Bali Action Plan and other agreements were made aimed at drawing up a new framework by 2009 for reducing greenhouse gases to succeed that of the current Kyoto Protocol. Discussions on the subject have already begun. Mountains of issues need to be resolved. All countries must cooperate to overcome their differences in opinion and position in order to tackle this global crisis.

(1) Japan's Prime Minister Fukuda's Special Address at the Davos Meeting

Every year, the World Economic Forum convenes its annual meeting at Davos, Switzerland (hereinafter referred to as "Davos Meeting"). At the January 2008 Davos Meeting, as the chair of the July 2008 G8 Hokkaido Toyako Summit, Prime Minister Fukuda gave a special address on global warming, which was selected as one of the Summit's major agenda items. The Prime Minister presented the concept "Cool Earth Promotion Programme" and the following three means to translate the concept into concrete actions:

1) Under the post-2013 framework, as the world's GHG emissions must peak (hit the highest level and then decrease) in the next ten to twenty years, the Prime Minister called on the United Nations to examine at the earliest possible time strategies and measures to halve this peak by 2050. To follow up on the agreements made at the Bali Conference, the Prime Minister said that Japan is resolved to work with major emitters to set quantified national emissions reduction targets to reduce GHG emissions in the future. To ensure that the reduction obligations are "fair and equitable," Japan proposed setting the target based on sectoral basis energy efficiency and reduction volume that would be achieved based on the technology to be in use in subsequent years to provide a scientific and transparent measurement (sectoral approach).
2) As for international environmental cooperation, the Prime Minister proposed setting up a common goal for the world to improve energy efficiency by 30%, cooperating actively with developing countries' efforts to reduce emissions, such as those to enhance energy efficiency, and creating a 10-billion dollar funding mechanism (Cool Earth Partnership) to extend assistance to developing countries suffering severe adverse impact as a result of climate change.
3) In terms of the development of innovative technologies that are vital to realizing drastic reduction of GHG emissions and facilitating the transition to a low carbon society, the Prime Minister disclosed that Japan would invest about 30 billion US dollars in the next five years for research and development in the areas of the environment and energy. He also said that Japan would conduct a fundamental review of its societal systems to facilitate its transition to a low carbon society.

(2) The Fourth G20 Dialogue

In March 2008, the Fourth Gleneagles Dialogue on Climate Change, Clean Energy and Sustainable Development (the so called "G20 Dialogue") was held in Chiba, Japan. This Dialogue was launched as a result of an agreement from the Gleneagles Summit held in the United Kingdom in 2005. The Fourth Dialogue was the last of the Dialogue series. Ministers and senior officials responsible for energy and environmental issues from the European Commission and 20 countries, including G8, emerging economies such as India and China, and other developing countries, participated in the Dialogue to discuss global warming issues. The 20 countries account for 80% of the world's GHG emissions. The ministerial level meeting, co-chaired by Ichiro Kamoshita, Minister of the Environment and Akira Amari, Minister of Economy, Trade and Industry, focused discussions on the issues of "Technology," "Finance and Investments", and "Post-2013 Framework." The meeting ended gaining political momentum and awareness among both developing and developed countries to cooperate in establishing an effective post-2013 framework. In accordance with the agreement from the Gleneagles Summit, the outcome of the G20 Dialogue will be reported at the G8 Hokkaido Toyako Summit to be held in July 2008.

(3) Toward the G8 Hokkaido Toyako Summit

Thanks to the adoption of the Bali Action Plan, the world has come to a consensus to start seeking solutions to global warming issues. Although differences in opinion and position among countries still exist, encouraging signs have emerged. For example, Australia, which had not ratified the Kyoto Protocol, agreed to do so at the Bali Conference.

The G8 Hokkaido Toyako Summit will be held in Japan this July. Continuing from last year, global warming will be one of the major agenda items. Japan has made prepa-

rations for the Summit, including a meeting of the G8 environmental ministers in Kobe this May and proposing the Kobe Initiative at the meeting*. Major developing countries will also attend the meeting. We must make a greater effort to resolve global warming issues by laying the groundwork for the developed countries to take the initiative to reduce emissions and to provide assistance to the developing countries to balance the environment and the economy and to countries threatened by the adverse impacts of global warming. Being the chair of the G8 Summit, Japan will take responsibility for establishing an environment conducive to the participation of all major GHG emitting countries.

* In addition to gaining extensive support for the Kobe Initiative, the meeting ended with G8 countries agreeing on the Kobe Call for Action for Biodiversity and the Kobe 3R Action Plan(Please see the appendixes).

Chapter 2
World Trends in the Creation of a Low Carbon Society

As we have seen in Chapter 1, global warming is threatening the very foundation of human existence. In the search for a solution to this problem, countries in the world found themselves at a tipping point in human history. They have started to make deep cuts in GHG emissions resulting from fossil fuel consumption, to keep the world's overall emissions at the same levels that can be absorbed by nature, and to create a truly affluent society. In other words, they have taken their first step towards the creation of a low carbon society. Our economic society, which was founded on material expansion, is now headed in a very different direction. This chapter examines how countries in the world are working towards the creation of a low carbon society, from the perspectives of a market-oriented economy and people's livelihoods.

Section 1 Global Warming and Market-oriented Economy

The Stern Review, published in the United Kingdom in 2006, gave a thorough analysis of the relationship between global warming measures and the economy. The report pointed out that climate change was the consequence of emitters' failing to pay the cost of GHG emissions and that change to the economic system is inevitable. It said that global warming has the characteristic of being "…global in its causes and consequences," and that recognition of the problem by the world and collective, cooperative measures will bring substantial economic benefits. The report also warned that if countermeasures were delayed, the cost would be tremendous. It underscored the importance of taking immediate action.

Today, as the world is gaining more awareness of global warming and other environmental problems, the framework of a sustainable society is gradually taking shape. Countries everywhere are making efforts to add economic values without imposing additional impact on the environment. Using a more proactive approach, some countries started to pursue activities aimed at creating a beneficial cycle between the environment and the economy. In other words, improving the environment can stimulate economic growth and revitalizing the economy can improve the environment. This section will explore such trends in the world.

1 Expansion of the Eco-business Market

(1) Growth of the Eco-business Market

In recent years, environment-related businesses are booming. According to an estimate by the Environmental Business International (EBI) in the United States, the global eco-business market was approximately 692 billion dollars in 2006. It has grown about 1.4 times in the decade since 1996 (Figure 2-1-3). Eco-business has a long history in the developed world (including the United States, Western Europe, and Japan), which makes up more than 80% of the market. Eco-businesses in these regions saw much growth in the 1980s, especially in the areas of air pollution, water treatment, and waste, due to the enactment of environmental laws and regulations. In recent years, while these areas have had only relatively moderate growth, areas in energy efficiency and renewable energy aiming at global warming mitigation have become the driving force of growth. Eco-businesses have also made inroads in developing countries, such as in Asia, to offset the growing environmental impact that accompanies the countries' economic growth. Their eco-business market is expected to grow at about 10% annually from now on. According to the EBI estimate, the world's eco-business market has grown 4.7% in 2006 and it will continue to expand in the future.

Based on the OECD environmental categories, the Ministry of the Environment conducts a survey of the sizes of the market and the workforce of eco-businesses in Japan. The result shows that the size of the eco-business

Column

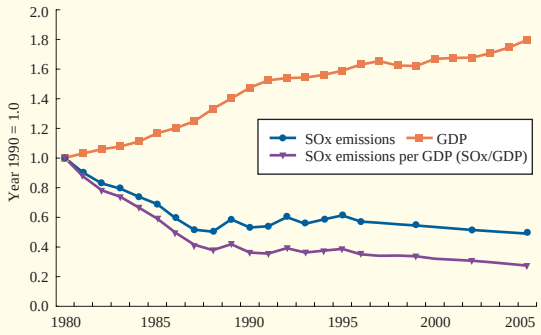
Towards a Society that Achieves the Decoupling of Economic Growth from Environmental Impact

The decoupling of economic growth from environmental impact is one of the main objectives of the OECD Environmental Strategy for the First Decade of the 21st Century, adopted at OECD Environment Ministers Meeting in 2001. "Decoupling" in the environmental field means the situation in which the rate that environmental impact increases is less than the rate of economic growth.

As an example of achieving decoupling, we can point out the relationship between economic growth and SOx emissions in Japan (Figure 2-1-1). In the past, to overcome terrible environmental pollutions and the two oil crises, Japan has promoted pollution control measures and has also pioneered the development and introduction of energy saving, high-efficiency manufacturing equipment. In the case of SOx emissions, Japan achieved a high level of decoupling among OECD countries as a result of the spread of advanced flue gas desulfurization equipment, promotion of low-sulfur fuel utilization, and improvement in efficiency of heat utilization.

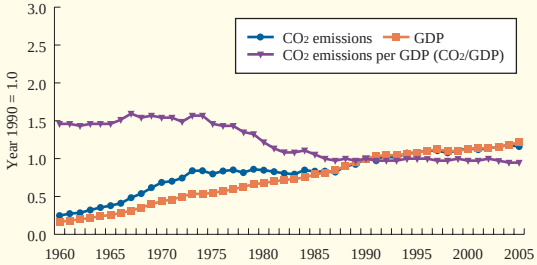
To create a low carbon society while ensuring compatibility between environmental conservation and economic development, it is necessary to transcend the system in which economic growth is always linked to increased fossil fuel consumption, by decoupling economic growth from CO_2 emissions. However, there has been no progress in this direction since the oil crises in the 1970s and 1980s (Figure 2-1-2).

Figure 2-1-1 Changes in SOx Emissions and GDP in Japan



Note 1: SOx emissions are those generated from soot and smoke emitting facilities provided for in the Air Pollution Control Law.
2: GDP = Real price (US$, 2000)
Source: Compiled by the Ministry of the Environment from the data of The World Bank, *World Development Indicator 2007; and the Ministry of the Environment, FY 2005 General Survey of the Emissions of Air Pollutants*

Figure 2-1-2 Changes in CO_2 emissions and GDP in Japan



Source: Compiled by the Ministry of the Environment from the data of IEA, *CO_2 Emissions from Fuel Combustion 2007*

market has grown from 30 trillion yen in 2000 to 45 trillion yen in 2006.

Growth of eco-businesses not only lowers environmental impact but also brings technological innovation, creates jobs, and enhances international competitiveness. Eco-businesses can add tremendous value to the economy. Eco-businesses are expected to continue to grow, connecting the environment with corporate values and profits and helping to realize a society that balances economy with the environment.

(2) Accelerating Development of Renewable Energy

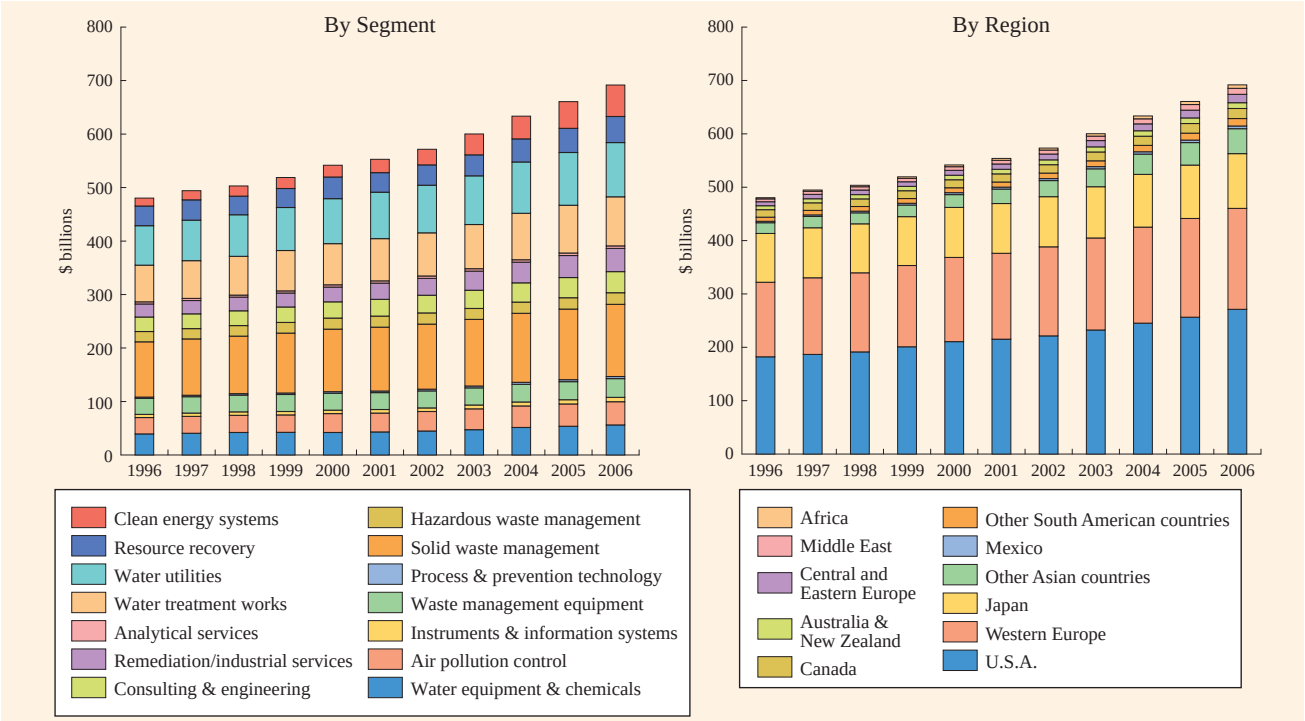
Next, let us look at the accelerating development of renewable energy in the world in recent years.

A Status on the Use of Renewable Energy

To reduce the emissions of carbon dioxide, we must wean ourselves of our dependence on fossil fuels and reexamine our energy sources. In recent years, countries worldwide have actively adopted policies to promote the introduction of renewable energies, accelerating their penetration and diffusion worldwide.

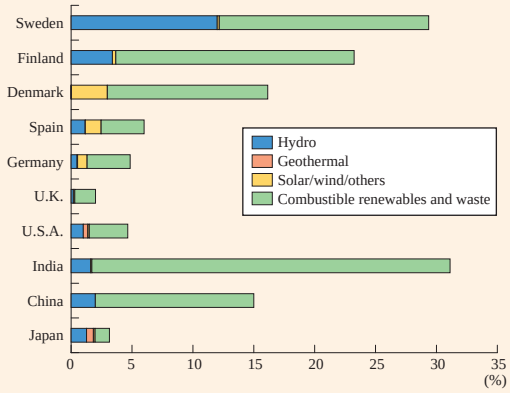
There is no uniform definition for renewable energy internationally. According to the International Energy Agency (IEA), renewable energy is energy resources that are incessantly replenished naturally. It includes energy generated from sunlight, wind, biomass, geothermal heat,

Figure 2-1-3 Trends in Global Environmental Business Market



Note: Environmental businesses are classified into 14 segments in accordance with the U.S. Standard Industrial Classifications (SIC).
Source: Compiled by the Ministry of the Environment from the material published by the Environmental Business International

Figure 2-1-4 Share of Renewables in the Primary Energy Supply (2005)



Source: Compiled by the Ministry of the Environment from the data of IEA, *Energy Balances of OECD Countries 2007, and Energy Balances of Non OECD Countries 2007*

water, and ocean resources.

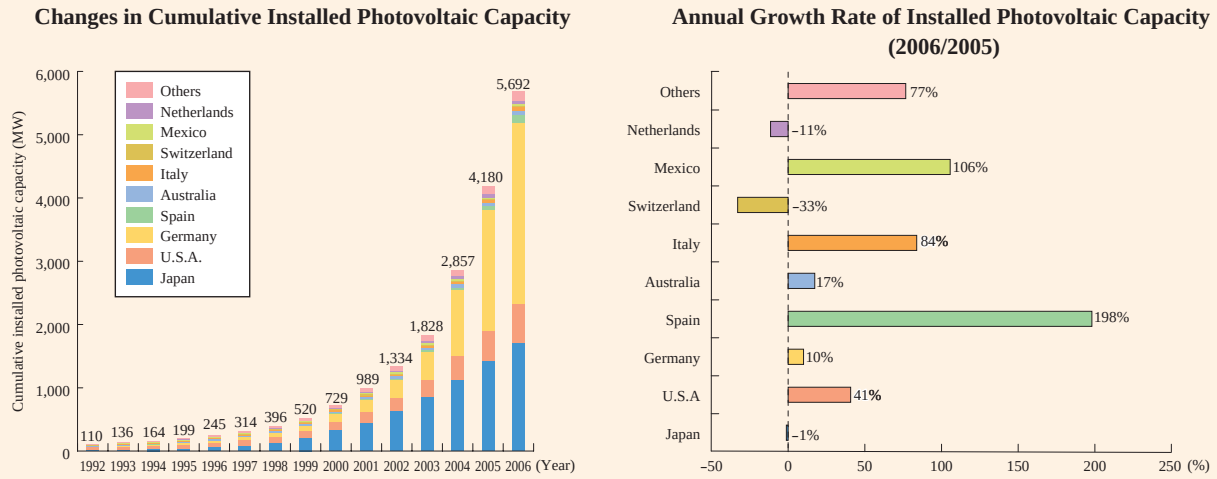
The volume of electricity generated using renewable energy increased in recent years. According to the IEA statistical data, use of wind power increased 24.8% and use of solar power increased 7.6% from 1990 to 2005. Although an across-the-board international comparison is difficult due to differences in the topography and natural environment of countries and the statistical methods they employ, the share of renewable energy in the primary energy supply of various countries in the 2005 IEA statistical data (Figure 2-1-4) shows a high percentage of hydraulic power use in Northern Europe and a high percentage of solar power and wind power use in Denmark, Germany, and Spain.

In solar power generation, Germany surpassed Japan as the No. 1 country in the world both in the cumulative installed photovoltaic (PV) capacity (Figure 2-1-5) and in the yearly installed PV capacity (Figure 2-1-6) in 2006 alone. The cumulative growth in installed PV capacity shows that in 2006, compared to the previous year, Japan had a decrease of 1% while Spain, Mexico, Italy, and the United States increased significantly by 198%, 106%, 84%, and 41% respectively, illustrating the accelerated use of PV power generation (Figure 2-1-5). In the production of PV cells, Japan has been the world's No. 1 producer since 1999. However, production in Japan in 2006 increased by only 11% compared to the previous year, whereas Europe had a substantial increase of 44% (in Germany 99%) and the United States 31%. Production of PV cells also increased drastically in China (203%), Taiwan (108%), and other Asian countries (Figure 2-1-7).

In terms of wind power generation, Germany was No. 1, Spain No. 2, and Japan No. 13 in the cumulative installed capacity as of 2006 (Figure 2-1-8).

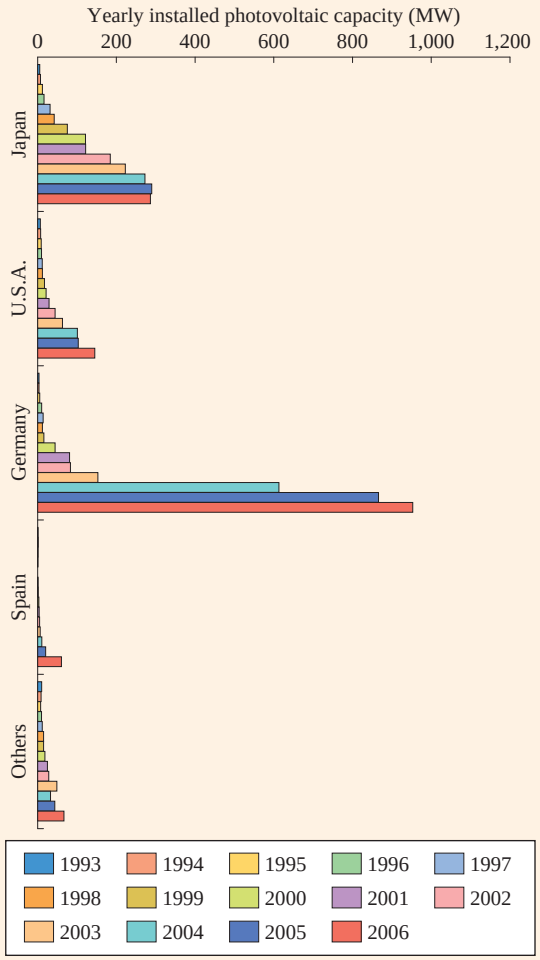
Each country has set installation targets and has stepped up policies to promote the development, introduction, and

Figure 2-1-5 Changes in Cumulative Installed Photovoltaic Capacity and Annual Growth Rate of Installed Photovoltaic Capacity (2006/2005)



Source: Compiled by the Ministry of the Environment from the data of IEA, *TRENDS IN PHOTOVOLTAIC APPLICATIONS Survey report of selected IEA countries between 1992 and 2006* (2007)

Figure 2-1-6 Yearly Installed Photovoltaic Capacity



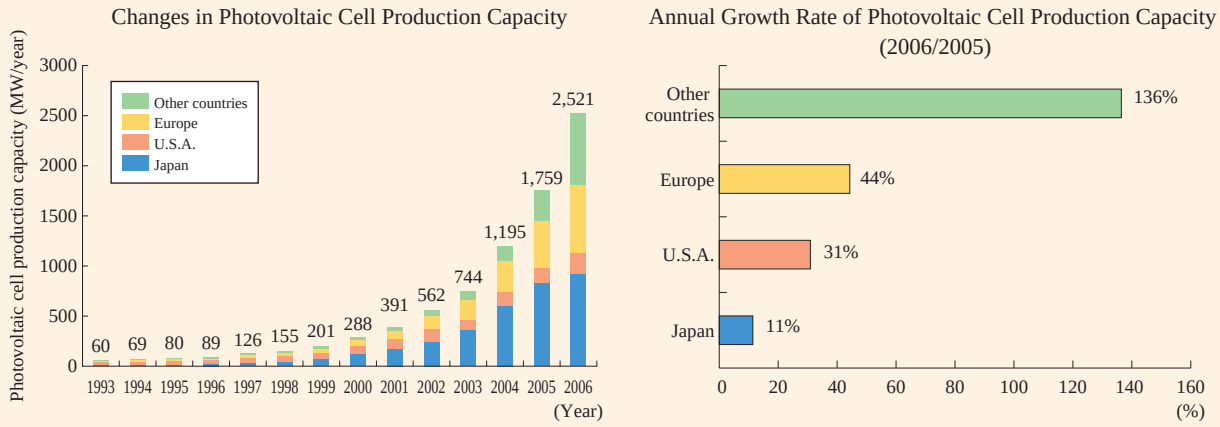
Source: Compiled by the Ministry of the Environment from the data of IEA, *TRENDS IN PHOTOVOLTAIC APPLICATIONS Survey report of selected IEA countries between 1992 and 2006* (2007)

***Planta Solar de Salamanca*, a large scale PV power generation facilities in Salamanca, Spain (facility area: approximately 360,000m^2)**
(Photo: courtesy of KYOCERA Corporation)

use of renewable energy.

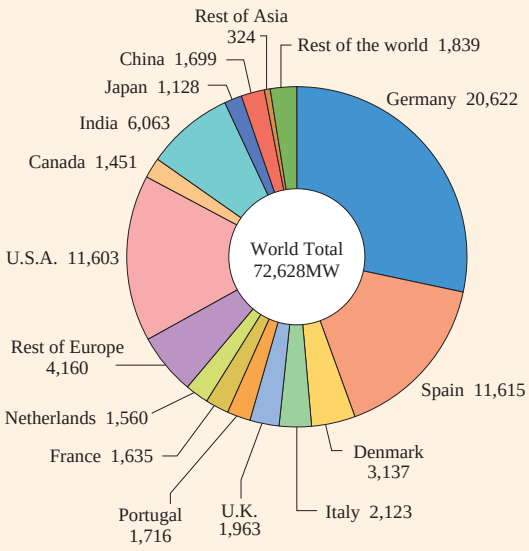
In the EU, the Directive on Electricity Production from Renewable Energy Sources (2001) set a target of using renewable energy to generate 21% of the electricity supply by 2010. Furthermore, the European Commission recommended in January 2008 to increase the percentage of renewable energy in energy consumption from 8.5% in 2005 to 20% by 2020, drawing immense interest to its future policy moves. The use of renewable energy is making inroads with mechanisms that place an obligation to introduce renewable energy. Germany, Spain, and Denmark adopted a feed-in tariff system that mandates utility companies to purchase electricity generated from renewable energy at a fixed price. The United Kingdom and Sweden adopted a Renewable Portfolio Standard (RPS) that places an obligation on electricity supply companies to produce a specified fraction or amount of their electricity from renewable energy sources.

Figure 2-1-7 Changes in and Annual Growth Rate of Photovoltaic Cell Production Capacity



Source: Compiled by the Ministry of the Environment from the data of IEA, *TRENDS IN PHOTOVOLTAIC APPLICATIONS Survey report of selected IEA countries between 1992 and 2006* (2007)

Figure 2-1-8 Installed Wind Power Capacity Worldwide (2006)



Source: Compiled by the Ministry of the Environment from the data of EurObserv'ER, *WIND ENERGY BAROMETER* (2007)

In the Kyoto Protocol Target Achievement Plan revised in March 2008, Japan set a target of increasing the use of new energy from 11.6 million kl (crude oil equivalent) (29.55 million tons of carbon dioxide equivalent) in FY 2005 to 15.6~19.1 million kl (38.0~47.3 million tons of carbon dioxide equivalent) in FY 2010. Besides providing assistance at various stages of the research and development, validation, and introduction of new energy, Japan also adopted measures to diffuse new energy. For example, utility companies are required to use a certain percentage of new energy in their electricity sales under the Law on Special Measures Regarding the Utilization of New Energy by Electricity Provider (Renewable Portfolio Standard Law, or RPS Law).

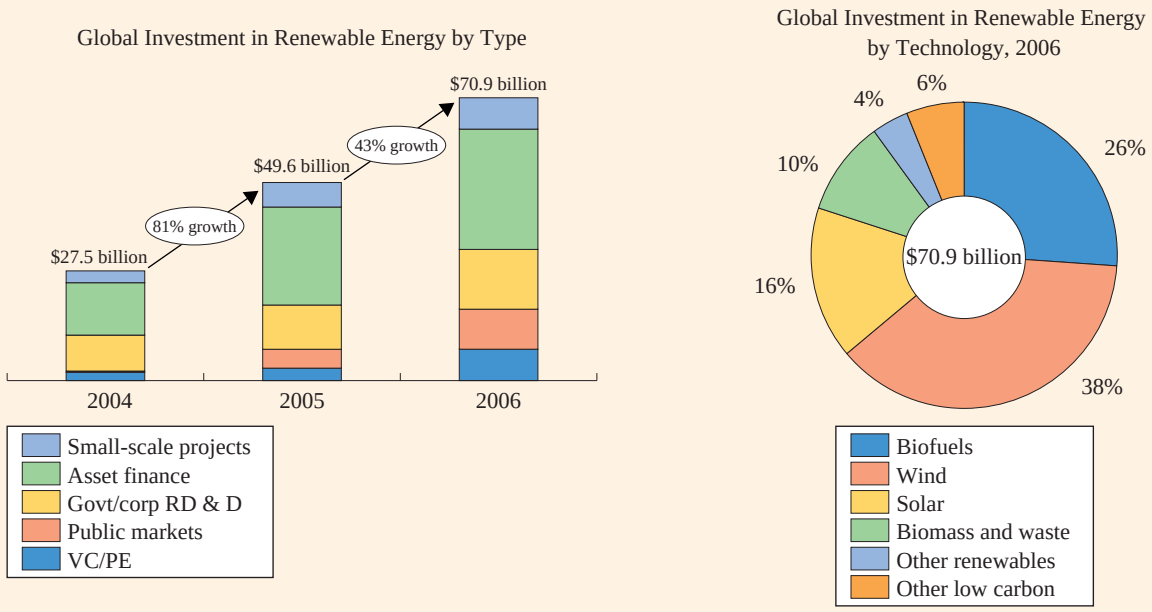
The World Energy Outlook 2007 issued by IEA predicts that the percentage of renewable energy in the world's electricity generation in 2030 will rise from 3,320 TWh (1 TWh = 1 billion kWh) in 2005 to 7,315 TWh in 2030, an increase of 2.2 times. The world has an increasingly greater expectation of renewable energy. Renewable energy sources will be adopted in various corners of the world at an increasingly faster pace in the future.

B Expansion of the Renewable Energy Market

Thanks to policies taken by the countries to support renewable energy and the increasing economic viability of renewable energy against the backdrop of rising oil prices, the world's renewable energy market has seen rapid growth in recent years. Various renewable energy-related businesses, from production to distribution and services, have sprung up.

According to "Global Trends in Sustainable Energy Investment 2007" issued by the United Nations Environment Programme (UNEP), investment in sustainable energy worldwide has become 71 billion dollars in 2006, an increase of 43% from the previous year (Figure 2-1-9). By region, most of the investment is in the developed countries but the amount of investment in the developing countries is also rising, from 15% in 2004 to 21% in 2006 (China accounts for 9% of the investment amount). By type, most of the investment is in wind power (38%), followed by biofuel (26%), and solar energy (16%) (Figure 2-1-9). IEA predicts that 40% of the investment in electricity will be for renewable energy in the next 25 years.

Figure 2-1-9 Changes in Global Investment in Renewable Energy by Type and Percentage of Global Investment by Technology



Note: Grossed-up values based on disclosed deals. The figures represent new investment only, and do not include PE buy-outs, acquisitions of renewable energy projects, nor investor exits made through Public Market/OTC offerings.
Source: SEFI, *New Energy Finance* (2007)

2 Construction of a System Using Economic Instruments and Its Progress

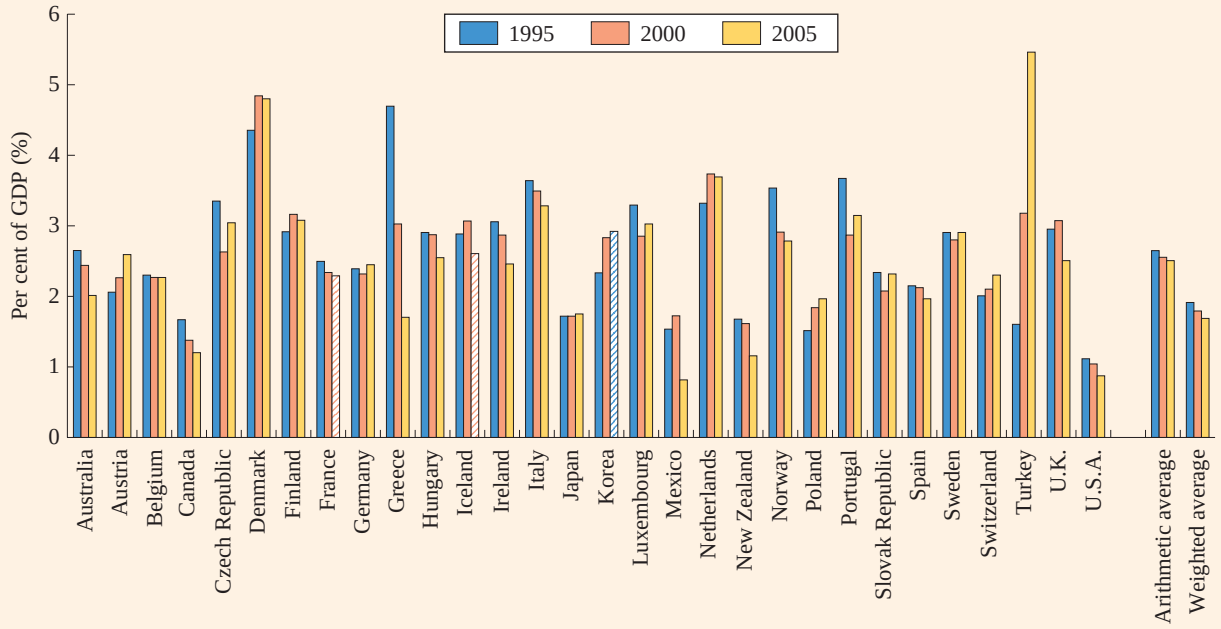
In order to achieve multiple policy objectives, including environmental protection and economic development, and to facilitate our transition to a low carbon society at the same time, we must reduce GHG emissions effectively and efficiently, using a policy mix that integrates and utilizes the characteristics of all measures, including voluntary, regulatory, economic, and informational approaches.

Of these approaches, the economic approach is premised on a market mechanism. It appeals to various actors with economic rationale to limit emissions, by providing them with economic incentives that use taxes and subsidies as instruments. The approach is believed to be effective also as an economic assistance measure for mitigating global warming. In implementation, it is important to apply the concept of policy mix to optimize the effect, minimize the burden on people, and control the administrative and financial costs. Financial assistance shall be administered with consideration to the costs and effects and the efficient utilization of budgets. This approach of utilizing the market mechanism is said to be one of the effective means to ensure the sustainability of socio-economic activities. In recent years, taxation and emission trading systems (to be explained later) have been adopted or reviewed by many countries in the world.

Japan and OECD countries all have environmental taxes. OECD defines “environmental taxes” as mandatory taxes levied by the government on environment-related items (including energy items such as gasoline, transportation items such as automobiles, waste, etc.) and paid unilaterally by taxpayers, no matter what the name, purpose, and usage of the taxes are, or whether the taxes are levied as an economic means for reducing GHG emissions. Environmental taxes in Japan are levied as gasoline excise, light oil delivery tax, automobile weight tax, and so on. According to OECD statistical data, in OECD countries the ratios of environmental tax to total tax revenue amounts in 2004 average 5.8% (6.4% in Japan) and revenues from environmental taxes account for 1.8% of the GDP (1.7% in Japan) (Figure 2-1-10).

As the impacts of global warming are felt worldwide, Japan has introduced taxes as measures to mitigate global warming, including taxes to promote biofuels, tax incentives for upgrading the energy efficiency of existing homes, preferential taxation to eco-friendly vehicles, exceptional treatment for fuel-economy cars in automobile acquisition tax, and a taxation system to encourage investment for reforming the energy supply-demand structure. The Kyoto Protocol Target Achievement Plan,

Figure 2-1-10 Revenues from Environmentally Related Taxes in Per Cent of GDP (1995, 2000, 2005)



Note: For France and Iceland, 2004 figures are used for 2005. For Korea, 2003 figures are used for 2005. The averages are calculated only across the countries for which 2005 numbers are available.
Source: OECD/EEA Database on Instruments Used in Environmental Policy

revised in March 2008, pointed out that environmental tax is an issue for which comprehensive studies must be seriously advanced. Since environmental tax would impose a burden on a wide range of citizens, efforts must be made to obtain the understanding and cooperation of citizens, companies, and other entities, taking into account the specific role of the tax in the context of overall climate change policies and measures, its effects, its impact on national economy and the international competitiveness of industry, as well as the current state of climate change policies and measures in foreign countries, etc..

In Europe, some taxes are levied on gasoline, coal, natural gas, and other fuels for purposes such as to limit carbon dioxide emissions that accompany consumption. For example, Finland introduced a carbon tax in 1990. It was the first country in the world to levy a tax according to the carbon content. Other Scandinavian countries (Sweden, Norway, and Denmark) have also adopted carbon tax by 1992. Germany reformed its environmental tax system in 1999. Besides raising the tax rate for mineral oils such as gasoline, it also introduced a new electricity tax. Since then, the mineral oil tax has been raised in phases as a measure to mitigate global warming. It was reorganized as energy tax in 2006 and coal was newly added as a tax item. Between 1993 and 1999, in 2003, and since 2006, the United Kingdom has raised the hydrocarbon oil tax rates levied on gasoline and other products in phases as a measure to tackle global warming. In 2001, it introduced a climate change tax to include coal for industrial use and other products as tax items. Currently, other countries and regions are in the process of adopting or reviewing the adoption of such taxes to curb the emissions of carbon dioxide and so on.

3 Development of the Emissions Trading Market

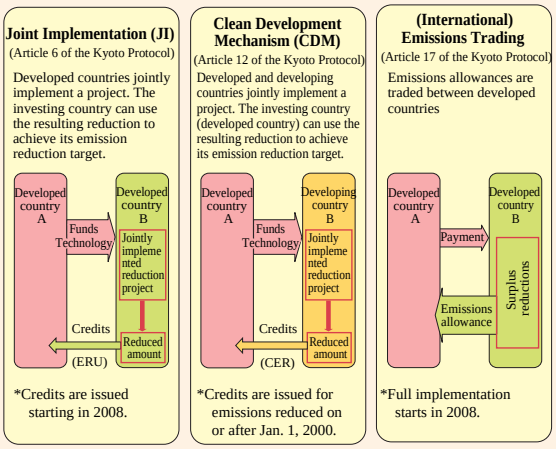
Similar to the environmental tax, emission trading is a price mechanism that enables the economic society as a whole to reduce GHG emissions with minimal cost. After the Kyoto Protocol entered into force in 2005, the Kyoto credit trading is gaining momentum and an emissions trading scheme, the EU Emissions Trading Scheme (EU-ETS), was launched in the EU. The international emissions trading market has grown substantially in recent years. According to a World Bank report, the emissions trading volume was about 3 billion tons (carbon dioxide equivalent) in 2007 and the trading value was 64 billion dollars, twice that of 2006 (Table 2-1-1). A new value,

Table 2-1-1 Carbon Market at a Glance, Volumes & Values

	2005		2006		2007	
	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)	Volume ($MtCO_2e$)	Value (MUS$)
Allowances						
EU ETS	321	7,908	1,104	24,436	2,061	50,097
New South Wales	6	59	20	225	25	224
Chicago Climate Exchange	1	3	10	38	23	72
UK ETS	0	1	na	na		
Sub total	328	7,971	1,134	24,699	2,109	50,394
Project-based transactions						
Primary CDM	341	2,417	537	5,804	551	7,426
Secondary CDM	10	221	25	445	240	5,451
JI	11	68	16	141	41	499
Other compliance & voluntary transactions	20	187	33	146	42	265
Sub total	382	2,893	611	6,536	874	13,641
Total	710	10,864	1,745	31,235	2,983	64,035

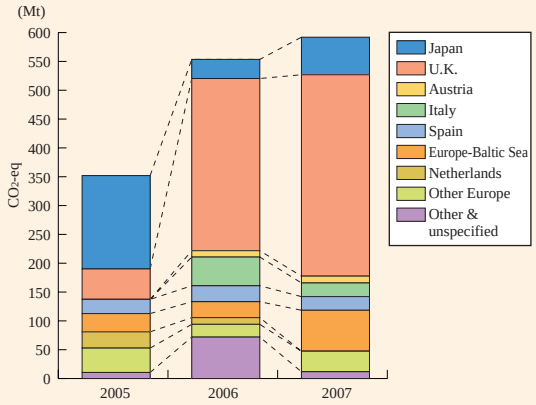
Source: The World Bank, *State and Trends of the Carbon Market* (2007, 2008)

Figure 2-1-11 Trends of Resource Productivity



Source: Ministry of the Environment

Figure 2-1-12 Primary CDM & JI Buyers (as shares of volumes purchased, vintages up to 2012)



Note: CDM here is the primary CDM.
Source: The World Bank, *State and Trends of the Carbon Market* (2008)

which is the amount of CO_2 reduction with a price tag, and a market for trading this value, are now taking shape worldwide.

(1) Current Emissions Trading Markets

The current emissions trading markets include the credit trading market based on the Kyoto Protocol's Kyoto Mechanism, the EU-ETS market, and markets based on various emissions trading systems that exist in different countries and regions.

A Emissions Trading Market under the Kyoto Mechanism

The Kyoto Mechanism is a market mechanism for achieving reduction commitments made by the developed countries that have ratified the Kyoto Protocol. It consists of three approaches: Clean Development Mechanism (CDM), Joint Implementation (JI), and international emissions trading (Figure 2-1-11).

The amount/credits that can be acquired/transferred under the Kyoto Mechanism are assigned amount units (AAUs) that were allocated initially to the Parties of the Kyoto Protocol, emission reduction units (ERUs) issued by JI, certified emission reductions (CERs) issued by CDM, and removal units (RMUs) gained through domestic carbon sink activities.

Currently, CER trading is the most active in the Kyoto Mechanism trading market, accounting for about 90% of all trading. The CDM market has two categories of trading: trading of primary CERs from emission reduction operations and trading of secondary CERs through resale or brokerage of primary CERs.

Japan and Europe purchase the majority of CERs

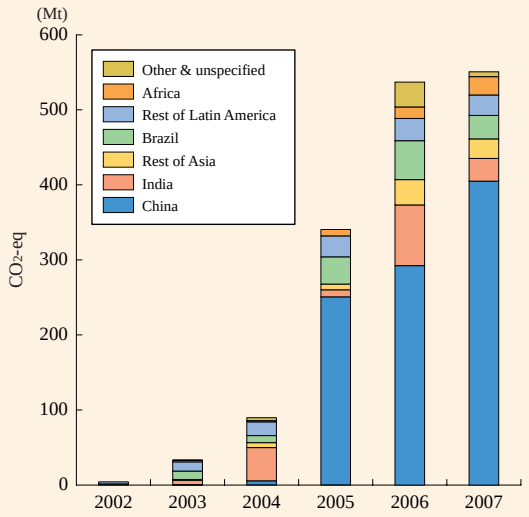
(Figure 2-1-12). The sellers include China, which accounts for 73% of the trading volume (2007), followed by India (6%), with Asia representing about 80% of the market (Figure 2-1-13). Among the registered CDM projects, biomass, hydraulic power, wind power and other renewable energy projects are on the rise (Figure 2-1-14).

B EU-ETS Market

For the EU, the GHG emission reduction target under the Kyoto Protocol is an 8% reduction from the 1990 level (some countries use 1995 as the base year for HFC, PFC, and SF_6). This target is to be achieved jointly by the 15 original EU Member States. EU-ETS is a multilateral emissions trading system for the entire EU region. It was introduced in January 2005 as a means for the EU to achieve the Kyoto Protocol target. Phase I (2005-2007) has ended and Phase II (2008-2012) has just begun (Table 2-1-2).

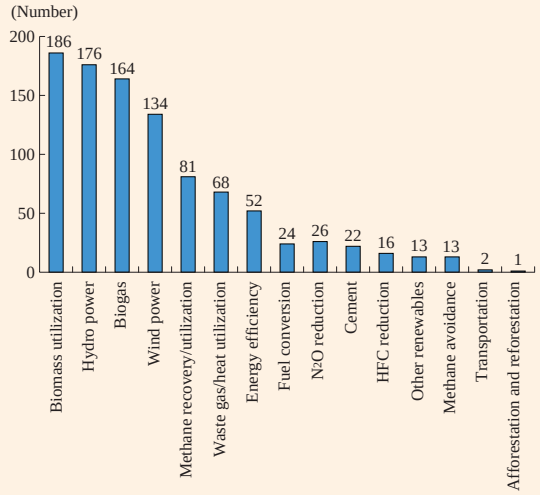
Phase I targeted energy-intensive installations such as power plants, oil refineries, iron mills, cement factories, and large-scale boilers (approximately 11,500 installations, accounting for 49% of carbon dioxide emissions in

Figure 2-1-13 Location of CDM Projects



Note: CDM here is the primary CDM.
Source: The World Bank, *State and Trends of the Carbon Market* (2008)

Figure 2-1-14 Number of Registered CDM Projects by Type



Note: CDM projects counted here are those registered by April 2, 2008 at the CDM Executive Board of the United Nations Framework Convention on Climate Change (UNFCCC).
Source: Compiled by the Ministry of the Environment from the data of The Institute for Global Environmental Strategies (IGES), *CDM Project Database*

Table 2-1-2 Overview of the EU Emissions Trading Scheme (EU-ETS)

	Phase I (2005-2007)	Phase II (2008-2012)
Targeted facilities	Facilities with emissions above certain levels in the industries of energy, iron and steel, cement, glasses, ceramics, and paper and pulp	Countries can expand the scope of facilities targeted
Targeted gases	CO_2	Countries can expand the scope of greenhouse gases targeted
Trading methods	Cap and trade scheme	
Upper limit on auctioning	5%	10%
Emissions allocated to countries	Less than 2005 level: 4 countries More than 2005 level: 23 countries (+8.3% in total compared with 2005)	Less than 2005 level: 16 countries More than 2005 level: 11 countries (-5.7% in total compared with 2005)
Non-compliance penalty	€40/t-CO_2	€100/t-CO_2
Linkage with Kyoto Mechanism	Linking to CER started in 2005	Linking to ERU to start in 2008
CDM/JI utilization	No limit (none accomplished)	Upper limit such as the maximum utilization of 20%

Source: Ministry of the Environment

2005 by the 25 EU Member States). The Member States formulated a national allocation plan (NAP) for assigned amount units. Upon approval by the European Unions' Executive Commission, the EU-Allowances were assigned to these installations. It is a mandatory system for limiting emissions (a so-called cap-and-trade approach). If the actual emission amount from an installation is below the allocated EU-Allowances, the installation can sell these allowances. Conversely, if the actual emission amount of an installation is expected to exceed the allocated EU-Allowances, the facility can reduce its emissions or purchase allowances. Since this system is linked to the Kyoto Mechanism, EU-ETS facilities can also use CERs or ERUs to meet the EU-ETS requirement.

It has been pointed out that allocation in Phase I was quite generous because consideration was given to ensure that the overall emission amount would meet the allocated amounts and that the system would be launched smoothly. For this reason, the EU-Allowances for Phase II have been reduced 5.7% from the actual emissions in 2005, forcing the installations to reduce emissions further.

In January 2008, the European Commission proposed to the European Parliament and the European Council a post-2013 framework to succeed Phase II. Currently, Member States mostly use the grandfathering method to allocate EU-Allowances to targeted installations based on their emissions in the past. The new framework will drastically increase the ratio of the auctioning method, allowing installations to purchase EU-Allowances according to their estimated emission amounts using open bidding. Discussions on institutional schemes to aid sectors facing severe international competition will continue.

C Emissions Trading Systems in Other Countries and Regions

The emissions trading system is also spreading to other countries. New Zealand has adopted an emissions trading system for the forest sector since 2008 and the system is expanding into other sectors. The governments of Australia and Canada have indicated the introduction of such system beginning in 2010. The US Congress has submitted multiple bills for regulating GHG emissions. One of the bills, which centered on the introduction of an emissions trading system, was approved by the Senate Environment and Public Works Committee in December 2007. Some states already have plans to launch such a system. The United States also has a voluntary emissions trading system. The Chicago Climate Exchange (CCX), launched in 2003, is led by the private sector. It has over 300 members, including electric power companies, manufacturing companies, and local governments.

(2) Examining Japan's Emissions Trading System

In FY 2005, Japan's Ministry of the Environment launched the Voluntary Emissions Trading Scheme (J-VETS) with a view to reducing GHGs cost-efficiently and steadily and accumulating knowledge and experience on a domestic emissions trading system. The scheme supports emissions reduction of businesses that reduce GHGs voluntarily and proactively, by providing subsidies for the installation of equipment to limit carbon dioxide emissions, such as improving energy efficiency, in exchange for the businesses' commitment to reduce a certain quantity of emissions. To facilitate achievement of the reduction commitment, this scheme uses a flexible measure that enables trading of the emission units. The first phase (started in FY 2005) ended in September 2007. Japan will review the results in order to enhance the scheme in the future by further expanding membership, diversifying methods of participation, and optimizing validation methods.

The Kyoto Protocol Target Achievement Plan pointed out that a domestic emission trading system should be reviewed in a comprehensive manner. In addition to the perspective of realizing the Government of Japan's medium-term strategies in relation to warming, the review should take into account the 2007 appraisal and verification outcome regarding the significant emissions reduction effect that can be realized from the "expansion and strengthening of voluntary action plans," which is the pillar of industry based countermeasures. The review should be carried out comprehensively, including the wide range of discussion points such as a comparison of the domestic emissions trading system with other methods and their effects, the impact on industrial activities and the national economy, international trends, etc., as well as the appropriateness of the introduction and the appraisal of specific proposals.

In January 2008, the Ministry of the Environment set up the Advisory Committee on the Emission Trading Scheme to review specific ways to design a domestic emissions trading system that can reflect the conditions in Japan. Taking into consideration mainly the emissions reduction after 2013, the Ministry of Economy, Trade and Industry also conducted an in-depth review of economic instruments, including the domestic emissions trading system, at the Study Group for Economic Instruments to Mitigate Global Warming. In the February 2008 meeting of the Council on the Global Warming Issue, which was made

up of well-informed individuals invited by Prime Minister Fukuda, domestic emissions trading system and environmental tax were the agenda items discussed.

(3) Future of the World's Emission Trading Markets

Worldwide, momentum is gathering for the establishment of an international emissions trading market. The EU-ETS is strengthening its ties with emissions trading systems in other countries and regions. Within Phase II, it formed an emissions trading market in conjunction with Norway, Iceland, and Liechtenstein, which are not inside the EU zone. In October 2007, the EU, ten US states, two Canadian provinces, New Zealand, and Norway gathered and launched the International Carbon Action Partnership (ICAP), which adopted a Political Declaration to review establishment of an international market for emissions trading. As more countries and regions are expected to adopt emissions trading systems in the future, we shall keep an eye on their development.

4 Expansion of the Carbon Offset Market

(1) Evolution of the Carbon Offset Market

In recent years, voluntary carbon offset activities are on the rise worldwide. Carbon offset refers to initiatives taken by various actors of the society, including citizens, businesses, NGOs/NPOs, local governments, and the national government, to find out the amounts of their own emissions and to take voluntary actions to reduce them. For emissions that are difficult to reduce, the actors may purchase credits of GHG emissions reduction/absorbed amounts realized at other locations or implement projects or activities to reduce/absorb emissions at other locations to compensate for all or part of their emissions that could not be reduced. Carbon offset activities are popular in the EU, including the U.K., the United States and Australia. Such activities have also made inroads into the private sector in Japan.

Besides credits used by the Kyoto Mechanism, carbon offset also has its own credit, known as Verified Emission Reduction (VER). According to a World Bank survey, the VER market has seen tremendous growth from 2006 to 2007. Compared to the previous year, the world's trading volume has reached 42 million tons (carbon dioxide equivalent) and the amount of trading about 270 million dollars.

Column

Examples of Carbon Offset

In recent years, goods and services utilizing the carbon offset system have been widely available in Japan, and the number of companies strategically commercializing the system is increasing.

The following are examples of such goods and services: a package delivery service for which the user bears part of the cost for CDM credit when purchasing products from specified mail-order companies; travel packages that absorb the cost to offset the CO_2 emitted during the tours through the use of the Green Power Certification System; Carbon Offset New Year's Greeting Cards that donated five yen from the sales price (55 yen) per card to support greenhouse gas reduction, such as through the purchase of CDM credit; leasing services with CO_2 credit for machine tools and vehicles; magazine subscriptions with CO_2 emission rights; and services that enable a company to offset the CO_2 emitted from its offices. With the rise in consumer awareness, the number of these types of goods and services is rapidly increasing.

Family enjoying the "CO_2 Emission-Free Tour"
(Photo: courtesy of JTB Kanto Corp.)

"Green Card" issued with the use of "The *Hikyaku* Express with CO_2 Emissions Credit"
(Photo: courtesy of Sagawa Express Co., Ltd.)

(2) Examining Carbon Offsets in Japan

The Ministry of the Environment launched a study group in September 2007 to study ways to implement carbon offsets and summarized its findings in a guideline "Guidelines for Carbon Offsetting in Japan" in February 2008. The guideline laid out basic principles for implementing carbon offsets, covering subjects such as methods for calculating emissions from carbon offset activities, carbon offset credits, and registration procedures, with a view to enhancing understanding of carbon offsets, building public trust in carbon offset activities, and establishing a foundation for promoting offset activities. In line with the guideline's principles, the Ministry expressed its intention to support and popularize carbon-offset activities, such as by establishing a carbon offsets forum to provide information and consultation services, in order to encourage voluntary emissions reduction activities by the actors that will make up a low carbon society.

5 New Development in the Financial Market

In this chapter so far, we have discussed expansion of the eco-business market and emissions trading market. Today, there is wide perception in the society that a business' response to environmental issues may affect its corporate value. At the same time, financial institutions, which provide funds to businesses, have developed greater interest in the environment.

The financial function, which facilitates economic activities, plays an important role in the creation of a low carbon society. More specifically, if the financial sector takes into consideration not only financial gains for its investment and financing decisions but also social values, such as benefits to the environment, it will change the monetary flow and bring forth immense changes to our economic society.

To promote environmentally conscious investment and financing, companies must make environmental information available to enable investors to make investment decisions from an environmental perspective. The environmental report is one of the tools companies use to disclose environmental information. In recent years, financial statement reports also began to include environmental information.

In view of these trends, we will present examples of environment being used as a criterion in investment and financing decisions.

(1) Socially Responsible Investment on the Rise

Socially responsible investment (SRI) refers to investment made not just from the financial perspective of profitability but also from the perspective of investing in businesses that take a proactive approach in tackling environmental and social issues.

SRI was begun in the 1920s by American churches, which excluded companies that were repugnant to their religious belief or ethical standards from their asset management. Such a selective investment approach, known as negative screening, screened out specific brands and businesses based on religious and ethical reasons. In the 1970s, riding the tide of civil rights and anti-war movements, shareholders actively demanded corporate social responsibility from the companies in which they invested, giving rise to the shareholder proposed SRI approach. Another type of SRI approach also emerged. It was a form of community investment aimed at boosting economic independence by providing low-interest loans to the poor to purchase housing and providing funds to small businesses. Since the 1990s, with the heightening interest in corporate social responsibility, the social activities of companies came under scrutiny and companies that scored high in their social contributions were selected as investment targets, popularizing the use of this social screening approach. Among the social screening approaches, positive screening is gaining wide acceptance today in western countries. It uses a specific standard to evaluate companies that excel in activities tackling social and environmental issues.

International organizations also appeal to investors to take the environment and society into consideration when making investment decisions. In 2006, the UNEP Financial Initiative (UNEP FI), in partnership with the UN Global Compact, issued the Principles for Responsible Investment (PRI), a standard for institutional investors to evaluate their investment. The objective of PRI is to reflect the factors–environment (E), society (S), and governance (G)–in the investment decision-making process of institutional investors worldwide. As of April 2008, 352 institutional investors and asset management organizations (including 13 organizations from Japan) have signed up. The assets managed by these signatories total approximately 13 trillion dollars. In the financing field, the Equator Principles have been adopted. They are a project-financing benchmark for the financial industry to ensure that large-scale projects are carried out with

consideration to the local community and natural environment. As of March 2008, 59 financial institutions in the world (including three institutions from Japan) have registered.

(2) Expansion of the SRI Market

A SRI Market in Western Countries

The scale of the SRI market is greatly different depending on how SRI is defined. Furthermore, each country has a different definition for socially responsible investment.

The scale of the SRI market in the United States, which has a long history of SRI, was approximately 2.7 trillion dollars in 2007 ("2007 Report on Socially Responsible Investing Trends in the United States" issued by the Social Investment Forum Foundation) and it has grown about 4.2 times in the last twelve years. Including only the ones using the environment as the screening standard, investment trusts for individuals totaled 44.5 billion dollars and funds managed by institutional investors accounted for 184 billion dollars. Institutional investors manage 90% of SRI in the United States. One characteristic is that pension funds account for most of the SRI.

In Europe, the SRI market has grown thanks to favorable legislative policies. For instance, in Netherlands, the Green Fund Scheme was adopted as a policy measure utilizing the financial function. It is a scheme in which government-approved green banks provide low-interest savings to individuals to gather funds and provide low-interest financing to environmental protection projects. In return, individuals who furnish the funds receive favorable tax treatment. In 2000, the British pension law was revised. The new law requires pension funds to disclose whether their investment principles have considered the social environment and ethics, as well as the level of consideration in their investment. As a result, the proportion of SRI assets in pension funds increased substantially.

In this way, pension funds in western countries, which manage large sums of assets and have a long-term investment horizon, have started to consider and place emphasis on the environmental efforts of the companies in which they invest their funds. There has been doubt in the past whether SRI can add social value to financial value in the investment while balancing the fiduciary duty of the pension funds to keep the benefits of the pensioners always as their highest priority. In recent years, however, opinions have emerged that favor investment activities made with consideration to the environment (E), society (S), and governance (G) as a means to optimize benefits for the pensioners.

B SRI Market in Japan

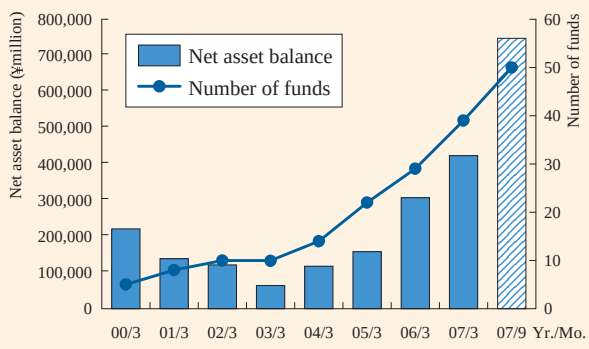
In response to the heightening awareness of environmental issues, Eco Fund was introduced in 1999 as one of the investment trust products, which marked the birth of SRI in Japan. The balance of open-type SRI investment trusts in Japan reached 747 billion yen as of the end of September 2007 (from "Japan SRI Annual Report" issued by the NPO Social Investment Forum Japan). Indeed, individual investors investing in investment trusts have been the motive force of Japan's SRI market (Figure 2-1-15). The recent trend in SRI investment trusts indicates that an open-type investment trust known as

Column

Carbon Disclosure Project

Measures against global warming have become a global issue and directly and indirectly impact the business performances of corporations. To understand how companies respond to and counteract the global warming problem, a non-profit organization together with progressive investors has conducted corporate surveys since 2002. This survey is known as the Carbon Disclosure Project (CDP). While only 221 companies answered the first questionnaire, with the increase in awareness of climate change and the support of investors, participation grew to 1300 companies worldwide for the fifth survey in 2007, including 76% of the 500 largest publicly traded companies in the world by market value (152 Japanese companies were among the 1300). Responses from these 500 firms indicated that although 79% view climate change as a business risk, even more (82%) view it as a business opportunity. Climate change brings physical risks such as loss of assets or delays of projects due to abnormal climate, and also brings regulatory risks such as strengthening of rules and regulations at national and international levels with the aim of GHG emissions reduction. On the other hand, climate change presents business opportunities, and an increasing number of companies view climate change positively, hoping to utilize it for their business benefits. In fact, the findings of the survey are used by 315 institutional investors worldwide (their total assets estimated at US$41 trillion) as practical investment information.

Figure 2-1-15 Changes in the Balance of Publicly-Offered SRI Investment Trust and the Number of Funds



Source: NPO Social Investment Forum Japan, *Japan SRI Annual Report* (2007)

Environmental Theme Fund, which invests in companies with superior environmental technology, has rapidly gained popularity due to higher awareness of global warming issues. Such funds financially support environmental technology and are expected to grow in the future.

The financial assets of individuals in Japan were approximately 1,500 trillion yen (FY 2006). Rather than making investment decisions solely based on financial returns, Japanese investors have begun to be more interested in finding out where and in what their money is being invested. More environmentally conscious financial products that can meet the heightened awareness of the Japanese people are expected to be developed.

(3) Linkage to Diversified Financial Instruments

Environmentally conscious investing and financing can be found not only in SRI but also in venture businesses and real estate development. For example, according to the United States Cleantech Venture Network, the number of investment cases in venture businesses of clean technology to reduce environmental impacts has doubled from 1999 to 2006 in the United States. It has grown into the No. 3 area in overall venture investment, following software and biotechnology.

Besides financial institutions such as banks, voluntary partnerships formed pursuant to the Civil Code can also collect funds from citizens and invest in or finance NPOs or community businesses engaging in environmental activities. Such community funds are attracting attention in recent years.

In the United States, under the Community Reinvestment Act (CRA), private financial institutions are required to make funds available to local communities. The Community Development Financial Institution (CDFI) also provides non-profit financing to local communities.

In Japan, small non-profit banks (the so-called NPO banks) have been established to provide funds to NPOs, citizen groups, and individuals engaging in activities for the local community, welfare, and protection of the environment. Social project funds that gather small investment from citizens to finance specific social projects have also been established in recent years. Such community funds are expected to provide a new flow of capital for community development, including environmental protection, in the future.

Wind turbines constructed by a Citizen's Fund (Left: "*Kazami*" in Asahi City, Chiba Prefecture; right: "*Tenpumaru*" in Katagami City, Akita Prefecture)
(Photo: courtesy of Natural Energy Citizen's Fund Corp.)

Section 2 Global Warming and People's Daily Lives in the World

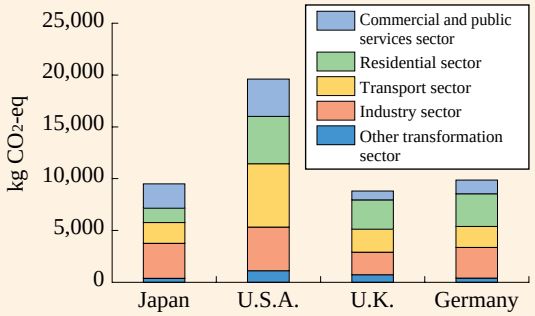
Our daily lives, which consume fossil fuel that causes global warming, exert an impact on the global environment. In order to build a low carbon society, we must give up our energy-intensive way of living and adopt a lifestyle that cherishes energy resources.

1 Residential Energy Consumption in the World

Energy is the foundation of socio-economic activities in every country and it is indispensable in people's daily lives. To mitigate global warming, we need to limit carbon dioxide emissions from energy consumption. In comparing the per-capita carbon dioxide emissions in 2005 of the United States, Germany, the United Kingdom, and Japan, the United States had double the emissions of Japan, especially in the transportation sector, which accounted for 31% of the total emissions. This percentage was extremely high, compared to 25% in the United Kingdom, 21% in Japan, and 20% in Germany. The industrial sector in Japan accounted for a high percentage of 36%, compared to 30% in Germany, 25% in the United Kingdom, and 21% in the United States. On the other hand, the residential sector was low (14%) in Japan, compared with 32% in Germany, 32% in the United Kingdom, and 23% in the United States (Figure 2-2-1).

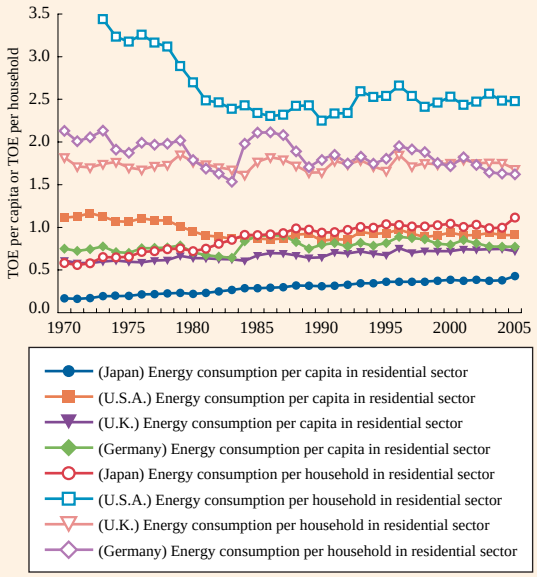
Changes in residential energy consumption per capita and per household (Figure 2-2-2) indicate that energy consumption in Japan, both in terms of per capita and per household, is lower than in other countries. The 2005 per-household energy consumption in Japan was 1.1 TOE (tonnage of oil equivalent), which was relatively low compared to the United Kingdom (1.7 TOE), Germany (1.6 TOE), and the United States (2.5 TOE). We can say that energy consumption per capita in the United States is equivalent to the energy consumption per household in Japan. However, the energy consumption trend in Japan is characterized by a long-term rise. It is important to put a stop to the increase and shift energy consumption to a downward trend.

Figure 2-2-1 International Comparison of Per Capita CO2 Emissions (2005)



Note 1: CO_2 emissions are those allocated to final consuming sectors in proportion to the electricity and heat consumed.
2: IEA allocates emissions to the combined residential/commercial and public services sector as above. The ratio of emissions between the two sectors was estimated to be the same as those before the allocation.
Source: Compiled by the Ministry of the Environment from the data of IEA, *CO_2 Emissions from Fuel Combustion 2007*

Figure 2-2-2 Changes in Residential Energy Consumptions per Capita and per Household in Selected Countries



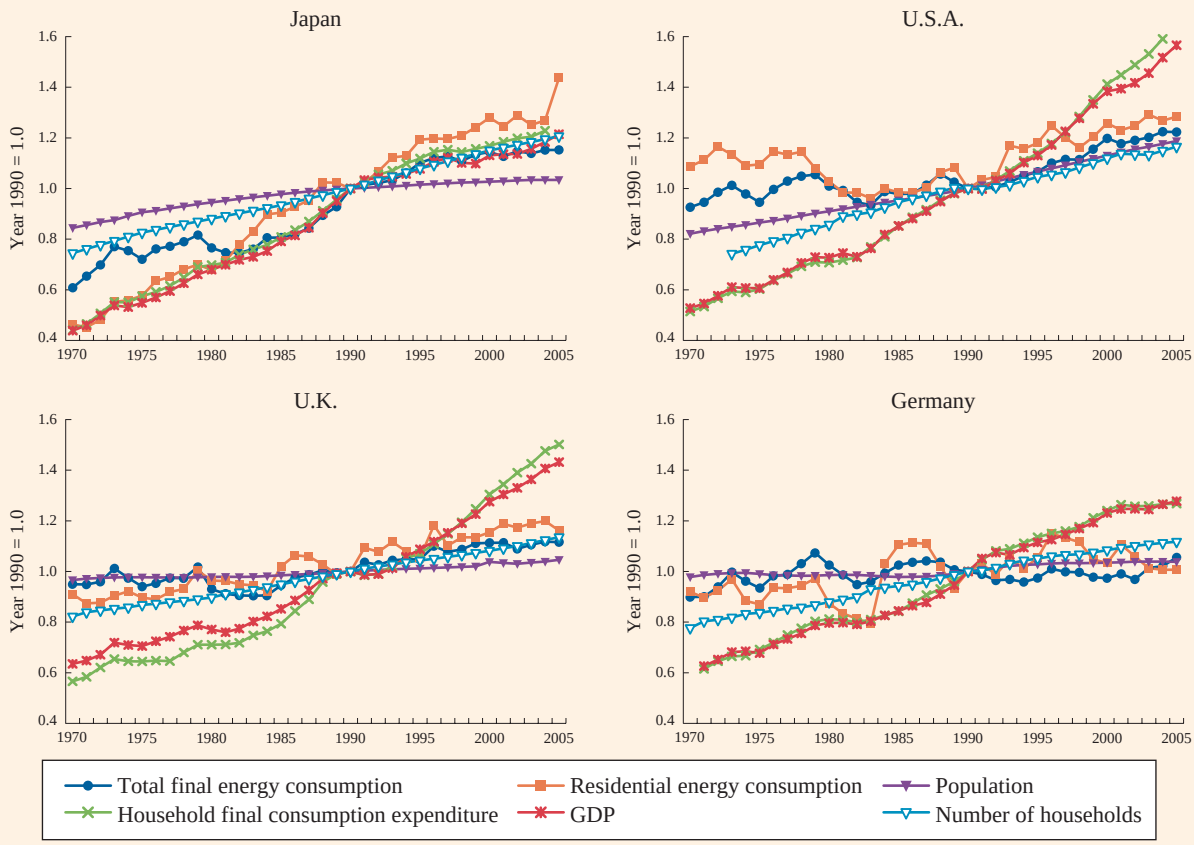
Note 1: Population data is taken from The World Bank, *World Development Indicator 2007*; and the number of households is taken from population census data of each country.
2: TOE = ton of oil equivalent, 1 TOE=10^7 kcal
Source: Compiled by the Ministry of the Environment from the data of IEA, *Energy Balances of OECD Countries 2007*; The World Bank, *World Development Indicator 2007*; and others.

2 Changes in Residential Energy Consumption

Next, let us look at the changes in residential energy consumption. The residential energy consumption in Japan increased substantially from 17,619 KTOE (kilotonne of oil equivalent) in 1970 to 38,123 KTOE in 1990, and to 54,743 KTOE in 2005. The 2005 energy consumption was 3.1 times that of 1970 and 1.4 times that of 1990. Using 1990 as the base year (1.00), Figure 2-2-3 shows the changes in residential energy consumption and changes in related indexes. The figure shows that the 2005 residential energy consumption in Japan has increased 44% from the base year; its percentage increase is especially high, compared to the other three countries (28% increase in the United States, 16% increase in the United Kingdom, and 0.7% increase in Germany). The final energy consumption of Japan has been on the rise consistently. The rate of increase in residential energy consumption has, however, surpassed the rate of increase in final energy consumption (in 2005, 15% increase from the base year) since 1982. In tandem with growth in GDP, household consumption expenditure has also increased. However, the rate of increase in residential energy consumption in Japan has also surpassed the rates of increase in such economic indexes. The population in Japan has started to drop beginning in 2005 but the number of households continues to rise. The year 2005 had a 21% increase, which was greater than the increases in the other three countries (17% increase in the United States, 14% increase in the United Kingdom, and 12% increase in Germany).

These data show that residential energy consumption in Japan has increased drastically due to (1) increase in per-household energy demand (increase in per-household energy intensity) for convenience and amenity as well as (2) increase in the number of households. The number of

Figure 2-2-3 Changes in Residential Energy Consumption and Related Indicators in Selected Countries



Note 1: Data on Population and household consumption expenditure are taken from The World Bank, *World Development Indicator 2007*.
2: The numbers of households are taken from population census data of each country. As for Japan, the numbers of households for 1970 and every 5 years after that are taken from population census, and those for other years are estimated by the Ministry of the Environment.
3: GDP and household final consumption expenditure are in real price (US$, 2000).

Source: Compiled by the Ministry of the Environment from the data of IEA, *Energy Balances of OECD Countries 2007*; The World Bank, *World Development Indicator 2007*; and others.

households in Japan is projected to peak in 2015 and then decreases; the upward trend in the number of households is estimated to continue until then ("Household Projections for Japan" issued by the National Institute of Population and Social Security Research in March 2008). As the number of households will continue to rise for some time, we must reduce the energy consumption per household in order to limit residential energy consumption.

Let us look at the other three countries. In the United Kingdom, the final energy consumption increased slightly (12%) and the residential energy consumption has increased 16% from the base year. However, compared to the rates of increase in economic indexes such as the GDP (43% increase) and household spending expenditure (50% increase), the rate of increase in energy consumption is relatively small.

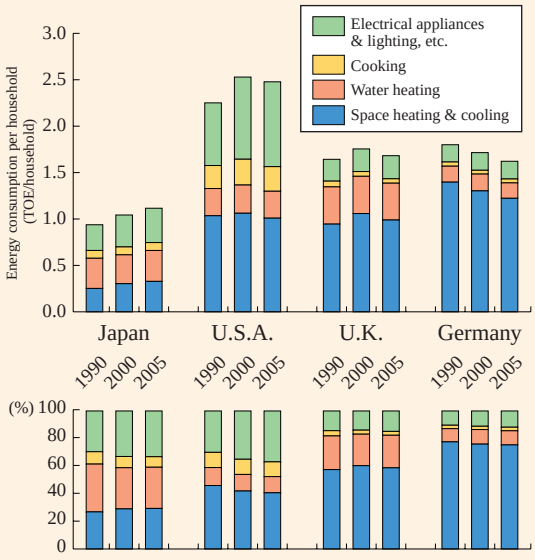
In Germany, the residential energy consumption in recent years is approaching the level of the base year.

In the 1980s in the United States, along with the annual increase of 0.16% in the final energy consumption, the residential energy consumption also increased at a similar rate. This is due to the fact that the high cost of energy resulting from the oil crises kept fuel consumption, mainly petroleum, at a steady level, and that the per-household energy intensity improved. However, lower oil prices and brisk economic growth in the 1990s greatly boosted the energy use including the residential energy consumption.

3 Residential Energy Consumption Based on Different Usages .....

The composition of residential energy consumption in the world differs depending on climate, living standard, lifestyle, and culture. Here, we review measures taken by different countries to improve the per-household energy intensity, with focus on the usages of energy in household.

Figure 2-2-4 Changes in Per-Household Energy Consumption by Usage in Selected Countries



Note: Electrical appliances & lighting, etc.: TV sets, refrigerators, personal computers, etc.
Cooking: heat sources for cooking, etc.
Water heating: bath, shower, etc.
Space heating & cooling: air-conditioners, heaters, etc.

Source: Compiled by the Ministry of the Environment from the data of Enerdata, *Odyssee Database* (March, 2008); IEA, *Energy Balances of OECD Countries 2007*; US-EIA, *Annual Energy Outlook 2004*; The Institute of Energy Economics, Japan, *2008 EDMC Handbook of Energy & Economic Statistics in Japan*; and others

As shown above, the per-household energy consumption in Japan is lower than in other western developed countries.

Japan's per-household energy consumption by usage in 2006 shows that 35.1% was used for power/lighting, etc., 31.2% for hot water, 23.7% for heating, and 7.9% for cooking, and 2.2% for air-conditioning. The national average shows that most of the energy consumed was for household electrical appliances and hot water. In comparison, the United Kingdom and Germany have extremely high energy consumption for heating (Figure 2-2-4).

The per-household energy consumption for heating in the United Kingdom and Germany is over three times that of Japan, and this is the major cause of difference among the countries in per-household energy consumption. Although the need for heating differs depending on the winter temperature, different heating systems also account for the difference in energy consumption. In western countries, many buildings are heated constantly using a central heating system.

(1) Measures to Improve the Energy Efficiency of Buildings

A Measures in the EU

Since a great part of the residential energy consumption in Europe is for heating, household energy conservation measures place an emphasis on insulating buildings to improve energy efficiency. Because central heating is an integral part of the building and is very common in Europe, improving heating efficiency must be carried out as part of building renovation, rather than just replacing individual devices. Most buildings were built a long time

ago and the equipment used in them is old. Improving energy efficiency by insulating old buildings and replacing old equipment with new heating units are expected to reduce energy consumption drastically.

In the EU, many countries are taking measures in order to comply with the 2002 EU Directive on the Energy Performance of Buildings. It requires Member States to introduce the following domestic systems by 2006: (1) setting of minimum standards of energy efficiency in new houses and buildings, (2) setting of minimum standards of energy efficiency in the renovation of large-scale houses and buildings, and (3) introducing an energy certification system for houses and buildings. The energy certification system for buildings requires the owner to prepare and present an energy efficiency certificate when constructing, selling, or leasing buildings. Providing consumers with various data on energy efficiency will add energy efficiency as a criterion in the decision-making of consumers. It also gives owners incentive to make the buildings more energy efficient. The 2006 EU Action Plan for Energy Efficiency points out that EU has the potential to reduce 20% of its energy consumption by 2020 by improving energy efficiency and that 11%, over half of the reduction, can be achieved by improving the energy efficiency of buildings.

Besides using regulatory measures in accordance with the EU Directive, Member States also implement various measures to help enhance the energy efficiency of buildings, including using subsidies and taxation to entice compliance by energy providers and voluntary actions from consumers.

For example, the United Kingdom requires its utility companies to assist consumers in energy conservation measures, such as insulation, to achieve the energy conservation target mandated by the country in accordance with the energy efficiency commitment (EEC). Germany focuses on providing assistance through policy-based finance. For instance, through a financing program that derives certain amount of funds from environmental tax, KfW Förderbank, a representative policy finance institution in Germany, offers low-interest loans to help insulate buildings, replace old heating equipments, and install renewable energy equipment to support energy conservation.

B Measures in Japan

Japan will also continue to take measures to secure the necessary living standard and at the same time enhance the energy conservation function of houses and buildings. In addition to enforcing energy-saving measures for new construction, the Kyoto Protocol Target Achievement Plan also promotes renovation to enhance the energy conservation function of existing houses and buildings.

In terms of measures for new construction, Japan plans to amend the Law concerning the Rational Use of Energy to expand the requirement to report energy conservation measures for houses and buildings to small and mid-sized houses and buildings (smaller than 2,000 m^2). The government also plans to issue orders to owners of large-scale houses and buildings (over 2,000 m^2) found to have insufficient energy conservation measures.

Other measures are being taken to promote energy-efficient housing. They allow communities to employ creative means, such as utilizing loans, regional housing subsidies, support systems for Local Council for Global Warming Measures, etc.

The government is also making an effort to set up a system to promote renovation that improves the energy efficiency of existing housing stock, including establishing preferential taxation treatment for energy-efficient upgrades of existing housing, such as the installation of double sash windows.

To help consumers choose energy-efficient housing, the government plans to promote the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) for buildings and development of comprehensive methods to evaluate the energy efficiency of buildings, including housing equipment and facilities. The government will promote the provision of information to consumers through evaluation and labels of energy conservation performance.

(2) Measures and Challenges to Improve the Energy Efficiency of Household Electrical Appliances

A Measures Based on the Top Runner Standard

Japan's per-household energy consumption for power/lighting, etc. is high, at about twice the level of that of Germany and about 1.5 times that of the United Kingdom (Figure 2-2-4). To advance energy conservation technology and enhance the energy efficiency of machinery and equipment, Japan put in place a regulatory standard (Top Runner Standard) to promote improvement in the energy conservation performance of each type of energy-intensive device. The Top Runner Standard refers to the energy conservation standard for each type of energy-intensive device (designated devices) specified by the Law concerning the Rational Use of Energy. It is set above that of the commercial product that has the highest energy conservation performance (Figure 2-2-5) at the

time when the energy conservation standard for that type of device is set. To date, 21 devices have been specified. The energy efficiency of individual devices has steadily improved. Japan plans to extend the Top Runner Standard to cover more products, expand the scope of coverage of the currently specified products, and strengthen the standard.

B Rising Energy Consumption from the Use of Household Electrical Appliances.

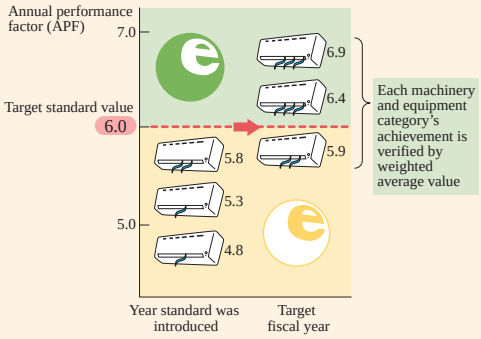
Despite measures to improve the energy efficiency of individual devices, changes in residential energy consumption by usage indicate that Japan has experienced a relatively large increase in energy consumption for power/lighting, etc. in FY 2006 compared to the developed countries in the western world. Specifically, energy consumed for lighting and household electrical appliances increased 50% compared from the base year, and it far exceeds the energy consumption increase of other usages (13% increase for hot-water supply, 21% for heating, 10% for cooking, and 26% for air-conditioning).

(A) Increase in Energy Consumption due to Increase in the Number of Devices

The number of household electrical appliances owned per household in Japan is on a rising trend. The average ownership of air-conditioning units and televisions, in particular, exceeds 2.5 units per household. Although the shares of new devices, such as personal computers, toilet seats with warm water bidets, and DVD recorders, are not

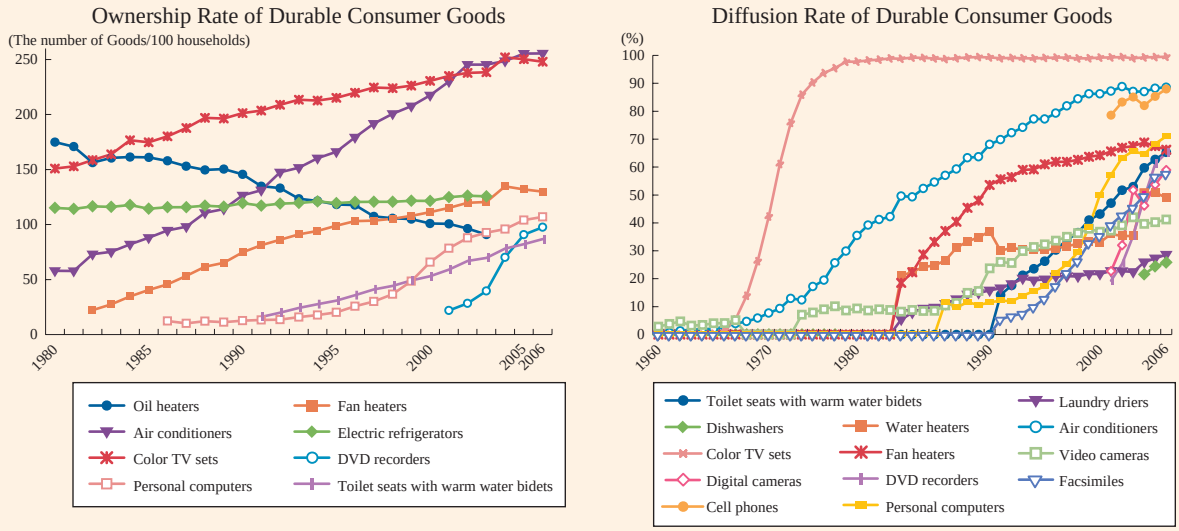
Figure 2-2-5 Top Runner Target Machineries and Equipment (21 Items) and an Example

1. Passenger vehicles
2. Freight vehicles
3. Air conditioners
4. Electric refrigerators
5. Electric freezers
6. Electric rice cookers
7. Microwave ovens
8. Fluorescent lights
9. Electric toilet seats
10. TV sets
11. VCRs
12. DVD recorders
13. Personal computers
14. Magnetic disk units
15. Copying machines
16. Space heaters
17. Gas cooking appliances
18. Gas water heaters
19. Oil water heaters
20. Vending machines
21. Transformers



Note 1: Target standard value for cooling-cum-heating air conditioners of non-ducted wall-mounted type whose cooling capacity is over 3.2kW up to 4.0 kW (free-dimension type)
2: APF (annual performance factor) = Total cooling/heating capacity required in one year/electricity consumed in a specified period
Source: The Energy Conservation Center, Japan, *Energy Saving Performance Catalogue (Winter, 2007)*

Figure 2-2-6 Changes in Ownership Rate and Diffusion Rate of Major Durable Consumer Goods in Japan



Source: Compiled by the Ministry of the Environment: For ownership rate, data was taken from the Institute of Energy Economics, Japan, *2008 EDMC Handbook of Energy & Economic Statistics in Japan*, and for diffusion rate, from the Survey of Consumer Behavior conducted by the Cabinet Office in March 2007

substantial at this time, the energy consumed by such devices has been rising in recent years (Figure 2-2-6). The increase in the number of these devices is the major cause of the increase in per-household energy consumption. In addition, as televisions and refrigerators become larger and have multi-functions, energy consumption also rises accordingly.

(B) Increase in Energy Consumption due to Changes in Lifestyle

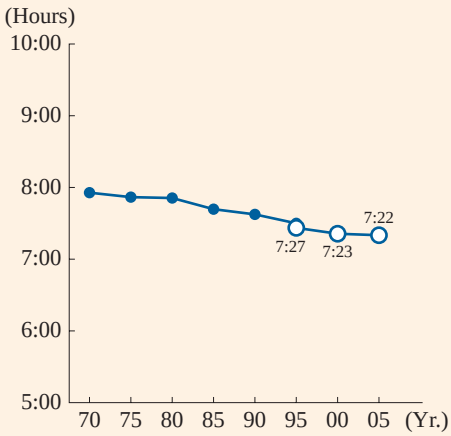
The rise in energy consumption is also said to have been caused by people's increasingly late-night lifestyles. According to a time-budget survey of the Japanese people by the NHK Broadcasting Culture Research Institute, the sleeping hours of the Japanese have been on a long-term decline since 1970 (Figure 2-2-7). In many ways, the longer hours of using household electrical appliances have led to the increase in residential energy consumption.

(C) Increase in Energy Consumption due to Changes in Household Composition

As mentioned earlier, the number of households in Japan, relative to other countries, has increased substantially from the base year. Changes in the number of persons per household in Japan show a decrease from 3.4 persons in 1970 to 2.6 persons in 2006, even fewer than the 2.7 persons in the United States. Although Japan has not reached the levels of the United Kingdom (2.3 persons) and Germany (2.1 persons), the number of members per household has been decreasing since 1990 due to low birth rate, aging population, nuclear families, increase in separate living among family members, and increase in single-person households as a result of late marriage and tendency to remain unmarried. Consequently, the number of persons per household has decreased drastically, at a pace much faster than in the other three countries (Figure 2-2-8).

A survey that studied the relationship between the num-

Figure 2-2-7 Changes in Hours of Sleep of Japanese People (National Average, Weekdays)



Source: NHK Broadcasting Culture Research Institute, *Time Use Data of Japanese People 2005* (2006)

Figure 2-2-9 Per-Capita Energy Consumption per Number of Household Members in Japan

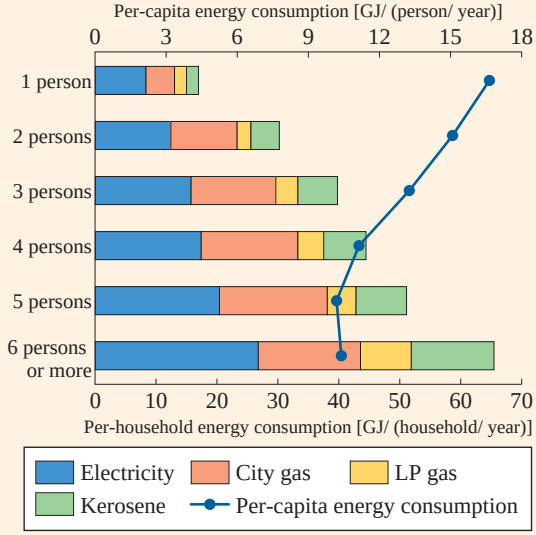
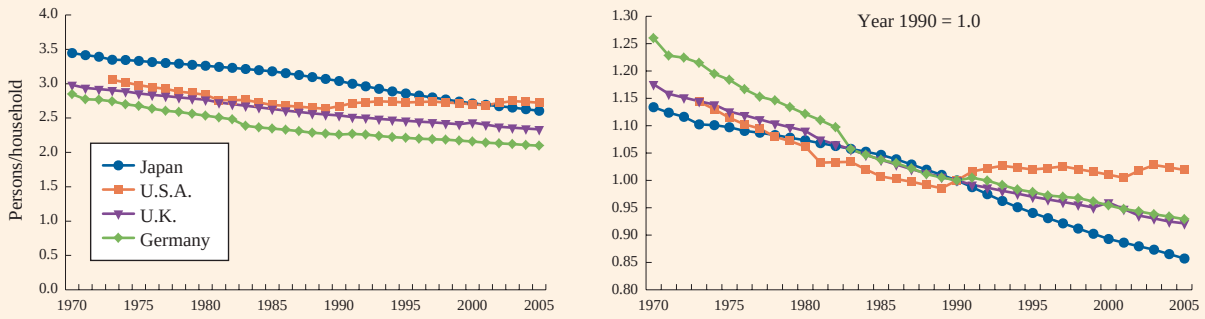


Figure 2-2-8 Changes in the Numbers of Family Members per Household in Selected Countries



Source: Compiled by the Ministry of the Environment from the data of The World Bank, *World Development Indicator 2007*, and population census of each country

Column

Eco-Renovation of Schools

In addition to being places of education, schools are important centers for promoting global warming mitigation measures, since they are the nucleus of communities. Recognizing this, the Ministry of the Environment began implementing in FY2005 the "School Eco-Renovation and Environmental Education Program" to control carbon dioxide emissions of schools while maintaining a comfortable learning environment for students. The program is carried out with an effective combination of improving insulation to reduce the burden of heating and cooling, introducing renewable energy sources, including solar power generation, and promoting green roofs. This program is characterized not only by the equipment prepared but also by the use of this improvement process as material to develop community-wide environmental education focused on the schools and to disperse technology for environmental construction in the community.

The first eco-renovation project was at the Kuromatsunai Junior High School in Kuromatsunai-cho, Suttsu-gun, Hokkaido completed in February 2007. It is estimated that there is a 30% reduction of carbon dioxide emissions from the levels generated prior to the renovation resulting from the use of Galvalume® steel sheeting and external insulation methods, afternoon sunlight from the double-paned insulated roof, resin sashes, and wood for the interior, such as beech tree flooring, as well as improvement of lighting efficiency.

***Hikari-no-michi* (Light Path): Natural sunlight floods the Hokkaido Kuromatsunai Junior High School**
(Photo: Courtesy of Atelier BNK Co., Ltd.; Photo taken by Makoto Yoshida)

ber of persons per household and energy consumption shows that per-capita energy consumption increases substantially as the number of persons in the household decreases. A one-person household is said to consume 1.5 times the per-capita energy of a four-person household (Figure 2-2-9). Members of a household generally share household electrical appliances, such as hot-water apparatus, refrigerator, and washing machine; the fewer the number of persons in the household, the higher per-capita energy consumption becomes. Such change in Japan's family structure is a major cause for the increase in energy consumption from using household electrical appliances.

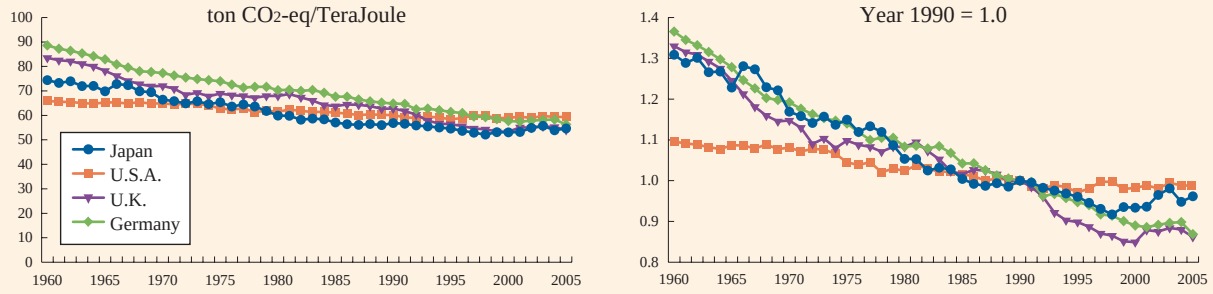
4 Residential Energy Consumption and Carbon Dioxide Emissions from Different Energy Sources

Next, let us look at residential energy consumption from the difference in energy sources.

According to IEA statistics data, a comparison of Japan, the United Kingdom, Germany, and the United States shows that the current carbon intensities (carbon dioxide emission per unit of energy consumption) of these countries are at similar levels (Figure 2-2-10). Changes in carbon intensity over time show that Japan's dependence on oil for electricity became lower after the oil crises. The promotion of nuclear energy, natural gas, and other energy sources to replace oil has reduced Japan's carbon dioxide emission intensity of electricity to a low level, even on an international scale (Figure 2-2-11). Although the carbon intensity has become lower concurrently, the decrease has leveled off in recent years.

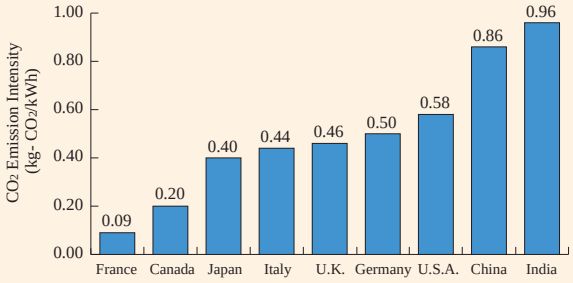
In Japan, the residential energy sources in 2005 include 52% of electricity, 29% petroleum, 17% gas, and 1% solar energy. Compared to the energy consumption of each of the energy sources in 1990, consumption of energy from electricity increased by 81%, gas 27%, and petroleum 18% (Figure 2-2-12). Compared to the United Kingdom, Germany, and other countries, Japan uses a much larger percentage of energy from electricity. For this reason, compared to the other countries, an increase or a decrease in the carbon dioxide emission intensity of electricity due to the changes in the composition of fuels

Figure 2-2-10 Changes in Carbon Intensities of Selected Countries



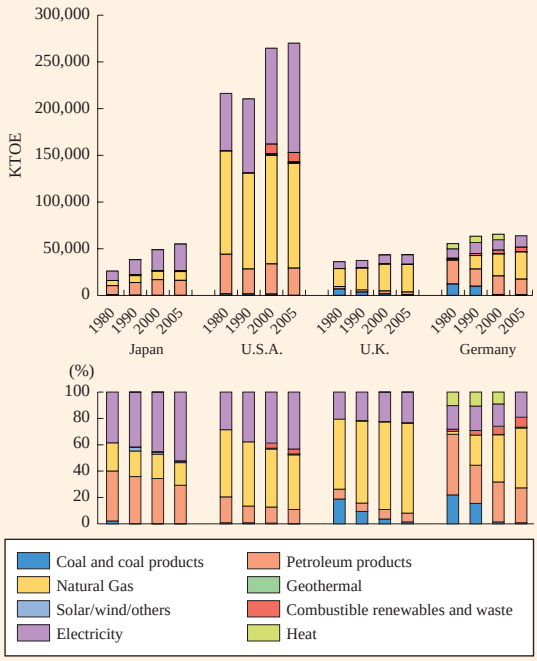
Note: TeraJoule (TJ)=10^{12} J
Source: Compiled by the Ministry of the Environment from the data of IEA, *CO_2 Emissions from Fuel Combustion 2007*

Figure 2-2-11 International Comparison of CO2 Emission Intensity of Electricity at the Power Generation End



Note: Includes CHP plants (co-generation). Values are from 2005.
Source: Material prepared for the third meeting of the Council on the Global Warming Issue

Figure 2-2-12 Changes in Fuel Mix of Residential Energy Consumption in Selected Countries



Note: KTOE (kilo ton of oil equivalent) 1KTOE=10^{10} kcal
Source: Compiled by the Ministry of the Environment from the data of IEA, *Energy Balances of OECD Countries 2007*

(petroleum, coal, natural gas, and nuclear power) for electricity generation would have a tremendous impact on the carbon intensity of residential energy consumption in Japan. For example, carbon dioxide emissions from the residential sector in FY 2005 were approximately 174 million tons. If the nuclear power plants were able to operate in FY 2005 at the utilized capacity originally planned in FY 2002, 8.5 million tons of carbon dioxide emissions would have been slashed.

The United Kingdom used 83% less coal compared to the base year and had replaced it with an increase in natural gas use. In 2005, natural gas accounted for about 70% of the overall energy mix, which contributed to the remarkable improvement made by the United Kingdom in carbon intensity. The United Kingdom promoted the use of natural gas by expanding the production of natural gas in the North Sea, liberalizing the electricity supply market, and reducing protective measures for the coal industry (privatization). Among the fossil fuels, natural gas emits little carbon dioxide during combustion compared to coal and petroleum. The use of natural gas drastically lowers the carbon intensity and contributes to the reduction in carbon dioxide emissions in the residential sector.

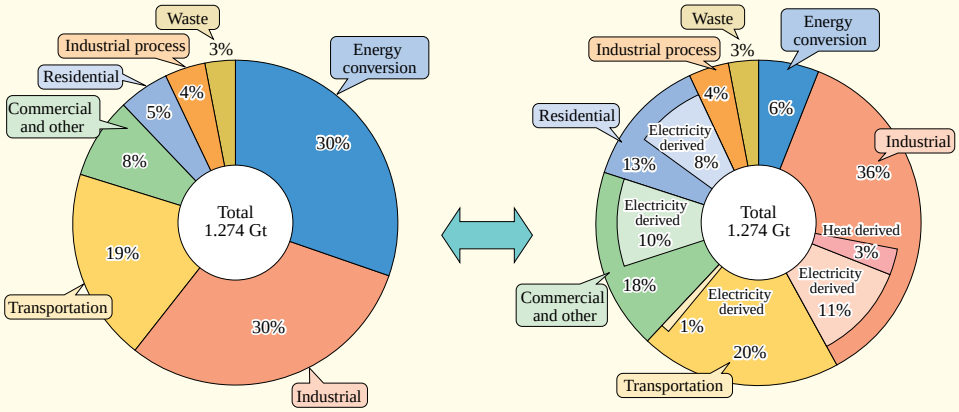
Germany has also reduced the use of coal and increased the use of natural gas, which lowered the carbon intensity. Since the unification of East Germany and West Germany in 1990, many old buildings in the former East German districts had improved energy efficiency by insulating walls and replacing old equipment. The shift of these districts from coal to natural gas is said to have contributed tremendously to the reduction in carbon dioxide emissions in the residential sector. It is reported that the increased use of district heating using solar power and biomass in

Column

CO_2 Emissions from the Residential Sector in Japan

Japan compiles and discloses data to the public on energy-generation related CO_2 emissions by utility (electricity/heat) companies. In this data, electricity/heat distributed to the industrial, transportation, commercial/other, and residential sectors is compiled based on electric/heat consumption. CO_2 emission from the residential sector before electricity/heat distribution accounts for about 5% of the Japan's total emissions. However, this figure becomes 13% after the distribution (Figure 2-2-13). This increase occurs because the amount of CO_2 emitted from electricity generation by electric power suppliers is included in the residential sector instead of in the energy conversion sector after the distribution. In FY2006, CO_2 emissions after distribution for the residential sector increased from the base-year by 30%. During this time, carbon dioxide emission intensity largely decreased temporarily, but returned to the base-year level due to lower level of nuclear power plant operations and a drastic change that took place subsequently in the ratios of energy sources in electricity generation. Therefore, the increase of CO_2 emissions of the residential sector by 30% from the base year is relatively proportional to the increase of residential energy consumption.

Figure 2-2-13 Breakdown of CO_2 Emissions before and after Distribution of Electricity and Heat



Source: Ministry of the Environment

Germany also contributed to the reduction in carbon dioxide emissions in the residential sector. We have covered the activities concerning renewable energy in the world in Section 1. There is also much expectation for the use of renewable energy in the residential sector, in addition to energy conservation measures. For example, solar energy can be used for heating, hot-water supply, and other low-heating needs, as well as for generating electricity.

5 Changing the Lifestyle

The amount of energy consumed changes depending on how we live, use energy, and make decisions. In order to eliminate wasteful energy use and reduce carbon dioxide emissions, we must care for the environment, treat it as our own problem, and link our concern for the environment to concrete actions.

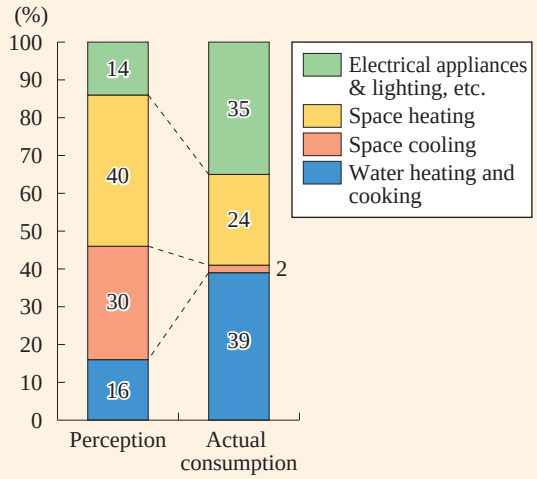
(1) Understanding the Relationship between Daily Life and Energy Consumption

In a survey to find out people's awareness of residential energy use, 40% of all households said that heating was the largest energy use in the household and 30% answered that air-conditioning was the largest energy use in the household, although air-conditioning only accounts for 2% of the energy use. That is, about 70% of all residents think heating or air-conditioning is the largest energy use in the household. It was pointed out that only 16% of all households knew that hot water supply (including cooking) consumes the most energy (39%) in households, showing a huge discrepancy between people's perception

and reality (Figure 2-2-14).

A correct understanding of the relationship between one's actions and the energy consumed will link to reduction in residential energy consumption. To this end, governments have started making efforts to raise the awareness and activities of residents to reduce energy consumption and carbon dioxide emissions by presenting information on energy consumption and carbon dioxide emissions in a visual form. For example, the UK Government expects to see "Smart Meters" with a visual display of energy use rolled out to the domestic sector within the next decade. In Japan, equipment such as the "Energy-saving Navigator," which visually indicates the current electricity consumption and cost, and gives out a warning signal when electricity usage exceeds the energy conservation target, is gaining popularity.

Figure 2-2-14 Divergence between Perception and Actual Consumption in Residential Energy Consumption in Japan



Source: Compiled by the Ministry of the Environment based on the following study: Takashi Inoue, Yusuke Morihara, and Ryoko Sakai, "Energy Consumption in Housing on the Basis of National Scale Questionnaire," *Digest of Speeches*, Architectural Institute of Japan (2007); and the Institute of Energy Economics, Japan, *2008 EDMC Handbook of Energy & Economic Statistics in Japan*

(2) Taking Actions to Conserve Energy

After understanding the relationship between the way we lead our lives and the energy consumed, we must take action to shift from an energy-intensive lifestyle to one that places value on energy resources.

The "Team Minus 6%" national campaign to mitigate global warming, with the Japanese Prime Minister as the team leader, advocates six specific activities, together with Cool Biz and Warm Biz. In addition, the "Let's Target 1 kg of CO_2 Reduction per Person per Day" campaign accepts "My Declaration for Accepting the Challenge" from citizens. This measure aims at cutting carbon dioxide emissions by 1 kg per person per day in everyday life. A citizen can choose from a global warming mitigation menu of daily activities that he/she is willing to undertake. They include how one controls the heating and air-conditioning temperatures, chooses products, drives automobile, uses electricity, and so on. As of the end of April 2008, approximately 599,000 individuals have made the pledge to take up the challenge.

It is important to carry out the activities of the menu in one's daily life. Besides consciously taking action, measures utilizing energy conservation technology, including the diffusion of energy efficient equipment and installation of energy saving facilities, can also have a tremendous impact on energy conservation. For example, compared to other countries, Japanese take more baths and consume considerable energy for hot water. It is recommended that family members shorten the interval in between their baths and that each individual shortens their showering time by one minute per day. It is also effective to utilize solar power as the energy to heat up water or to install high-performance water-heating equipment and facilities. By changing the conventional combustion-type water heater to the CO_2 coolant heat pump-type water-heating appliance, the primary energy used can be cut by about 30% and carbon dioxide emissions can almost be halved.

There is also momentum in households, offices, and

Left and center: Smart Meter; right: Energy-saving Navigator
(Photo: Courtesy of More Associates and The Energy Conservation Center, Japan (ECCJ))

streets all over the world to switch from the use of more energy-intensive incandescent lamps to the more energy-saving fluorescent or LED (light-emitting diode) for lighting.

In conjunction with the Ministry of the Environment and Ministry of Economy, Trade and Industry, manufacturers of household electrical appliances, retailers, and consumer groups joined and established a forum for the diffusion and promotion of energy efficient household electrical goods to popularize equipments and devices that conserve energy.

By incorporating information technology (IT) in residential housing, the state of energy use can be shown in real time. The technology for energy-conservation management systems that optimize the operation of lighting and air-conditioning according to the indoor condition has been developed and its application is much expected.

It is also important to re-evaluate housing as a living space from an environmental perspective. In terms of residential housing, it is desirable to shift from consumable type houses, which are built and demolished, to preservable high quality houses, which will be well cared for and used for a long time. The value of a building should be evaluated from an environmental point of view, including its energy efficiency. Popularizing housing (200-year old houses) that can be used for a long time and has excellent environmental performance can be said the key to a low carbon society.

(3) Towards a Lifestyle that Cherishes Energy Resources

To realize a low carbon society, we must shift from an energy-intensive lifestyle to a lifestyle that places value on the environment. In the transition to a low carbon society, people who care about the global environment, who choose to reduce their impact on the environment, and who lead an environmentally conscious lifestyle will play an important role. It is us–each one of us–who will make up this low carbon society.

In the world, 1.6 billion people are living without electricity and suffering from energy shortage. Currently, the world has approximately 6.7 billion people. By 2050, the population is predicted to exceed 9 billion, with most of the population growth taking place in Asia. As the population grows and people seek a more affluent life, more energy will be needed and carbon dioxide emissions will increase, further aggravating global warming. We must keep reminding ourselves of the danger that we might lose our livelihood to changes brought about by the effects of worsening global warming. As the world has taken its first step towards a low carbon society, we must make the change now–to a lifestyle cherishing energy resources–for the sake of future generations.

Christmas illuminations using LED (Left: Champs-Elysees, Paris, right: Roppongi Keyaki-zaka Street, Tokyo)
(Photo: Courtesy of Cahierdeparis, and Mori Building Co. Ltd.)

Column

Eco Points "Point System Changes Action"

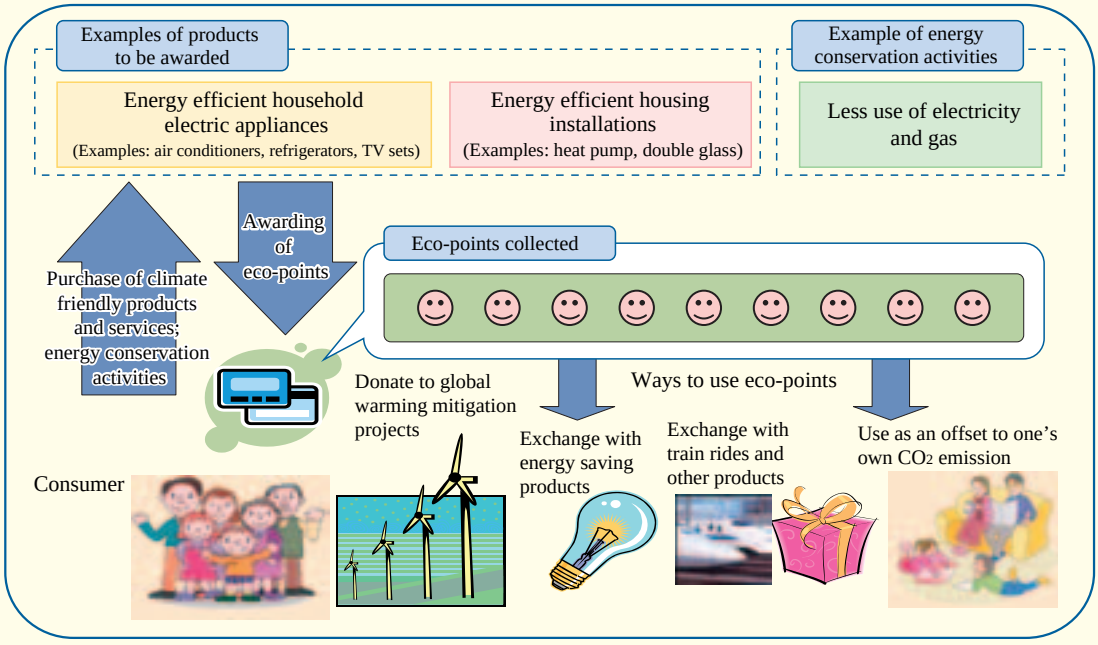
As a method to reduce GHG emissions in the residential sector, the eco point system is expected to play an important role as a friendly and easy to understand way to encourage all Japanese to make efforts to cut emissions. Eco-points are awarded for the purchase of energy conserving products and services and for energy conserving activities, such as saving electricity. Eco points can be exchanged for various goods and services.

Currently, at the local level, eco-points are awarded for declining plastic shopping bags at supermarkets and using the train instead of a car to go shopping. In addition, during some bonus marketing campaigns in 2007, some electronics retail stores offered more points or special discounts for the purchase of energy saving household electrical appliances.

To encourage these activities nationwide, the Ministry of the Environment started to encourage Eco-point model projects that are to be established as financially independent business models, beginning in FY2008. Specifically, the Ministry has selected three national-level business models and nine local-level business models in order to support the development and testing of their eco point systems.

The national level project issues eco-points that can be used nationwide by linking different industries, such as railroad companies and home appliances manufacturers. At the local level, various projects were selected, including a project started by various shops in a local shopping mall to stimulate their regional economy, a project working with developers to build energy saving cluster housing, and a project working to reduce the CO_2 emissions of home-delivery services. Through the implementation of these model projects, eco points systems are expected to develop with participation by many people (Fig. 2-2-15)

Figure 2-2-15 Image of Eco-Point Projects Promoted by the Ministry of the Environment



Source: Ministry of the Environment

Chapter 3
Policy Measures Taken by Japan to Create a Low Carbon Society and Japan's International Contributions

As mentioned in Chapter 2, the world is moving towards a low carbon society. In view of this global trend, Japan must achieve the target set forth by the Kyoto Protocol and enhance policy measures to facilitate the creation of a low carbon society. This chapter will elucidate the basic concepts of the measures that Japan is taking to arrest global warming, focusing especially on the transportation area, which requires measures that match regional characteristics, and the area that utilizes nature's blessings, such as solar power. It will introduce the development and dissemination of technology in the industrial sector, which will be a major player in Japan's endeavor to create a low carbon society. Finally, it will describe the measures that Japan is taking to assist developing countries, especially in Asia, in curbing their rapidly rising GHG emissions.

Section 1 Achieving the Target of Kyoto Protocol's First Commitment Period

1 Status of GHG Emissions in Japan

According to the Kyoto Protocol, Japan is required to make a 6% reduction in GHG emissions from the base year (FY 1990 for carbon dioxide, methane, and nitrous oxide, and 1995 for the three CFC substitutes, including HFC, PFC, and SF_6) by the end of the Protocol's first commitment period (2008-2012). Japan's GHG emissions in FY 2006, however, reached 1,340 million tons (carbon dioxide equivalent), an increase of 6.2% from the base year.

Although progress has been made in the reduction of methane, nitrous oxide, and the three CFC substitutes, carbon dioxide emissions from energy use in FY 2006 increased drastically compared to the base year (12% increase from the base year). They account for approximately 90% of Japan's GHG emissions and totaled 1,186 million tons in FY 2006. The rise in carbon dioxide emissions is partly due to the lowered utility rate of nuclear power generating facilities after nuclear power generation was shut down in late 2002. In addition to such special event, it is also the result of economic expansion of China, change in the industrial structure, an increase in office floor areas, the increase in energy consumption in offices and households due to a rise in the ownership of computers and household electrical appliances, and so on.

Changes in carbon dioxide emissions by sector show that emissions from the industrial sector, which accounts for 30% of the total carbon dioxide emissions, have leveled off. Although emissions from the transportation sector, which accounts for approximately 20%, have increased by approximately 20% compared to FY 1990, they are on a downward trend. On the other hand, emis-

Table 3-1-1 State of GHG Emissions in Japan

(Unit: Mt- CO_2)

	Base year (percentage to total)	FY2005 results (difference from base year in %)
CO_2 emissions from energy use	1,059 (84%)	1,186 (+12.0%)
Industrial	482 (38%)	460 (-4.6%)
Commercial and others	164 (13%)	229 (+39.5%)
Residential	127 (10%)	166 (+30.0%)
Transportation	217 (17%)	254 (+16.7%)
Energy conversion	67.9 (5%)	77.3 (+13.9%)
CO_2 emissions from non-energy use	85.1 (7%)	87.7 (+3.1%)
CH_4	33.4 (3%)	23.6 (-29.2%)
N_2O	32.6 (3%)	25.6 (-21.7%)
Three CFC substitutes	51.2 (4%)	17.3 (-66.2%)
Total	1,261 (100.0%)	1,340 (+6.2%)

Source: Ministry of the Environment

sions from the commercial and others sector, which represents approximately 20%, and the residential sector, which represents approximately 10%, have increased substantially (Table 3-1-1).

In order for Japan to take the lead in the international community in realizing a low carbon society, we must take the initiative to assuredly achieve the 6% reduction target set forth by the Kyoto Protocol.

2 Achieving the Target of Kyoto Protocol's First Commitment Period .....

(1) Kyoto Protocol Target Achievement Plan

Pursuant to the Law Concerning the Promotion of Measures to Cope with Global Warming (Law No. 117 of 1998), the Kyoto Protocol Target Achievement Plan (approved by the Cabinet on April 28, 2005, hereinafter referred to as "Target Achievement Plan") stipulates the necessary measures for assuredly achieving the 6% emissions reduction target set forth by the Kyoto Protocol. Japan has made concrete efforts to meet this target by improving the efficiency of air-conditioners, televisions, and other appliances and increasing the fuel efficiency of automobiles. The Global Environment Committee of the Central Environment Council and the Global Environment Subcommittee under the Environment Division of the Industrial Structure Council deliberated in a joint meeting to revise the Target Achievement Plan in order to ensure achievement of the target. In response to the final report of the joint meeting, the Global Warming Prevention Headquarters agreed to revise the Target Achievement Plan (Figure 3-1-1) in March 2008, which was later approved by the Cabinet. The revised Target Achievement Plan incorporated additional and strengthened policies and measures to further encourage the industrial sector to formulate voluntary action plans; to further improve the energy efficiency of houses and buildings; to enforce the Top Runner Program for machinery and equipment; to step up energy conservation measures at factories and business establishments; to improve the fuel efficiency of automobiles; to formulate and issue emissions control guidelines for businesses based on the amended Law Concerning the Promotion of Measures to Cope with Global Warming*; to introduce a system of calculation and reporting of GHG emissions by business unit or franchise unit based on the revised system of GHG calculation, reporting and disclosure; to expand and improve implementation plans of local governments; etc. (Fig. 3-1-1).

With respect to the revised Target Achievement Plan (hereinafter referred to as "Revised Target Achievement Plan"), actors in various sectors must make full effort to carry out not only the policies and measures in the original Target Achievement Plan but also the additional and enhanced policies and measures of the Revised Target Achievement Plan (Figure 3-1-1). Furthermore, to achieve the target of the Kyoto Protocol's first commitment period, Japan will also combine forest management to secure carbon sinks and use of the Kyoto Mechanism (Figure 3-1-2).

The longer we delay implementation of these policy measures, the greater the reduction we will have to make within a short time in order to meet the 6% emissions reduction target of the Kyoto Protocol. It is important that we immediately implement the policy measures that can be carried out at this time to secure the reduction. Achievement of the 6% reduction target is premised on steady implementation of the existing and additional measures. We must monitor the progress of the plan's implementation closely, be spontaneous in making adjustments, and add or enhance policy measures speedily whenever necessary to ensure fulfillment of the 6% emissions reduction target.

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* Note: Amendment to the Law Concerning the Promotion of Measures to Cope with Global Warming

In order to meet the 6% emissions reduction stipulated by the Kyoto Protocol, Japan needs to step up measures drastically to curb the continuously rising emissions from the commercial and others sector and the residential sector. As one of the measures to ensure the steady implementation of reduction measures set forth in the Target Achievement Plan, the Cabinet approved a bill amending the Law Concerning the Promotion of Measures to Cope with Global Warming in March 2008 and submitted it to the 169th regular session of the Diet. The amended law was then enacted in June 2008.

The amended law incorporates the following provisions:

(1) To formulate and issue guidelines for controlling emissions to encourage businesses to carry out environmentally friendly business activities voluntarily and proactively.

(2) To change the system for calculating, reporting, and disclosing GHG emissions by emitter to a system of calculation and reporting by business unit or franchise unit.

(3) To encourage prefectures, designated cities, core cities, and special cities among local governments to formulate measures for controlling GHG emissions in their implementation plans in accordance with the natural and social conditions of the local society.

(4) To review the way in which information on GHG emissions of businesses is provided to users, such as investors, and implement any measures deemed necessary.

Figure 3-1-1 Outline of the Revised Target Achievement Plan

Measures and Policies for Target Achievement

1. Measures and policies concerning reduction, absorption, etc. of GHG emissions

(1) Measures and policies concerning reduction of GHG emissions

[Examples of major additional measures]

- Promotion of voluntary action plans
- Improvement of energy conservation performance of houses and buildings
- Measures for Top Runner equipments
- Strengthening of energy conservation measures at factories and business establishments
- Improvement of automobile fuel efficiency
- Promotion of measures to reduce GHG emissions of small and medium sized businesses
- Measures for agriculture, forestry and fisheries; water and sewage; traffic flow, etc.
- Urban greening and measures for wastes, three CFC substitutes, etc.
- Promotion of measures for new energies

(2) Measures and policies concerning absorption of GHGs

- Forest improvement including thinning of wood, and development of national campaigns to create sound forests

2. Cross-sectoral policies

- Systems for calculation, reporting and public disclosure of GHG emissions
- Development of national campaigns

Issues to be reviewed immediately:

- Domestic emissions trading scheme
- Environmental taxes
- Reviewing of late-night lifestyle/work style
- Introduction of daylight saving time

GHG Emissions Reduction and Absorption Targets

	Outlook for GHG emissions in FY2010*	
	Mt- CO_2	Ratio to base year's total emissions
CO_2 emissions from energy use	1,076～1,089	+1.3%～+2.3%
Industrial	424～428	−4.6%～−4.3%
Commercial and others	208～210	+3.4%～+3.6%
Residential	138～141	+0.9%～+1.1%
Transportation	240～243	+1.8%～+2.0%
Energy conversion	66	−0.1%
CO_2, CH_4 and N_2O emissions from non-energy use	132	−1.5%
Three CFC substitutes	31	−1.6%
GHG emissions	1,239～1,252	−1.8%～−0.8%

* The emissions outlook is for both cases in which measures produce the maximal and minimal envisioned effect. While Japan aims at producing the maximal effect, Japan's reduction commitment shall be achieved even with the minimal effect.

Japan will steadily achieve the 6% reduction commitment under the Kyoto Protocol by including GHG absorption measures and Kyoto Mechanisms to reduce GHG emissions.

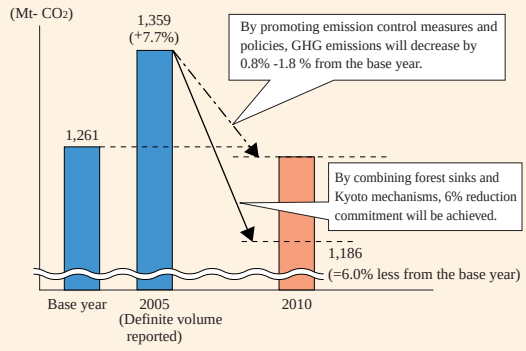
Review of Progress of Target Achievement Plan

- Check strictly the state of each measure's progress around June and December every year
- In addition, forecast the total emissions of the first commitment period and comprehensively evaluate the progress in FY 2009.

→ Revise the Plan flexibly and reinforce and add measures and policies as needed.

Source: Global Warming Prevention Headquarters

Figure 3-1-2 Outlook of GHG Emissions in FY 2010 in Japan



Source: Global Warming Prevention Headquarters

The developed countries' fulfillment of the emissions reduction commitment stipulated by the Kyoto Protocol will be a milestone on the road to achieving the ultimate goal of the United Nations Framework Convention on Climate Change, which is to stabilize the concentrations of greenhouse gases in the atmosphere. To contribute proactively to the fulfillment of the long-term goal set forth in Cool Earth 50, we must first meet the 6% emissions reduction stipulated by the Kyoto Protocol and then work on making a long-term, continuous, and drastic emissions reduction.

(2) Adaptation Measures

The Fourth IPCC Assessment Report pointed out that in order to cope with the inevitable short-term and long-term effects of global warming that are expected to occur, we must not only take mitigation measures to curb GHG emissions but also adaptation measures. In the face of natural disasters and unavoidable consequences of climate change in the future, all concerned parties must be able to carry out measures effectively and efficiently, more so than ever, in order to adapt to the situations.

The Ministry of the Environment established the Committee on Climate Change Impacts and Adaptation

Research in October 2007. It reviews what is necessary to cope with the long-term impacts of global warming on national life between 2020-2030, identifies the impact of global warming on Japan and the developing countries in the future, assesses our vulnerability, and examines the direction of research needed to promote adaptation measures.

In their related council or committee meetings, the Cabinet Office, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Land, Infrastructure, Transport and Tourism are reviewing adaptation measures designed for office works and operations under their jurisdiction, including water resources management, and disaster prevention, as well as public works and projects related to rivers, sea coast, ports and harbors, and agriculture, forestry, and fisheries.

Column

Public Sector's Initiative to Control Greenhouse Gas Emissions

As an actor of economic activity, the position that the government holds in the national economy is very large, and it is very important that they take the initiative to control greenhouse gas emissions related to government operations.

Each ministry has developed policies related to specific measures to be executed in order to control the emission of greenhouse gases, and is implementing measures such as purchasing goods and services, including low-emissions vehicles, and thorough energy conservation efforts for buildings. For FY 2006, the total greenhouse gas emissions from government operations were about 1.71 million tons, which represents a 14.4% reduction in emissions from the FY 2001 level, exceeding the target of 7% reduction. For example, during FY 2006 the Ministry of the Environment implemented measures such as attaching reflective plates to the fluorescent lights in the Ministry offices to reduce electricity consumption by regulating the illumination, as well as implementing a 8 p.m. lights out policy and energy-saving operation guidelines for air-conditioners and heaters in regional environmental offices. These measures resulted in a 9.7% reduction of greenhouse gas emissions in FY 2006 over FY 2001.

In addition, to promote green contracting (environmentally considerate contracts) to reduce environmental impact as much as possible when purchasing goods and services, the Green Contract Law (Law concerning the Promotion of Contracts Considering Reduction of Greenhouse Gases and Others Emissions by the State and Other Entities.) was enacted in November 2007. This law has created a system of comprehensive evaluation that includes environmental concerns in addition to costs in order to contract with suppliers of superior goods and services when the public sector (national and local governments, independent administrative institutions, etc.) purchases electricity, automobiles or buildings. It also extended the duration of national subsidies for ESCO project contracts to 10 years. The proactive involvement of the public sector, including at the national level, in green contracting coupled with the Green Purchasing Law enacted in FY 2001 has not only reduced the environmental impact from the public sector but is also expected to encourage suppliers to provide products with less environmental impact products and to change the entire economy and society to be more environmentally considerate.

Section 2 Drastic Reduction of Greenhouse Gas Emissions in the Mid-to-long Term

1 Status on Efforts to Create a Low Carbon Society

To achieve the ultimate objective of the United Nations Framework Convention on Climate Change, which is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system," we must balance carbon dioxide emissions with carbon dioxide absorption.

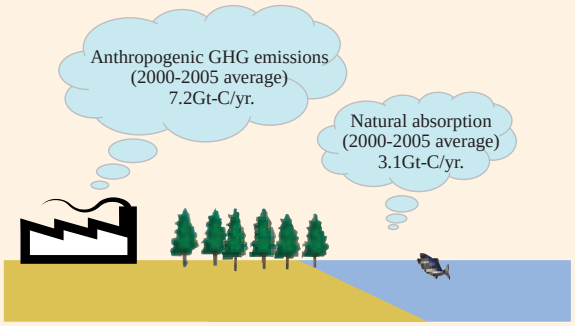
Currently, the world's carbon dioxide emissions are over double the volume that can be absorbed by nature (Figure 3-2-1). In view of the fact that the concentrations

of carbon dioxide in the atmosphere are soaring, Cool Earth 50 puts forth the goal of first halving the world's carbon dioxide emissions of the current level by 2050. To this end, we need to "build a low carbon society" and "develop innovative technology".

The 21st Century Environment Nation Strategy approved by the Cabinet in June 2007 underscored the need to realize in an integrated manner "a low carbon society," "a sound material-cycle society," and "a society in harmony with nature" in order to aim at a sustainable society that can overcome global crises such as global warming.

To clarify the direction for measures "to create a low carbon society," the Global Environment Committee of the Central Environment Council reviewed the basic concepts of a low carbon society, the specific image of such a society, and the strategies for realizing it. Since September 2007, it has held twelve meetings. The Committee issued the report "Towards the Creation of a Low Carbon Society," which incorporated the comments of experts and discussions on the basic principles and other topics.

Figure 3-2-1 CO_2 Emissions and Absorption Results



Note: Atmospheric CO_2 concentration in 2005 was up at 379 ppm (its natural concentration is 280 ppm).
Source: Compiled by the Ministry of the Environment from the data of *IPCC Fourth Assessment Report (AR4)* (2007)

2 Basic Principles of a Low Carbon Society

In its report "Towards the Creation of a Low Carbon Society," the Global Environment Committee of the Central Environment Council named the following three as the basic principles:

(1) Minimize Carbon Dioxide Emissions

Putting in place a social system that gives full consideration to minimizing carbon dioxide emissions is the key. To this end, all sectors of the society, including industries, the government, and citizens, must realize the finite nature of the earth; exercise the volition to break away from a society of mass production, mass consumption, and mass disposal; promote the use of energy efficient products and low carbon energy sources when making purchase decisions; and increase the productivity of resources through the implementation of the 3Rs, and so on.

(2) Create a Simple Lifestyle that Gives a Sense of Richness

We must renounce the uniform society championed by developed countries that seeks richness in life through mass consumption. People's decision to renounce such society and values and to seek spiritual fulfillment will transform the social system and help create a rich, but low-in-carbon society. Manufacturers also need to carry out reforms voluntarily to meet such consumer needs. For example, businesses shall develop environmentally friendly products actively to respond to a market trend favoring products that are friendly to the environment.

(3) Realize Harmony with Nature

It is important to establish venues and create opportunities for the public to come in contact with nature, restore the rich and diverse natural environments, such as forests and oceans; and promote the use of "nature-oriented technology," such as the use of biomass in local communities, in order to secure carbon sinks; and adapt to global warming, which is inevitable in the future.

3 Relationship between a Low Carbon Society, a Sound Material-Cycle Society, and a Society in Harmony with Nature

As mentioned in Chapter 1, for the realization of sustainable development, the international community today is facing an urgent call to build a low carbon society and to drastically cut GHG emissions.

However, sustainable development is achieved not just by means of a low carbon society, it must be pursued in conjunction with the realization of a sound material-cycle society through the 3R resource management and a society in harmony with nature, which enjoys and passes on nature's blessings.

(1) Low Carbon Society and Sound Material-Cycle Society

Through the 3Rs, measures to build a sound material-cycle society will also help mitigate global warming. In March 2008, the Fundamental Plan for Establishing a Sound Material-Cycle Society was revised pursuant to the Fundamental Law for Establishing a Sound Material-Cycle Society (Law No. 110 of 2000). Since measures for building a sound material-cycle society and a low carbon society both necessitate changes to the socio-economic system and lifestyle, it called for the implementation of interdisciplinary measures to optimize synergetic effect. To this end, efforts shall be made to observe the material cycle as much as possible by first reducing waste (Reduce), and then by reusing (Reuse) and recycling (Recycle) through prevention of improper waste treatment to reduce the impact of waste on the environment. Finally, the remainder of waste shall be used for generating electricity through heat recovery to aid the reduction of GHG emissions.

In the reduction of waste, municipal solid waste decreased by approximately 2.8% in the two years from FY 2003 to FY 2005. In terms of reuse, the used products market had expanded steadily to almost 3.7 trillion yen in FY 2004. On the other hand, recycling has been on a gradual rise in recent years. In FY 2005, the recycling rate of municipal solid waste was 19% and the recycling rate of industrial waste was 52%. In the use of waste for power generation, electricity generated in FY 2005 at incineration facilities for municipal solid waste amounted to 7,050 GWh.

(2) Low Carbon Society and Society in Harmony with Nature

As global warming advances, more damage will be done to biodiversity, making the realization of a society in harmony with nature more difficult. The loss and deterioration of forests and wetlands also harm biodiversity. As a result, carbon dioxide retained by their ecosystems will be released into the atmosphere, aggravating global warming. In other words, there is a close link between a low

Column

Let's Reduce "Wood Mileage" Using Local Timber!

Kyoto Prefectural Kitakuwada High School is promoting efforts focused on reducing CO_2 emissions by consuming locally produced timber. This reduces the "wood mileage" (i.e., the distance the timber is transported), and results in far less CO_2 emissions when compared to using imported timber. Specifically, with the slogan of "Let's reduce 'Wood Mileage' Using Local Timber!" the school, in collaboration with research institutes, manufactures and provides log houses and furniture made of locally-grown Japanese cedar/Japanese cypress.

This effort has been highly praised as maintaining a good balance between the application of the silvicultural technology that has a long history of over 1200 years in the Kyoto Kitayama area and has supported the world-class architectural culture in Kyoto, and measures to reduce global warming. Their effort was rewarded with the grand prize for the "Stop Global Warming – One Village, One Product Project" launched by the Ministry of the Environment of Japan in FY 2007 to recognize excellence in local measures to counter global warming.

A made-to-order log house (bus stop) built by Kitakuwada High School
(Photo: courtesy of Japan Center for Climate Change Actions (JCCCA))

carbon society and a society in harmony with nature, and it is important to implement policy measures that consider both.

Forests, wetlands, and plains store large volumes of carbon dioxide. Besides protecting and restoring them, utilizing recyclable biological resources in the community, such as lumber, biomass from the maintenance of countryside, and nature's blessings, such as sunlight, as energy can make our daily lives sustainable. They can also serve as substitutes for non-renewable resources, including fossil fuels. These measures contribute to the establishment of both a low carbon society and a society in harmony with nature.

4 Promoting Policy Measures That Match Regional Characteristics .....

The scope of policy measures to facilitate the transition to a low carbon society is extremely wide, both from the fact that GHG emissions originate from activities involving the entire economic society and from the perspective that a low carbon society shall be realized in conjunction with the realization of a sound material-cycle society and a society in harmony with nature. We will introduce here specific examples of measures that have incorporated regional characteristics, including transportation measures that are effective in curbing carbon dioxide emissions and measures that utilize nature's blessings such as green space, wind power, and sunlight.

(1) Transportation Measures

Carbon dioxide emissions from automobiles are especially high in the transportation sector, accounting for 90% of the sector's emissions. In the future transition to a low carbon society, while it is of course necessary to improve the fuel efficiency of individual automobile units and introduce clean energy vehicles, it is also desirable to reexamine the aspect of car dependency from a wider perspective of the movement of people and goods in relation to regional characteristics, to choose the appropriate public transport modes, including railways and buses, and to use them in an integrated manner. For this purpose, it is necessary to pursue policy measures for building compact cities that have short transport distances to minimize environmental impact and establishing sustainable regional transport systems with a long-term perspective.

Column

Hottest Cities in Japan

The summer of 2007 saw a large number of hot days in Japan, with temperatures on August 16 rising to 40.9 ˚C, the highest temperature observed in Japanese history, in Tajimi City, Gifu Prefecture, and Kumagaya City, Saitama Prefecture.

Since 2006, Tajimi City has undertaken efforts to prevent heatstroke. They include displaying signboards in public areas and facilities and issuing precautions to pre-registered citizens by e-mails when the indices for temperature, humidity, etc. exceed a specified level. Also, the City has sponsored the "Acchicchi-Summit" (http:www.acchicchi-summit.com/) since FY 2003 under the concept of "Understanding Global Warming Prevention while Having Fun" in cooperation with other local governments of areas known for their extreme heat, and has raised public awareness through events and experiential activities on the theme of global warming.

Similarly, Kumagaya City initiated the "Project to Disseminate Preventive Information for Heat-related Illness such as Heatstroke" in cooperation with the Japan Weather Association to forecast the risk level for heatstroke occurrence. In addition, the City has implemented a variety of efforts, such as engaging communities to encourage citizens and businesses to create and carry out projects with the catchphrase of "VERY HOT! Kumagaya."

A Signboard to draw public attention to heatstroke
(Photo: courtesy of Tajimi City)

A Environmentally Sustainable Transport Concept

Currently, Environmentally Sustainable Transport (EST) is pursued as a measure to facilitate the transition to a sustainable transport system. EST refers to environmentally sustainable transport, for which a vision is formulated with a long-term perspective, and transportation and environmental policies are drawn up and implemented to realize the vision. It was first reviewed by the OECD in the mid-1990s and has been adopted actively by European countries.

To put EST into practice, we need to use a multifaceted approach that includes implementing traffic flow measures, upgrading public transportation modes, improving the fuel efficiency of automobiles, reducing dependency on fossil fuels, as well as raising public awareness to facilitate change to transport activities that exert a lower environmental impact. It is necessary for the government, businesses, and the public to form a consensus on a long-term vision, formulate strategies and policy measures to achieve the vision, and implement the strategies and measures in a steady and decisive manner.

B Example: Measures Undertaken by Toyota City, Aichi Prefecture

Currently, 27 municipalities are receiving assistance for EST model projects undertaken in conjunction with the Ministry of Land, Infrastructure and Transport and Tourism, the National Police Agency, and the Ministry of the Environment. Toyota City in Aichi Prefecture is carrying out one of the model projects. The project aims at building a forward-looking city that is friendly to its residents and the environment. It formulated the "Vision for 2025 Toyota City Transportation & Town Development Project" to reduce carbon dioxide emissions by easing traffic congestion, increasing the ridership of public transportation, revitalizing the downtown area, encouraging the use of public transport, promoting ecologically friendly driving, etc.

Using technologies such as Traffic Demand Management (TDM) and Intelligent Transport System (ITS), Toyota City was able to increase average daily ridership of public transport in FY 2005 by approximately 18%, which translates into an emissions reduction of 60,000 tons (carbon dioxide equivalent) in one year.

(2) Measures to Utilize Nature's Blessings

To advance to a low carbon society, we must control the emission of carbon dioxide from energy use. To help accomplish this, we must adopt measures that utilize renewable energy, including solar, wind and biofuel, as well as efforts to incorporate nature such as by expanding green space, restoring waterfront areas, creating paths to facilitate wind and air circulation, etc.

It is also important to build an infrastructure to facilitate the combined use of these low carbon energies and efforts and to expand their applications according to regional characteristics.

A Using Green Space to Cope with the Heat Island Phenomenon

The heat island phenomenon is triggered by an increase in man made surfaces, such as concrete roads, in cities. The high summer temperatures in both day and night (sultry nights) cause heatstroke and other problems. Large and mid-sized cities are securing wind paths for air circulation, green space, and waterfront to alleviate the heat

Column

Generating Electricity from Vehicle Vibration and Body Motion

While speakers convert electrical current into sound vibration, an effort aimed at the practical application of technology that converts the kinetic energy of vibration into electricity is being promoted.

If we could convert our unconscious acts, such as walking, or vehicle vibration into electricity, we would be able to generate electricity by converting our day-to-day activities into energy.

While this technology has yet to be applied, some pilot projects, such as generating electricity to light up a bridge on an expressway or generating electricity from the simple act of walking through a station have been conducted.

A bridge on an expressway lighted up using electricity from vehicle vibration
(Photo: courtesy of the Metropolitan Expressway Co., Ltd.)

island phenomenon.

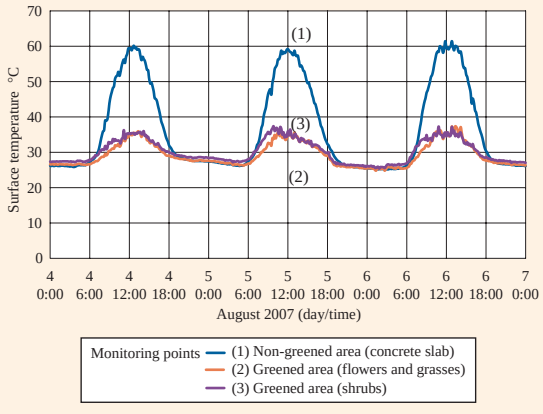
The “Pilot Programs for Inventing Cool City” launched in FY 2007 is a program that uses an integrated approach to combine multiple heat island countermeasures, such as planting trees at buildings to reduce carbon dioxide emissions, installing earth thermal heat pumps, etc., in the central districts of cities with notable heat island characteristics.

In FY 2007, eleven areas in the nation, including Tokyo’s Otemachi-Marunouchi-Yurakucho area (OMY area), were designated as model areas with notable heat island characteristics. Based on measures carried out on the rooftops of commercial buildings in the OMY area, we found that temperatures at rooftops that had planted greenery are over 25 ˚C lower than the rooftops with a concrete surface (Figure 3-2-2). Rooftop gardening not only ameliorates the rooftop surface but also has the benefit of cooling the air that passes through the rooftop.

B City Development Using Solar Power

Many municipalities are implementing progressive measures in regard to the use of solar power to generate electricity. One of these municipalities, Iida City in Nagano Prefecture, utilized the Megawatt Solar Share-Use Model Program sponsored by the Ministry of the Environment that employed funds invested by citizens to install solar power generating systems on the rooftops of day care centers, civic centers, etc. The City has been working on a new system to popularize the Program. The Program aims at providing a channel for citizens to participate in projects through financing, rather than donations, to raise awareness and to promote the Program.

Figure 3-2-2 Changes in Surface Temperature during Thermal Image Monitoring at the Rooftops of Commercial Buildings in OMY Area



Note: OMY area = Otemachi-Marunouchi-Yurakucho Area in Tokyo, Japan
Source: Compiled by the Ministry of the Environment from the data of Mitsubishi Estate Co., LTD.

Other projects are also being carried out. Stoves using wood pellets are installed in many day care centers in the city. This project aims at reducing the use of fossil fuels by utilizing natural energy and building a system to recycle wood pellets within the local community.

C City Development Using Wind Power

Various wind-power generation projects are carried out in different regions according to the local wind conditions. Wind-power generation is expected to increase especially in small cities and mountain villages where there are not as many tall and big buildings as in large cities and where the natural wind flow can be fully utilized.

Kuzumaki township of Iwate Prefecture formulated the “Kuzumaki New Energy Vision” in March 1999 to actively promote the use of new energy, such as wind-power and solar power, for electricity generation. As a result, electricity produced from new energy can be supplied to approximately 16,000 households and reduce carbon dioxide emissions by approximately 34,000 tons annually. Wind-power generation accounts for over 90% of the electricity produced. Taking into consideration the protection of birds and animals, the township utilizes the wind that passes through a farm at an altitude of 1,000m. In addition, it also supports residents’ activities in making the township eco-friendly by providing subsidies for the purchase of firewood and installation of solar power generation and heat utilization systems.

Day care center using solar power to generate electricity
(Photo: courtesy of Iida City)

Wind turbines in Kuzumaki Township
(Photo: courtesy of Kuzumaki Township)

5 Development and Dissemination of Low Carbon Technology .....

(1) Development and Dissemination of Innovative Technology

In order to achieve the long-term goal of halving the world's GHG emissions from the current level by 2050 as proposed in Cool Earth 50, we must take political action to improve and popularize the existing technology and at the same time, research and develop innovative technology. As examples of innovative technology, the Cool Earth 50 mentioned zero-emission coal-fired power generation and advanced nuclear power generation. With this backdrop, the Low Carbon Technolgy Plan was formulated to seek breakthroughs in related innovative scientific technologies and to promote improvement and dissemination of existing technologies in order to find a fundamental solution to the energy and global warming problems. The Plan was reviewed by a working group and approved by the Council for Science and Technology Policy of the Cabinet Office in May 2008.

(2) Popularization and Development of the Existing Highly Efficient Technologies

The world economy in the future is expected to experience continued high economic growth in the Asian region. High economic growth is accompanied by an increase in industrial activities and construction of infrastructure; and in general, energy consumption will go up and GHG emissions will increase. If this chain reaction is not stopped, global warming cannot be arrested. For this reason, it is imperative for the developed countries to share with the world, including developing countries, their existing technology of controlling GHG emissions while continuing production. This can substantially enhance the effectiveness of GHG emissions reduction. Japan has experienced two oil crises and has developed and adopted many highly efficient technologies. Thanks to these technologies, Japan is able to maintain its international competitiveness. These technologies become a very effective tool for decoupling economic growth and GHG emissions.

If technological transfer of these highly efficient technologies is carried out under the Clean Development Mechanism (CDM), the developed countries can not only support the sustainable development of developing countries but also share the achieved GHG emissions reduction credits with the developing countries. The developed country can add the Certified Emission Reduction (CER) credits to its own emissions reduction amount or trade the CERs received from CDM. The CDM Executive Board established under the United Nations Framework Convention for Climate Change (UNFCCC) has 1,056 registered projects on its registry as of May 8, 2008. Technological transfer from developed countries to developing countries through CDM is an effective means to reduce GHG emissions. In a future world where transition to a low carbon society is necessary, the country that has many highly efficient technologies will have a relatively advantageous position. Compared to other developed countries, Japan has many highly efficient technologies. Fully utilizing their merits, Japan can create business opportunities through technological transfers to developing countries.

As shown above, transfer of low carbon technology will bring tremendous benefits to Japan. However, as seen in the thermal efficiency of thermal power plants, Japan was surpassed by the United Kingdom and Ireland in FY 2002 and FY 2003 in the weighted average of thermal efficiency at the generating end, which combines the heat efficiency of coal, oil and gas, because the two countries have adopted the latest natural gas thermal power generation (Figure 3-2-3). To continue to be an environmental nation, Japan must devote its greatest effort to developing technology. To maintain our lead in this and other environmental technology fields, we must always seek the latest cutting-edge technology.

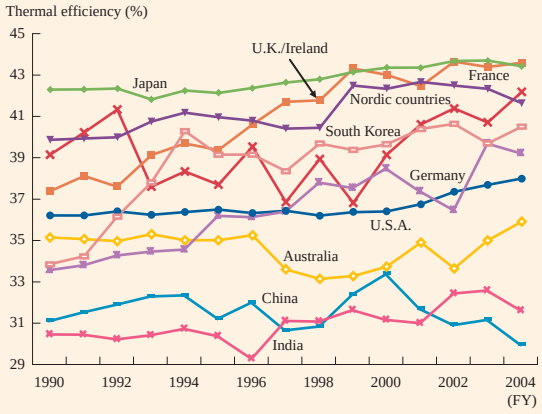
(3) Development and Dissemination of Low Carbon Technology for Power Generation and Industry

In our transition to a low carbon society in the future, the industrial sector shall contribute by seizing global warming as a business opportunity and actively taking measures to develop technology, improve the efficiency of production processes, and transfer technology to developing countries.

The energy conversion sector, including power generation, accounts for approximately 6% of the carbon dioxide emissions in Japan. Of emissions from power generation, those emitted from electricity consumption, etc. by sectors other than the energy conversion sector are also counted as indirect emissions (see Chapter 2, Section 2, Column 4, Figure 2-2-13).

The development and dissemination of low carbon technology shall be embraced not only by the energy conversion sector and the industrial sector but also by all sectors

Figure 3-2-3 International Comparison of Thermal Efficiency of Thermal Power Plants



Note: Thermal efficiency is the gross generating efficiency based on the weighted averages of efficiencies for coal, petroleum and gas (based on low heating value).

Source: ECOFYS, *INTERNATIONAL COMPARISON OF FOSSIL POWER EFFICIENCY*, (2007)

of the society including transportation and households. Here, we will introduce examples of low carbon technologies used by the energy conversion sector and the industrial sector, which together account for a large percentage of Japan's carbon dioxide emissions. Regarding the development of innovative energy technology, prior to the "Innovation Plan for Environmental Energy Technology," the Ministry of Economy, Trade and Industry has put together the "Cool Earth–Energy Innovative Technology Plan" in March 2008. Of the 21 technologies selected by the Plan, we will introduce advanced nuclear power generation, high efficiency coal-fired power generation, carbon capture and storage (CCS), high efficiency natural gas thermal power generation, and an innovative iron-making process as well as the commercialized energy conservation technology.

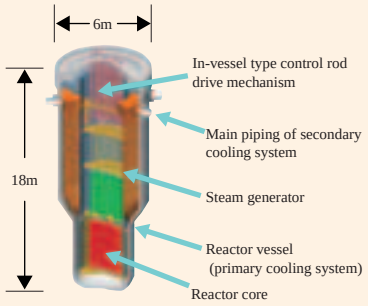
A Development and Dissemination of Power Generation Technology

(A) Advanced Nuclear Power Generation Technology

Nuclear power generation, which does not emit carbon dioxide during the power generation process, is the only clean energy source that has the potential to become Japan's major electricity source at this time. Therefore, it has an extremely important role in the fight against global warming. Premised on the assurance of safety, the government and citizens must continue to cooperate in steadily promoting nuclear power as a major electricity source. To this end, it is necessary to improve the light-water reactor technology, which is the prevailing technology in

"Monju" fast breeder reactor
(Photo: courtesy of Japan Atomic Energy Agency)

Figure 3-2-4 Medium Small Reactor (350MWe-IMR)



Source: Ministry of Economy, Trade and Industry, *Cool Earth - Innovative Energy Technology Program*

Japan and overseas today, and develop innovative power generating technologies such as the fast breeder reactor and so on, with a view toward 2050. Specifically, focus shall be placed on the development of the next-generation light-water reactor technology that will substantially enhance safety, affordability, and reliability; the fast breeder reactor cycle technology that will drastically increase the efficiency of uranium use; and "medium small reactor" system that can meet the electricity needs of developing countries and island states (Figure 3-2-4).

(B) High Performance Coal-fired Power Generation Technology Combined with Carbon Capture and Storage

Compared to other fossil fuels, coal has the advantage of superior supply stability and high economic efficiency. On the other hand, it also has many environmental factors that limit its use, such as the large CO_2 emission volume per unit of heat it produces. To resolve such issues from the environmental standpoint, clean coal technologies shall be promoted to control CO_2 emissions.

Since coal is abundant and inexpensive, its use in the developing countries is likely to increase in the future. For this reason, enhancing the efficiency of coal-fired power generation–so that more electricity can be generated with

less coal–is also highly effective in reducing GHG emissions.

So far, Japan has conducted many studies on coal-fired thermal power generation technology and has enhanced the efficiency of power generation. Currently, research and development are being carried out on advanced ultra-super critical thermal power generation, integrated coal gasification combined cycle system, integrated coal gasification fuel cell combined cycle system, etc.

Advanced ultra-super critical thermal power generation is a technology used to improve power generation efficiency by tweaking the steam condition of the current pulverized coal thermal power generation method to produce high temperature and high pressure. The integrated coal gasification combined cycle system is an integrated technology that generates electricity using coal gasification, gas turbines, and steam turbines. The integrated coal gasification fuel cell combined cycle system is a technology that further adds fuel cells.

If the power generation efficiency can be raised from the current 42% to 65% by adopting and popularizing these technologies, carbon dioxide emissions can be reduced by approximately 40%. Furthermore, by combining these technologies with CCS, carbon dioxide emissions can be reduced to almost zero.

CCS is a technology that separates/captures carbon dioxide from exhaust gas emitted from large point emission sources, such as thermal power plants, and stores or sequestrates the carbon dioxide underground in geological formations or in deep ocean masses for long periods of time to prevent carbon dioxide from being released into the atmosphere. This technology is composed of four components, namely, separation/capture, transport, compression, and storage. Separation/capture technology and storage technology are at the core of this technological development. Japan started basic research on this in the late 1980s. To date, small verification tests using compression up to the 10,000-ton level have been carried out to study storage stability. One of the major hurdles for the commercialization of CCS is cost reduction. To lower the cost of separation/capture, which accounts for approximately 60% of the CCS cost, Japan has been developing elemental technology such as a highly efficient absorbing solution. To popularize CCS, we need to have environmentally effective and efficient methods to manage CCS. Japan is also developing such methods.

Overview of a long-term pilot plant for CO_2 capture
(Photo: courtesy of Mitsubishi Heavy Industries, Ltd.)

(C) High-efficiency Natural Gas Thermal Power Generation Technology

Compared to other fossil fuels, natural gas is a clean energy that exerts relatively little environmental impact. Therefore, in line with the "Basic Energy Plan," Japan continues to promote the adoption and increased use of natural gas while making efforts to strike a balance with oil, coal, nuclear energy, and other energy sources.

When burning fuel, gas from the fuel can be used to turn the turbine and generate electricity. Such internal-combustion turbines are small and lightweight, and have many merits including high output and quick activation. The combined cycle system combines the thermal generation and steam power generation, in which the residual heat from internal combustion is used to produce high temperature and highly pressurized steam to turn the steam turbine. Because natural gas thermal combined cycle power generation uses the two kinds of turbines for power generation, its heat efficiency reaches the 50% or more level. One way to raise the efficiency of natural gas thermal power generation even higher is to raise the temperature at the entrance of the gas turbine. Since Japan developed and installed a gas turbine with a temperature of 1100 ˚C at its entrance in the 1980s, the heat resistance performance has improved. The current commercialized gas turbine has reached a temperature of 1500 ˚C at its entrance.

Development of the next-generation gas turbine, which has a temperature of 1700 ˚C at the entrance, is being pursued as a national project. When this gas turbine is developed, high-efficiency natural gas thermal power generation, which uses such turbines, will have a heat efficiency up to 56%, delivering even higher performance. The development of the high performance gas turbine is expected to increase the performance of the integrated coal gasification combined cycle system as well.

B Innovative Iron-making Process and Energy Conservation Technology Used in the Iron and Steel Industry

(A) Innovative Iron-making Process

Iron is an indispensable metal in daily life, used in various kinds of products ranging from building frames, ships, and automobiles to office supplies such as staples. To extract iron, oxygen must be removed from iron oxide in the iron ore. The process requires maintaining a temperature over approximately a thousand degrees for a long time. During the first oil crisis, the iron and steel industry was one of the industries hardest hit in Japan. By actively adopting energy conservation technology, it was able to overcome the crisis, and in the aftermath, it has kept up its steady effort in technological development.

However, in order to reduce carbon dioxide emissions more drastically, the industry must approach technological development with a long-term perspective. It needs to develop (1) technology to separate/capture carbon dioxide from the gas emitted from shaft furnaces, also known as blast furnaces at iron works, and (2) technology to use hydrogen reductant to replace some of the cokes. Specifically, with a view to commercialization in 2030-50, Japan will pursue development of a new type of absorbing solution that can efficiently separate carbon dioxide from gas emitted from shaft furnaces, which has high concentrations of carbon dioxide, and development of technology to regenerate absorbing solution. Japan will also promote the development of technology to use catalysts to change the property of gaseous by-products from coke production and technology to reduce iron ore utilizing increased hydrogen as a reductant. The goal is to reduce about 30% of carbon dioxide emissions from the iron-making process by combining the use of these technologies.

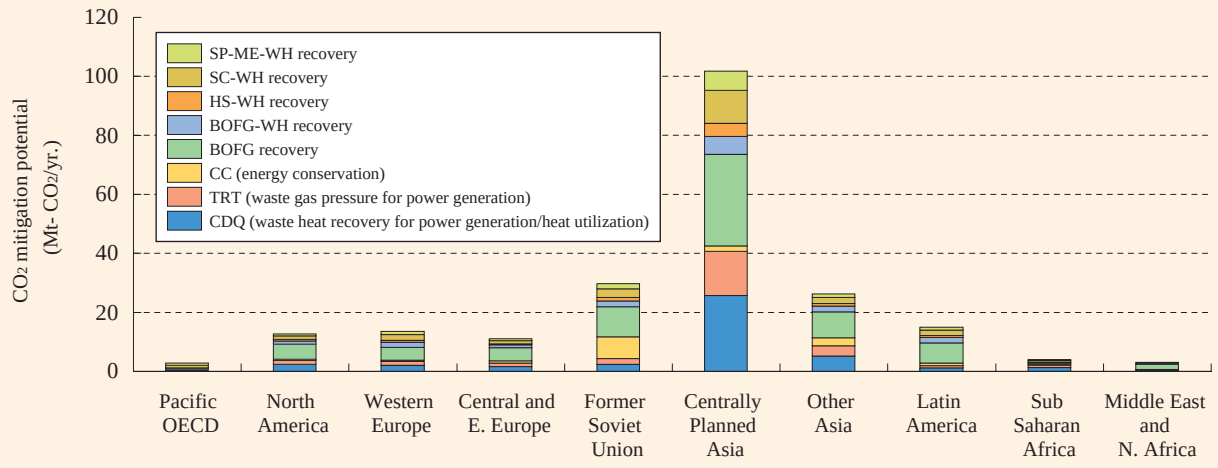
(B) Energy Conservation Technology

The iron and steel industry in Japan boasts the highest level of energy efficiency in the world. This is attributed to the widespread use of equipment to recover exhaust energy, in addition to superior production technology and operation techniques.

For example, the top-pressure recovery turbine (TRT) utilizes gas recovered from the blast furnace to generate electricity. In the blast furnace, iron oxide in the iron ore is reduced to iron, which is the most important process in iron making. The high-temperature, high-pressure gas, which is generated secondarily from the process, rises up to the top of the furnace. Rather than releasing it into the atmosphere, the gas is recovered at the top of the furnace and the exhaust energy is used to operate a turbine to generate electricity.

When coal is baked in a coke oven to generate coke, hot coke at a temperature of approximately 1200 ˚C is quenched in an enclosed coke dry quenching system (CDQ) using inert gases such as nitrogen. The heat absorbed by the inert gas is then used to power a steam boiler to generate electricity. Similar to TRT, CDQ is an effective means for utilizing exhaust energy.

Figure 3-2-5 CO_2 Reduction Potential of Energy Efficient Technologies in Iron and Steel Industry (Forecast for 2030)



Note: 1. Centrally Planned Asia includes China, Mongolia, North Korea, and Vietnam.
2. SP= sinter plant, ME=main exhaust, WH=waste heat, SC=sinter cooling, HS=hot stove, BOFG=basic oxygen furnace gas, CC=continuous casting, TRT=top pressure recovery turbine, CDQ=coke dry quenching

Source: Compiled by the Ministry of the Environment from the data of Kanako Tanaka, Ryuji Matsuhashi, Masahiro Nishio, Hiroki Kudo, *Industry Expert Review Meeting to the Fourth Assessment of Working Group 3 IPCC, Cape Town, 17-19 January 2006*

Although these technologies had been introduced actively in Japan in the 1990s and their use is now widespread, they have not made inroads into iron works in other countries. Popularizing these technologies worldwide can substantially reduce carbon dioxide emissions (Figure 3-2-5).

C Energy Conservation Technology of the Cement Industry

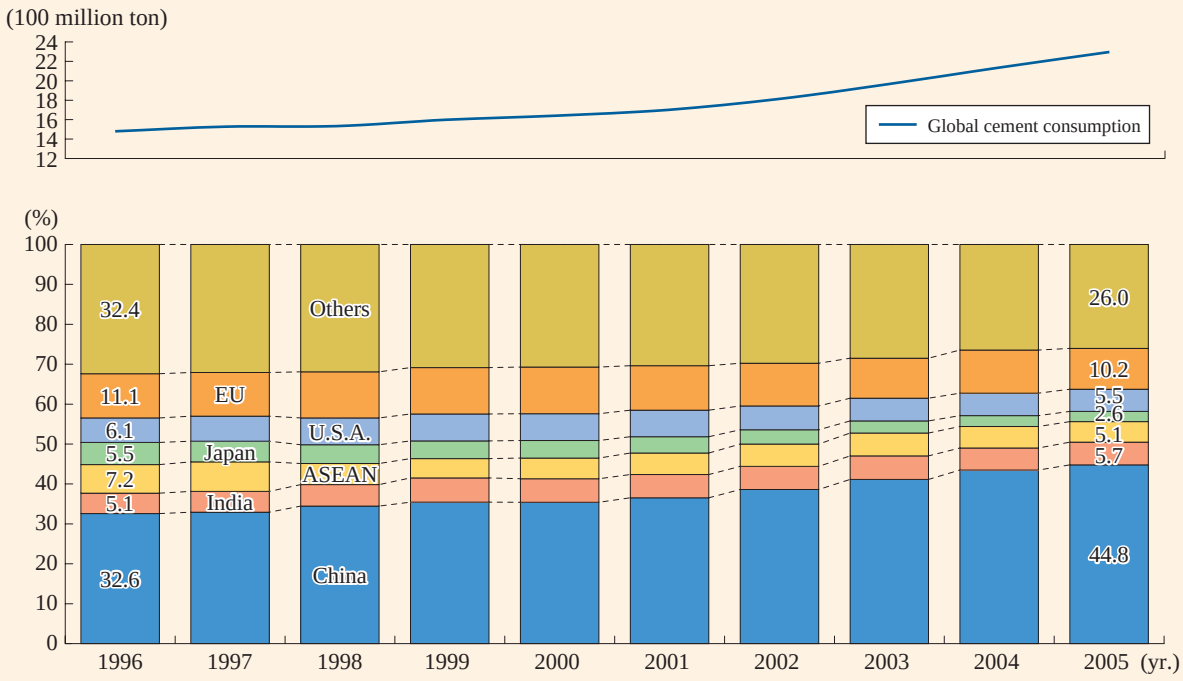
In terms of strength, cost, and ease of use, concrete is one of the superior construction materials today, and is a main material used most frequently in various kinds of constructions, roads, dams, port facilities, etc. The global consumption of cement, which is the material for concrete, has increased because of a rising need for the construction of infrastructure in Asia, especially China, which is experiencing rapid economic growth. This trend is expected to continue for the mid-to-long term into the future (Figure 3-2-6).

Cement is produced in the following processes: the material process in which materials such as limestone, clay, and silica rock are mixed and pulverized, the sintering process in which the mixed and pulverized materials are baked, and the finishing process in which the materials are made into product after being ground into powder form. Each process consumes large volume of energy. The cement industry is one of the most energy-intensive industries, with energy cost representing a high percentage of the production cost. Carbon dioxide emissions from the cement industry in Japan account for approximately 4% of its total emissions. Carbon dioxide emitted from the world's cement industry accounts for approximately 5% of the emissions said to have been caused by human activities. For this reason, energy conservation in the production process of cement will directly contribute to the reduction of carbon dioxide emissions worldwide.

The vertical roller mill used by the cement industry in material processing is an energy conservation technology that Japan can contribute to the world. Generally, a tube mill is used for the process. It is a mechanism used to crush raw materials by rotating a long horizontal tube with iron balls inside serving as a grinding media. The mechanism consumes a large volume of electricity. In the case of a vertical roller mill, a disk-shaped turntable and the vertical roller are used to grind materials into powder efficiently. Compared to the tube mill, the productivity can be increased by 60-80% and the electric power consumption can be reduced by approximately 30% (in terms of electric power intensity).

During the sintering process, the powdered materials, prepared from material processing, react chemically with heat to produce clinker, which has the characteristic of becoming hardened when mixed with water. For this process, the materials are heated up to a high temperature

Figure 3-2-6 Changes in Global Cement Demand and Composition Ratio by Region



Source: Compiled by the Ministry of the Environment from the data of Japan Cement Association, Cement Demand and Supply as of March 2007

of 1450 ˚C in a rotary kiln. In Japan, an energy efficient dry kiln is used. This method utilizes the combustion exhaust gas from the rotary kiln's burner to dry and preheat the materials before firing. Compared to the wet kiln, which does not dry or preheat the materials, this method can cut the heat quantity needed by about 36-37% for making one ton of clinker.

6 Meetings of the Council on the Global Warming Issue Held

In line with the policy address delivered by Prime Minister Fukuda at the 169th Diet in January 2008, meetings of the Council on the Global Warming Issue, attended by experts, have been held since March to explain to the public the concept of a low carbon society and ways to facilitate a transition to such a society. With a view to shifting to a low carbon society, the Council reviews production systems, lifestyles, and ways to bring about fundamental changes to cities and transportation. To curb GHG emissions drastically, the Council has chosen ten cities, which will take on the challenge of becoming model environmental cities by setting ambitious goals and implementing progressive measures. The Council will discuss as quickly as possible basic principles for these model cities, ways to mobilize the citizens to help steadily achieve the Kyoto Protocol, and measures for Japan to provide leadership in international discussions of the next framework. Emissions trading systems, environmental taxes, and other policy measures to facilitate emissions reduction will also be discussed in depth.

As we have seen so far, in order for us to advance to a low carbon society, all sectors of the society must make efforts to minimize carbon dioxide emissions. In order to achieve the long-term goal of halving the global GHG emissions from the current level by 2050 as proposed in Cool Earth 50, Japan as a developed country must proactively and significantly reduce its emissions of GHGs by that year. There seems to be a general perception that unless we impose tight restrictions on our daily lives, we will not be able to realize a low carbon society. However, as Chapter 2 shows, there is a gathering momentum in the world to view the transition to a low carbon society as a new business opportunity and the world is responding to it positively by developing renewable energy and expanding the eco-business market.

The objective for the launch of the Council on the Global Warming Issue also indicates that to overcome global warming, the society and the economy must advance to a new level that views the global warming crisis as an opportunity for the world as a whole to realize growth.

In relation to this, Japan has proposed to invest approximately 30 billion dollars in the next five years for the research and development in the fields of the environment and energy.

At the same time, for the world trend of viewing the global warming crisis as an opportunity to take root in Japan, it is important that we research and analyze the environmental and socio-economic trends and backgrounds of global warming measures in Japan and overseas, raise public awareness, and implement various policy measures systematically and with a long-term perspective.

Council on the Global Warming Issue
(Photo: courtesy of Cabinet Office, Government of Japan)

Section3 Japan's Contribution to Global Warming Measures in the Asian Region

1 State of the Environment in the Asian Region and Future Forecast

As we have seen in Chapter 1, any full-fledged measures to reduce GHG emissions in the future must be carried out not only by the developed countries but also in cooperation with the developing countries. The Asian

region, in particular, will hold the key to global warming initiatives in the future. Since it has a huge population and it has witnessed tremendous economic growth in recent years, Asia will be the region with the highest carbon dioxide emissions. Within the Asian region, local environmental issues such as air pollution, which accompanies economic development, and cross-border issues, such as acid rain, are becoming serious. All countries concerned must cooperate in tackling and overcoming these problems.

(1) Economic Growth and GHG Emissions in China and India

Today, countries in Asia are experiencing continuous and rapid economic growth that is unprecedented in the world (Figure 3-3-1).

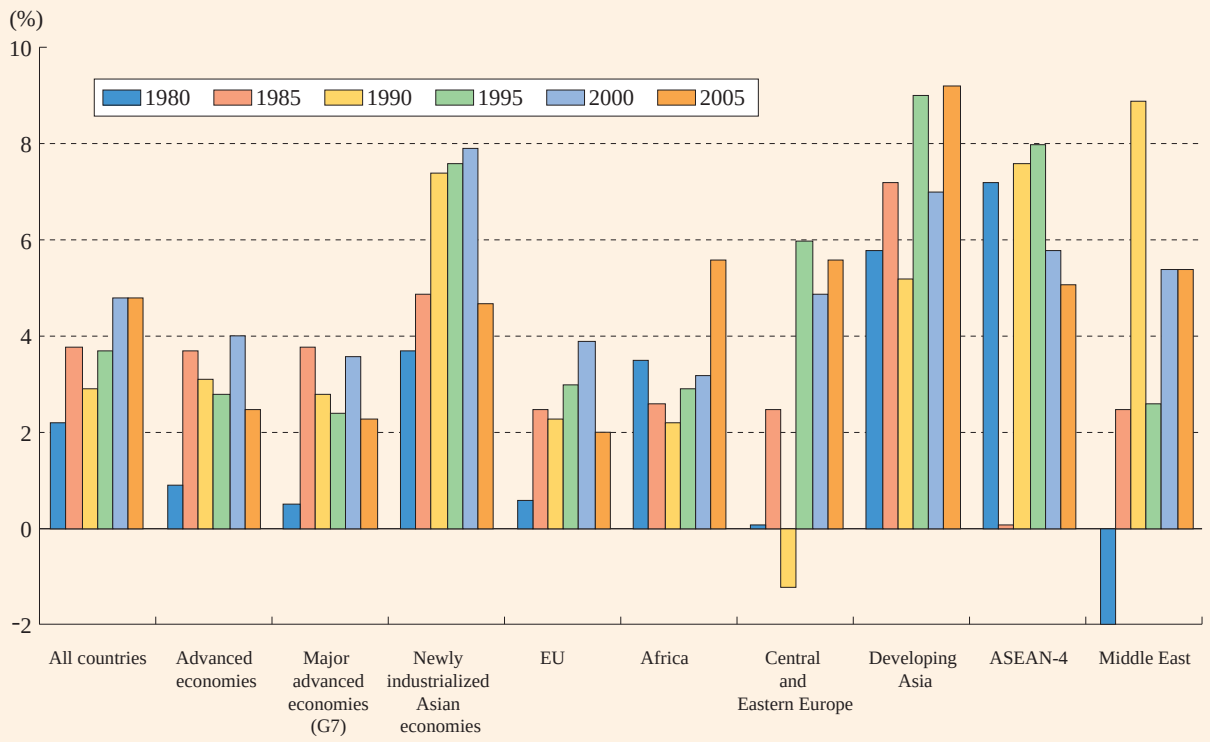
Against this backdrop of economic growth that continues at a high level, energy consumption is also increasing rapidly. Primary energy consumption in the Asian region was 13.7% of the world's total in 1971 but it rose to 31.1% in 2005. Carbon dioxide emissions are no exception. They increased from 15.1% of the world's total in 1971 to 35.8% in 2005.

Within the Asian region, economic growth in China and India is especially remarkable. Since 1979, China's average real GDP growth rate was about 9.7%; and since 2003, over 10% for five consecutive years. India has also taken up economic reform since 1991. It had an average annual growth of 6% in the 1990s and realized a GDP growth rate of 9.4% in FY 2006. In terms of primary energy consumption, China was No. 2 (14.5%) in the world in 2005, following the United States and India was No. 5 (3.7%), following Japan. In terms of carbon dioxide emissions, China was already the largest emitter in Asia and was No. 2 (19.0%) in the world, following the United States (22.0%). India has also seen a steady increase in emissions since the 1970s, reaching the same level as Japan (Figure 3-3-2).

In terms of per-capita energy consumption as of 2005, compared to the 7.9 TOE of the United States and 4.2 TOE of Japan, it was still low at 1.1 TOE in China and at 0.3 TOE in India. This means that the energy consumption of both countries is likely to continue to rise in tandem with their economic growth. Consequently, the carbon dioxide emissions will also increase.

The "World Energy Outlook 2007," published by IEA in 2007, predicted that the primary energy demand would increase 55% (annual average of 1.8%) between 2005 and 2030 and that China and India would account for 45% of that increase. It pointed out that China's primary energy

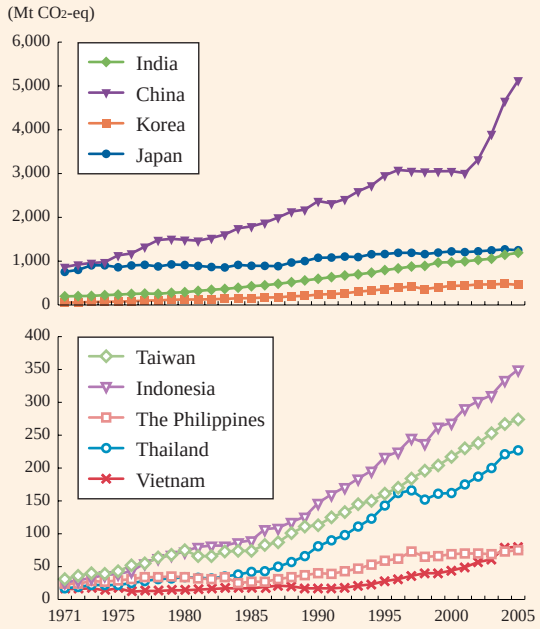
Figure 3-3-1 Changes in World Economic Growth by Region



Note: ASEAN-4 includes Thailand, Indonesia, Malaysia, and the Philippines

Source: Compiled by the Ministry of the Environment from the data of IMF, World Economic Outlook Database (October 2007)

Figure 3-3-2 Changes in CO_2 Emissions in Asian Countries



Source: Source: Compiled by the Ministry of the Environment from the data of IEA, *CO_2 Emissions from Fuel Combustion 2007*

demand would more than double from 1,742 million TOE in 2005 to 3,819 million TOE in 2030. Around 2010, China would surpass the United States as the world's No. 1 country in energy consumption. India's primary energy consumption is likely to more than double by 2030. In tandem with the increase in energy consumption, carbon dioxide emissions will also increase substantially. It is predicted that in 2030, China will surpass the United States and become the world's largest emitter and India will be in the third place, after the United States (Figure 3-3-3).

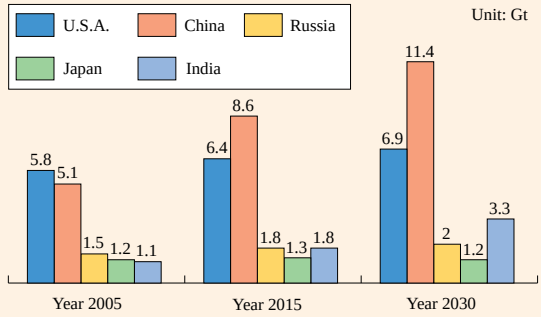
(2) State of Pollution in China and India

Due to rapid economic growth and changes in the industrial structure, the Asian region is faced with simultaneous and multiple environmental problems, making the implementation of anti-pollution measures an urgent task.

For example, the increase in the burning of coal and oil at thermal power generation plants and factories and surge in the number of automobiles led to a rise in the emissions of air pollutants such as sulfur oxide (SOx) and nitrogen oxide (NOx). Pollution in the city areas is especially severe. In 2004, the concentrations of particulate matter in the atmosphere in Chongqing, Tianjin, Calcutta, Delhi, and Jakarta were extremely high, at over 100μg/m^3, which is five times the WHO standard value (Figure 3-3-4).

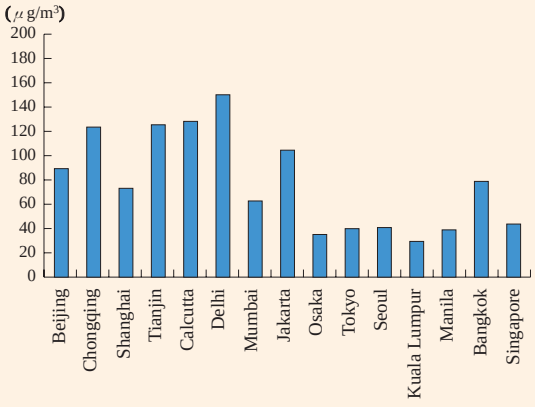
Such air pollution problems may not only pose health hazards domestically but also affect other countries through cross-border pollution. The Asian region must tackle the problem as a whole.

Figure 3-3-3 Future Prospect of CO_2 Emissions in Top Five Countries



Source: Compiled by the Ministry of the Environment from the data of IEA, *World Energy Outlook 2007*

Figure 3-3-4 Particulate Matter (PM) Concentration in Major Asian Cities (2004)



Source: Compiled by the Ministry of the Environment from the data of the World Bank, World Development Indicators 2007

2 Sharing Japan's Experience in Overcoming Pollution with Asia

(1) Basic Concept

As explained in Section 2, the two oil crises prompted Japan to adopt energy conservation measures, in addition to pollution prevention measures. In the face of severe environmental and energy constraints, the government and citizens joined forces in undertaking measures. As a result, Japan was able to improve energy efficiency by approximately 35% in the period between the first oil cri-

sis in 1973 and 2005. Today, Japan's pollution prevention technology and energy conservation technology are at the highest level in the world.

On the other hand, Asian countries must take immediate measures to tackle pollution resulting from rapid economic growth as well as energy conservation measures to mitigate global warming. By disseminating pollution prevention technology, which Japan developed from its experience of overcoming pollution, and energy conservation technology and systems to the Asian countries and prompting them to take actions, Japan can show Asian countries the way to a low carbon society. We will introduce here how Japan utilizes its experience to assist Asian countries.

(2) Co-benefit Approach to Global Warming Mitigation

Co-benefit means an activity that delivers two different benefits at the same time, referring here to the need of developing countries to pursue development and the need to mitigate global warming (Figure 3-3-5).

Despite the rising interest in environmental issues, developing countries in general tend to place the highest priority on development, which brings economic growth, but a relatively low priority on measures that mitigate global warming. Therefore, measures that fulfill the need for development while mitigating global warming are useful in motivating developing countries to curb GHG emissions actively, the effectiveness of which is also highlighted in the Working Group III Report of the IPCC Fourth Assessment Report.

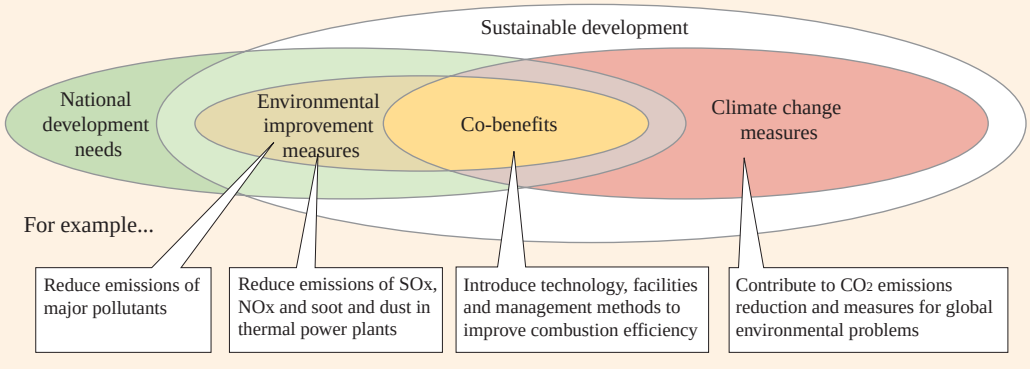
For the developing countries, pollution resulting from development is especially an important issue that needs to be addressed within the regions. A co-benefit approach to arrest global warming, which undertakes anti-pollution measures to resolve such regional environmental problems while implementing measures to mitigate global warming, is an effective means for advancing proactive measures to arrest global warming (Figure 3-3-5).

Air pollution, water contamination, and other environmental problems have become increasingly evident in developing Asian countries that are witnessing spectacular economic growth. Due to the countries' pressing need to address these environmental problems, helping these countries to adopt co-benefit measures to tackle both pollution and global warming at the same time will be an extremely effective way to diffuse global warming mitigation measures in the Asian region.

Co-benefit-type assistance for developing countries is already being carried out under the framework of Japan's Official Development Assistance (ODA) and by private companies in the form of development activities. For example, the comprehensive environmental improvement project in Guiyang, China is carried out under the "Sino-Japanese Environmental Model City Program" advocated at the 1997 Sino-Japanese Summit. It is reported that the project's measures focusing on equipment upgrade and anti-pollution have not only drastically reduced the emissions of pollutants such as SOx and NOx but also reduced carbon dioxide emissions by 1,067,400 tons.

To advance the co-benefit approach of global warming mitigation measures in the future, we need to step up efforts to raise awareness in the developing countries and provide financial assistance to support joint activities as well as research and development. To this end, Japan and China announced in December 2007 that the two countries would cooperate in implementing a co-benefit type joint research model project from 2008 onward to reduce pollutants and consequently GHG emissions. In the Bali Conference, Japan and Indonesia issued a joint statement

Figure 3-3-5 Concept of Co-benefit Approach to Global Warming Mitigation



Source: Ministry of the Environment

that the two countries would cooperate in environmental protection through co-benefit measures. To pave the way for the formulation of specific projects, we would draw up joint programs to transfer environmental technology and knowledge.

In addition, the Ministry of the Environment has started to implement CDM projects as model projects beginning in 2008 to meet the need for anti-pollution measures in developing countries in Asia.

(3) Environmentally Sustainable Transport (EST) in Asia

Due to rapid urbanization in recent years, many Asian cities are beset with various problems including air pollution from automobiles, noise, traffic congestion, and an increase in energy consumption in the transport field. At this time, per-capita car ownership in Asian cities is dramatically low compared to the developed countries. However, coupled with a rise in income from economic growth, if motorization advances rapidly, these problems will become more pronounced.

Motorization has progressed in Japan at a rapid speed since the late 1960s, and transport-related pollution problems, such as air pollution, also started to become conspicuous. Thanks to the strengthening of regulations to control exhaust gas, development of technology to reduce exhaust gas, and the popularization of low-emission vehicles, transport-related pollution problems have been ameliorated substantially. Nevertheless, as explained in the previous section, we must scale up efforts to build transportation systems and cities that will exert minimum environmental impacts in order for us to advance to a low carbon society.

Against this backdrop, Japan and the United Nations Centre for Regional Development (UNCRD) established the initiative “Regional EST Forum in Asia” beginning in 2005 with a view to resolving transport-related environmental problems in Asian countries. In the Third Meeting of the Regional EST Forum in Asia held in March 2008 in Singapore, besides the reporting of EST activities by various countries, a discussion was held focusing on using the co-benefit approach to advance global warming mitigation measures and economic development, an approach championed by Japan. The discussion resulted in the recognition that countries should avoid over-dependence on automobiles by improving public transport systems and that it is important to combine economic development with pollution prevention measures to reduce GHG emissions. Japan announced its intention to support collaborative schemes in Asia to promote EST in an integrated manner and co-benefit type measures in Asian countries.

It will become increasingly important for the Asian countries to share their issues and knowledge and work together to realize EST in the future.

Column Water Problems in the Asia-Pacific Region and the Global Warming

It is estimated that approximately 1.1 billion people worldwide are without continuous access to safe drinking water, and around 600 million people, notably the largest number of them, are in the Asia-Pacific region. It is acknowledged that one of the UN Millennium Development Goals aims at a 50% reduction of the number of people who are without access to safe drinking water by the year 2015. In addition, over 80% of casualties of water disasters such as floods and windstorms worldwide are concentrated in this region, further aggravating the water environment in the region. The global warming has grave impacts on human beings through water problems, and is already affecting water resources and water management, raising concern that this situation will worsen more severely in the future.

In December, 2007, the 1st Asia-Pacific Water Summit, the first international meeting where the heads of state from Asia and Pacific countries discussed the region’s water-related problems, was held, organized by Asia-Pacific Water Forum and the Steering Committee of the 1st Asia-Pacific Water Summit. Participating countries gave presentations on damage and crisis, including glacial lake outbursts and flash floods caused by the large-scale retreat of Himalayan glaciers, and sea-level rise in small island countries and low-lying areas posing a threat to water resources and their management. The importance of cooperation among the Asia-Pacific countries to tackle these water problems was recognized.

Our country has been working on the solution of global water problems. Water Environment Partnership in Asia seeks to promote good water management in Asia monsoon area through maintenance of information infrastructure related to water environment and human resource development.

(4) Financial Assistance through "Cool Earth Partnership"

As explained in Chapter 1, Prime Minister Fukuda proposed in the Davos Meeting that Japan would establish the "Cool Earth Partnership," a new funding mechanism that would provide a cumulative total of approximately 10 billion dollars over a period of five years to support developing countries committed to stabilizing the climate by pursuing both reduction in GHG emissions and economic growth. Through this mechanism, Japan will provide financial and technological support to help these developing countries to implement measures to reduce GHG emissions as well as assist countries susceptible to climate changes (island nations, Africa, etc.) in the implementation of adaptation measures. This will also pave the way for developing countries to participate actively in an effective post-2013 international framework for climate change.

In accordance with the Cool Earth Partnership, Japan and Indonesia are engaging in talks on the provision of yen loans for climate change measures.

It was agreed upon during the January 2008 visit by Japan's Minister of the Environment, Mr. Kamoshita, to Tuvalu, an island nation in the South Pacific, that Japan would review specific assistance measures. Japan also indicated then that it would take a leadership position among developed countries in providing assistance to developing countries. In addition, Japan has decided in February 2008 to provide grant aid to Senegal and Madagascar in Africa and Guiana in South America.

(5) Assistance in Human Resources Development

Human resources development with a long-term perspective is also an important tool in helping developing countries to become sustainable societies. Many developing countries do not have adequate monitoring techniques and implementation systems to track air pollution and other problems. Because they fail to monitor the state of pollution accurately, they also at times fail to take the appropriate remedial measures. Japan has experience in overcoming the abovementioned pollution and many baby boomers, in particular, have experience and expertise in monitoring and other fields. A system has been put in place through the Japan International Cooperation Agency (JICA) to dispatch these people to developing countries to monitor local conditions and to transfer the technologies of monitoring and analysis to the local people. More efforts should be made in the future to scale up the program.

Furthermore, to develop human resources (environmental personnel) who can lead social reforms to work towards a sustainable Asia from a long-term perspective, the Ministry of the Environment formulated the "Vision for Environmental Leadership Initiatives for Asian Sustainability in Higher Education" in March 2008. Based on this vision, Japan has formed a network with graduate schools in Asia to start providing support from FY 2008 to train environmental personnel in universities in Asian countries. The Scientific Capacity Building/Enhancement for Sustainable Development in Developing Countries (CAPaBLE) has been implemented since 2003 through funding provided for The Asia-Pacific Network for Global Change Research (APN) formed by 21 countries in the Asia-Pacific region. The program is contributing to the development of human resources by providing education and training to researchers of developing countries.

Conclusion

The World at a Turning Point in Building a Low Carbon Society

Without doubt, global warming is progressing and our Earth is now in crisis. If no actions were taken, the ecosystems would deteriorate on a global scale, aggravating the world's various problems, including water shortage, food crisis, and poverty. The foundation of human existence would be at risk and the sustainable development of our social economy would be hampered. Global environmental problems are closely related to human security. They pose the greatest challenge to humankind. Whether we can overcome this challenge, avert global crisis, build a low carbon society, and pass it on to the next generations depend precisely on the decisions we make and the actions we take today.

Taking the opportunity of the agreement arrived at in the Bali Action Plan at the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change in December 2007, countries in the world are stepping up efforts to overcome their conflicts of interest and to join forces in forming effective agreements to tackle global warming. However, differences in stance and opinion among countries have surfaced, making it a challenge for the world to work together to realize a framework for the period after the end of the Kyoto Protocol's first commitment period, as agreed upon in the Bali Action Plan.

In order for the world to tackle this problem, Japan must take the lead as an environmentally advanced country in implementing global warming mitigation measures through international cooperation. Japan has a lifestyle and history that are in harmony with nature. It has also accumulated technologies for overcoming environmental and energy problems. To reduce GHG emissions on a global scale, Japan must accelerate global warming mitigation measures and at the same time, step up international cooperation to share Japan's experience with the developing countries. In July this year, the G8 Hokkaido Toyako Summit will be held, with environmental problems, including global warming, as its main agenda. As the chair of the Summit, Japan will take the lead in forging a framework that has the participation of all major emitting countries in order to make a concrete reduction in the world's GHG emissions.

The global warming issue forces us to make an effort to use resources and energy efficiently and to reexamine our socio-economic activities and lifestyle of mass production, mass consumption, and mass disposal. To build a low carbon society, all sectors that make up the society must realize the finite nature of the earth and give the utmost consideration to minimizing GHG emissions. To avert global crisis, every one of us who makes up the society today is asked to treat global warming as his or her own problem and start taking action now.

Overview 2

The World Has Reached a Turning Point in the Creation of a Sound Material-Cycle Society, and Japan's Efforts

Overview 2

The World Has Reached a Turning Point in the Creation of a Sound Material-Cycle Society, and Japan's Efforts

Introduction

Conventional socioeconomic activities based on mass production and mass consumption lead to the creation of mass-disposal societies and hamper environmental protection and the development of sound material cycles. In Japan, about 470 million tons of waste is generated annually. The increasingly diverse nature of wastes produced is making disposal more and more difficult and environmental burdens are increasing due to inappropriate disposal. This situation is further aggravated by the shortage of landfill capacity at final disposal sites, as demonstrated by the fact that the remaining useful life of final disposal sites for industrial wastes averages approximately 7.7 years, across the country, and only about 3.4 years in the metropolitan Tokyo area.

Such socioeconomic activities are also closely related to concerns about the exhaustion of natural resources (especially fossil resources), global warming caused by greenhouse gases, the destruction of nature through large-scale resource extraction, and the disturbance of natural material cycles in the natural world. These activities, along with the global warming crisis and the ecosystem crisis, feed on each other in a vicious circle and represent deteriorating global environmental problems. In particular, waste disposal problems are becoming increasingly serious in developing countries, especially in fast-growing Asian regions. Some estimate that the worldwide amount of waste generation in 2050 will be double the amount in 2000. Furthermore, recent increases in demand for resources, worldwide, and soaring resource prices have raised concerns over the stable supply of resources, adding tighter resource-related constraints not only to resource-scarce Japan but also to other countries in the world.

If human beings continue these socioeconomic activities, we will face constraints on both resource availability and the environmental capacity to accept further waste, which may hinder the sustainable development of society and the economy.

In light of the current situation, there is an urgent need to step up efforts towards a sustainable society and to integrate these activities with efforts towards a low-carbon society and a society in harmony with nature so that a sound material-cycle (SMC) society based on lower natural resource consumption and lower environmental burdens can be successfully established in Japan, as well as in the rest of the world.

With this in mind, we analyze the world as it is approaching a turning point in the establishment of a SMC Society.

It first describes how Japan has taken the initiative in creating a SMC Society and disseminating information on the 3Rs, and describes the kinds of 3R activities that are being carried out in the developed world, including the G8 and the OECD. This provides an overview of the world as it approaches an important turning point in the establishment of an international SMC Society. This chapter also provides as much information as possible on 3R activities discussed at the G8 Environmental Ministers Meetings and the G8 Summit. This year, the Fundamental Plan for Establishing a SMC Society was revised for the first time in five years (decided by the cabinet March 2008) . In line with the revised Fundamental Plan, Japan will take measures to establish a SMC Society mainly through (i) the integrated promotion of efforts toward a low-carbon society, a society in harmony with nature and efforts toward a SMC Society, (ii) the construction of SMC blocks, (iii) the achievement of newly set numerical targets such as material flow indicators and effort indices, and (iv) international contributions that take account of growing resource consumption and waste generation in Asian countries.

Chapter 2, titled "History of Japan's sound material-cycle society," examines the SMC Society from a historical perspective. Japanese society in the Edo era is believed to have been a SMC Society based on community activities. People in those days were engaged in social activities involving lower carbon emissions and lived their lives with a deeper awareness of being in harmony with nature. Efforts taken during this period clearly suggest that a sustainable society can be established through the

comprehensive promotion of a low-carbon society, a society in harmony with nature and a sound material-cycle society. (For example, Edo possessed a safe and sanitary night soil recycling system in which night soil stored in night soil reservoirs was carried to villages around the Musashi no Kuni region in order to be bartered for farmers' agricultural produce.)

Chapter 3 focuses on the establishment of Spheres of SMCs. In recent years, efforts have been made towards establishing a SMC Society by means of various levels of SMC blocks. This chapter describes and examines the concept of SMC blocks, as spelled out in the Second Fundamental Plan for Establishing a SMC Society, and discusses issues from the perspective of the integrated establishment of a low-carbon society, a society in harmony with nature and a SMC Society. By citing specific examples, this chapter illustrates how collaborations among different entities play a critical role in establishing successful SMC blocks.

Chapter 4 examines the prospects for establishing a SMC Society in East Asia, involving Japan's cooperation. This chapter describes how active Japan is in promoting the establishment of a SMC Society with not only East Asia but also the entire international society. Japan has an important role to play in creating a SMC Society in East Asia. Specifically, Japan should understand the detailed needs of East Asian countries, consider country-specific situations, such as the status of economic infrastructure, and determine which of its technologies, systems and experiences are suitable for each country before transferring them in a manner that ensures the protection of intellectual property rights. By highlighting past cooperation results and future prospects, this chapter also outlines Japan's efforts to transfer such technologies and systems in a well-planned manner.

Chapter 1

The world in transition, and Japan's efforts to establish a Sound Material-Cycle Society

The 20th century saw the world move toward economic growth and the emergence of a mass-production and mass-consumption society in developed countries. However, developments in the 20th century also caused the collapse of the primitive sound material-cycle (SMC) society and produced major environmental problems, including pollution and dioxin problems. Japan, which achieved rapid economic growth in the latter half of the century, also faced pollution and other serious environmental problems and sought ways to solve them. In recent years, Japan has dedicated itself to the solution of the waste management problems which followed the previous environmental problems and has been creating a new SMC Society. The nation's new challenge is to take an integrated approach to the establishment of a low-carbon society in order to counter the major problem of global warming, to create a society in harmony with nature that helps conserve ecosystems and will allow people to enjoy the blessings of nature for many years to come, and to establish a SMC Society.

On the other hand, the 21st century, which has been called the century of the environment, is seeing rapid economic growth in developing countries, especially in Asia, and the associated generation of huge amounts of wastes. As waste management problems become more serious, there is a growing need to address problems such as global warming and the security of resources, which are expected to be in short supply as demand increases.

With these developments in mind, we reevaluates the primitive SMC Society that Japan created in the Edo era and examines the process that has been underway since about 2000 to establish a new SMC Society in Japan. The experience gained by Japan has involved the creation of many technologies, frameworks and systems which should have the potential to make a major contribution not only to Japan's future ability to establish a SMC Society but also to its integrated efforts to create a low-carbon society and a society in harmony with nature, in keeping with the mottainai spirit (not being wasteful with goods), and will assist the formulation of future policy measures by other countries, including developing countries.

Section 1 The international situation related to waste management

The amount of global waste generation is increasing as the economy and population continue to grow, all around the world, especially in Asia (Figure4-1-1).

A forecast on municipal solid waste generation in the member states of the Organization for Economic Cooperation and Development (OECD) *(OECD Environmental Outlook to 2030)* estimates that the total waste generation in the OECD member states in 2005 was about 1.7 times the amount in 1980, and that the 2025 amount will be about 2.2 times the 1980 figure (Figure4-1-2).

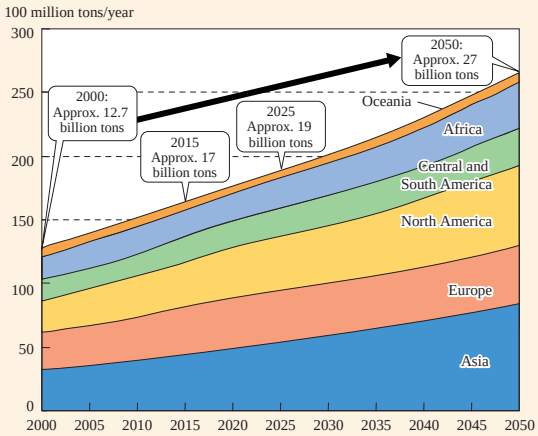
A wider variety of wastes is also emerging, including medical wastes and so-called e-wastes, or electrical and electronic wastes such as TVs, personal computers and refrigerators after which become unusable. Some of these wastes contain hazardous substances or cause infection and must be treated with special care.

In January 2008, a serious incident related to waste management occurred in Naples, Italy. The city's final disposal site reached full capacity and the wastes that had no other "outlet" were left on street corners (Figure4-1-3).

(1) International recycling of waste

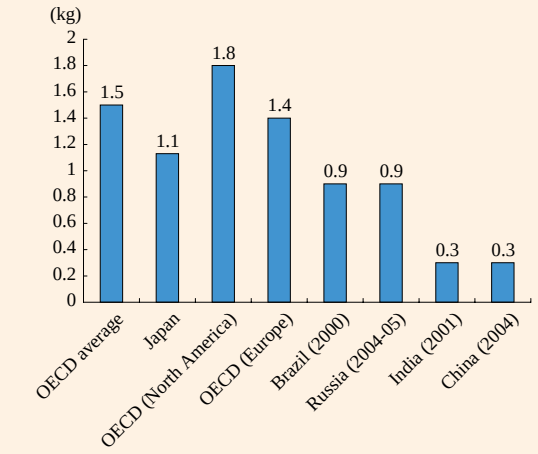
Meanwhile, the prices of natural resources are soaring due to increasing demand for natural resources, especially in China. Demand is also growing for certain circulative resources (CRs) distributed for commercial gain, such as metal scrap, used paper and waste plastic, as the economies of China and other East Asian countries develop. As a result, imports of such CRs into these countries have surged recently. For example, steel scrap exports from Japan almost tripled from approximately 2.81 million tons in 2000 to approximately 7.63 million tons in 2006 (Figure4-1-4).

Figure 4-1-1 Future Prospects of World Waste Generation [2000-2050]



Source : A paper written by Prof. Tanaka of Okayama University

Figure 4-1-2 Per capita daily municipal solid waste generation in OECD countries (2005)

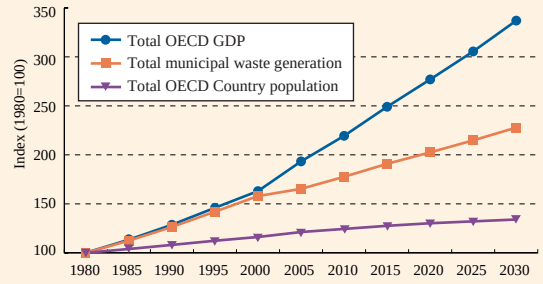


Source: Created by the Ministry of the Environment, based on OECD data

Such increases in the international movement of CRs, especially those from developed countries to developing ones, can be attributed to the following factors: (i) recycling laws enacted in developed countries have helped increase the amount of CRs recovered, establishing new supply sources for CRs; (ii) as many companies in developed countries have moved their production to developing countries in Asia and other regions, developing countries are finding that the amounts of CRs collected domestically are too great for them to use by themselves; (iii) as a result of economic growth in importing countries, demand for resources has increased so much that the amounts of CRs generated within the country are no longer large enough to meet demand[1].

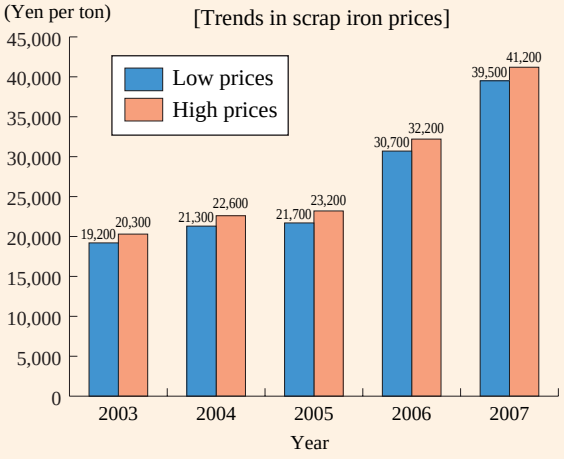
Such transboundary movements of CRs can, as long as they are environmentally sound, enable resources to be reused and recycled more efficiently and inexpensively. They can also foster the development and growth of the recycling industry and can therefore contribute to not only

Figure 4-1-3 OECD Country municipal waste generation (1980-2030)

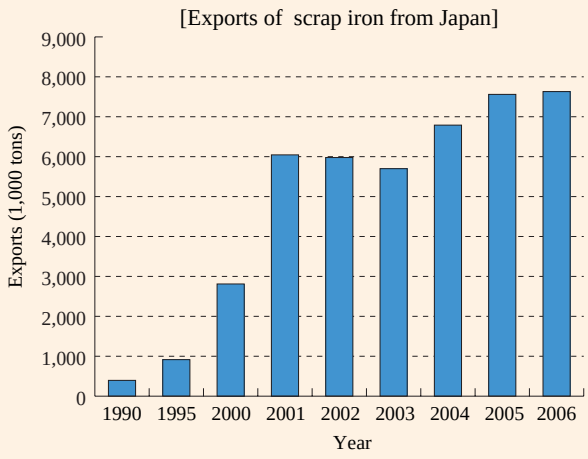


Source: Prepared by the Ministry of the Environment, based on OECD data

Figure 4-1-4 CR prices and exports



Note: The scrap iron (scrap steel) prices are H2 scrap cash prices (including delivery) for every December.
Source: Japan Iron and Steel Recycling Institute



Source: Ministry of the Environment

1 *International Trade of Recyclable Resources in Asia,* Edited by Michikazu Kojima, Institute of Developing Economies

employment creation but also the establishment of a sustainable society in developing countries.

On the other hand, there are several important challenges associated with the transboundary movement of CRs. One of these challenges is that an outflow of resources from a country (in the form of exports of CRs, based on market principles) can lead to a slowdown or a hollowing out of the domestic recycling industry. Some point out that this may hinder Japan's ability to steadily maintain and strengthen its waste management and recycling structures that have been built up over the years. In addition, it is known that some CR importing countries have yet to fully establish a mechanism for responsible waste management and are therefore posing a risk of environmental pollution. Another consideration is that imports of secondhand products and recycled products can be regarded as transboundary movements of potential wastes because these products can turn into wastes after a short time of use, offsetting their availability at low prices in the importing countries and the fact that this allows effective use to be made of resources. Initiatives to establish an international SMC Society should take account of disadvantages such as these (Figure4-1-5).

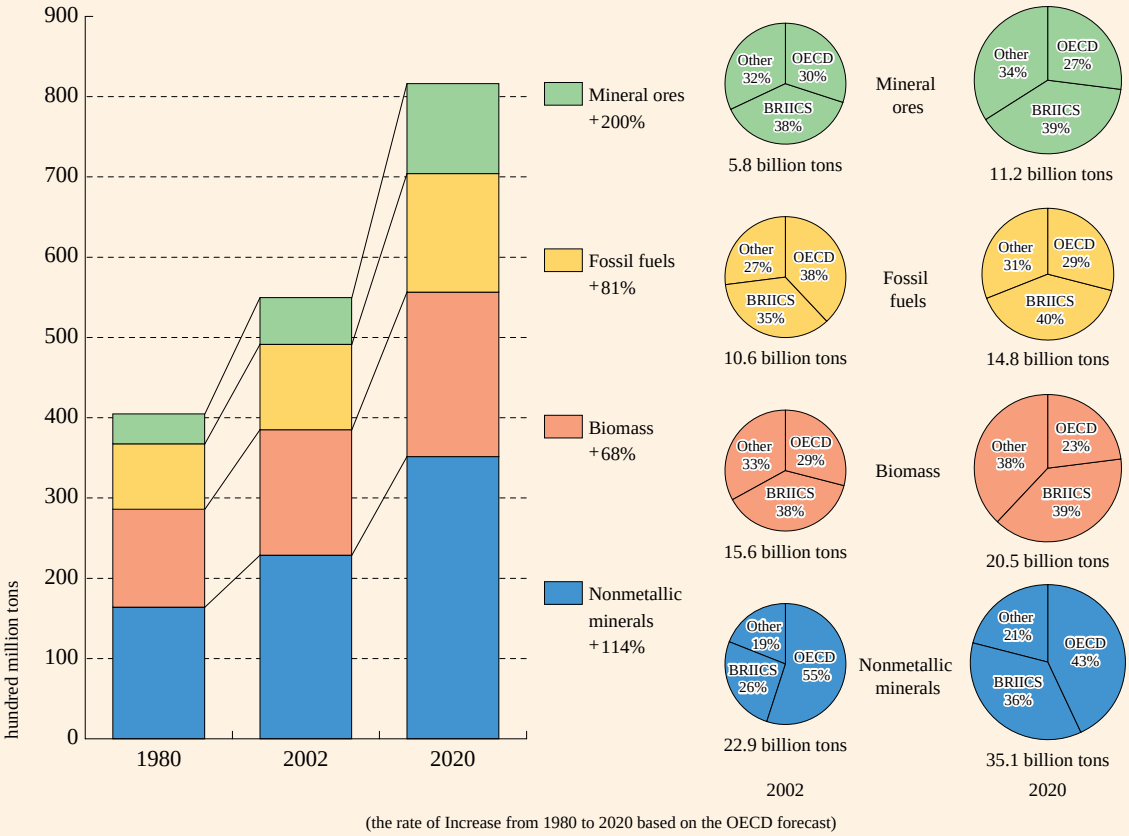
(2) Efforts by the international community and Japan

Japan faced serious waste management problems in the 1990s, such as a shortage of final disposal sites and large-scale illegal dumping cases, all of which raised concerns about environmental pollution. However, radical policy reforms implemented in the early stages of these problems allowed Japan to become a world leader in the establishment of a SMC Society by the early 21st century.

Based on such experience, at the G8 Sea Island Summit in 2004, Japan proposed the "3R Initiative," aimed at internationally promoting the establishment of a SMC Society through 3R activities. The 3Rs refer to restraining generation (Reduce), reuse (Re-use) and regeneration (Recycle), and represent the concept of balancing environmental conservation and economic growth through the effective use of resources. The G8 leaders endorsed this proposal and adopted it as the G8's new initiative, which led to the announcement of the "Science and Technology for Sustainable Development: '3R' Action Plan and Progress on Implementation."

Following on from this, the Ministerial Conference on the 3R Initiative was held in Tokyo in April 2005 to officially launch the 3R Initiative. On this occasion, Japan

Figure 4-1-5 Global resource extraction, by region and type of resource (1980, 2002, 2020)* BRIICS (Brazil, Russia, India, Indonesia, China, and South Africa)



(the rate of Increase from 1980 to 2020 based on the OECD forecast)

Source: Prepared by the Ministry of the Environment, based on OECD data

announced “Japan’s Action Plan for a Worldwide Sound Material-Cycle Society through the 3R Initiative” (also known as “Japan’s Action Plan to Promote Global Zero-Waste Societies”). Japan put forward another proposal at the G8 Summit in Saint Petersburg, Russia, in 2006, and the G8 countries all agreed that they would set appropriate targets, taking account of resource productivity, furthering efforts to optimize the resource cycle. In addition to its involvement at summit meetings, Japan has also been leading international discussions on 3R promotion and fostering political dialogue and information sharing through the Senior Officials Meetings on the 3R Initiative, held in March 2006 and October 2007.

Japan’s leadership in other international discussions, not just those of the G8, can be observed in its involvement with the OECD’s ongoing project on material flows and resource productivity and in the fact that a Japanese delegate serves as the chair of the Working Group on Environmental Information under the OECD Environment Policy Committee. From the viewpoint of promoting the 3R Initiative, Japan also supports the International Panel for Sustainable Resource Management, which was organized by the United Nations Environment Programme (UNEP) in 2007 for the purpose of scientifically evaluating the environmental effects of the use of natural resources.

In April 2008, the OECD-UNEP Conference on Resource Efficiency was held in Paris, bringing together relevant ministers, senior government officials in charge, experts, businesses, NGOs and the like from around the world. The participants affirmed the importance of sharing best practices on national initiatives and continuing efforts to improve resource efficiency. The meeting of OECD Environmental Ministers that took place following the above conference also reaffirmed the perception that 3R activities and resource productivity improvement are of major importance with regard to restricting natural resource consumption and reducing environmental burdens (Figure4-1-6).

To provide guidelines for Japan’s contribution to building a future framework for the world, the Cabinet endorsed “Becoming a Leading Environmental Nation Strategy in the 21st Century ~ Japan’s Strategy for a Sustainable Society” in June 2007, setting out the direction of the environmental policies that Japan should implement in cooperation with other countries. This document cites “the construction of a sound material-cycle society through 3R activities” as one of the eight priority strategies to be rolled out within the next year or two. Specifically, this centers on two goals: efforts to construct a SMC Society in Asia and the promotion of the 3R Initiative, proposed by Japan, within the G8. In order to achieve the first goal, the national strategy stipulates that Japan should carry out the following actions: disseminate Japan’s 3R systems, technologies and experience to the international community and establish an international information center on the 3Rs along with common rules on the 3Rs; integrate Japan’s accomplishments on sustainable resource circulation with the formulation of the East Asia Sound Material-Cycle Society Vision, which spells out the basic concept and targets for establishing an East Asia SMC Society, and thereby seek to create a sound and smoothly functioning resource cycle across East Asia.

With respect to the Asian region, Japan has been supporting Asian countries’ activities since the launch of the 3R Initiative, in line with Japan’s Action Plan to Promote Global Zero-Waste Societies. This support includes assisting counties in developing a 3R plan or strategy and providing information on 3R systems, technologies and expe-

Figure 4-1-6 Examples of material flow information and their relation to policy targets

Official material flow indicators (approved or proposed)

Qualitative targets → Quantitative targets → Time-framed quantitative targets

Broad consideration of sustainability → Focus on resource efficiency/productivity

Belgium	Denmark	Finland	Sweden	U.K.	Austria	Netherlands	Portugal	Germany	Italy	Poland	Japan
- Decoupling of resource consumption and economic growth	- More efficient use of resources	- Resource efficiency and life cycle	- Efficient cycles for non-hazardous substances and resources	- Improvement of resource efficiency	- Resource productivity (Factor 4)	- Dematerialization (Factor 4)	- Resource use in industry (Factor 1.5)	- Material productivity (Factor 2 in 2004-2020)	- Total material requirement (TMR) - 25% reduction by 2010 - 75% reduction by 2030 - 90% reduction by 2050	- Strength of materials, water and waste in manufacturing (50% reduction in 1990-2020)	Targets for 2000-2015: - 60% increase in resource productivity (GDP/DMI) - 40-50% increase in the cyclical use rate - 60% reduction in final disposal amount

Source: Prepared by the Ministry of the Environment, based on OECD data

Abstracts of Chair's Summary G8 Environment Ministers Meeting

Kobe, Japan
May 24-26, 2008

The 3Rs

Progress of the 3R Initiative

31. The contributions of the 3R Initiative in advancing 3Rs activities in each G8 member country and other countries since its proposal at the G8 Sea Island Summit in 2004 were recognized. It was also recognized that the 3R Initiative has provided a platform for sharing information and exchanging views and experiences on 3Rs-related policies among the G8 and other countries. It was noted that the 3R Initiative has demonstrated the G8 countries' determination to contribute to the establishment of a sustainable society.

Prioritized implementation of 3Rs policies and increases in resource productivity

32. It was observed that the promotion of the 3Rs and increases in resource productivity are important for achieving sustainable development in both the G8 and other countries. Towards that end it was also observed that comprehensive policies comprising both regulatory and market-based tools, and addressing the full life-cycles of products are needed. Furthermore, the need for policies to further stimulate technological development and innovation and to create markets for resource-efficient products was acknowledged. However, it was also recognized that governments alone cannot produce the necessary changes and that the contribution of all actors and sectors of society is crucial.

33. In addition to environmentally sound waste treatment and recycling, high priority was placed on waste reduction. Several efforts to reduce the use of disposable plastic bags and other single-use consumer products were described. Japan observed that China, Japan, and the Republic of Korea will jointly call for other countries to follow suit. It was noted that substantial reductions of waste generation and resource utilization require fundamental changes in awareness and lifestyle.

34. It was noted that both G8 and non-G8 countries recognize that strong linkages and the co-benefits exist between the promotion of environmentally sound waste management and the 3Rs, and the reduction of greenhouse gas emissions. In addition, the views from non-G8 countries emphasizing the importance of developing and disseminating technologies for the promotion of the 3Rs in accordance with national circumstances were also noted.

35. The progress and achievements of the work by the OECD on material flow analysis and resource productivity and the contributions on sustainable resource management by UNEP were welcomed.

Establishment of an international sound material-cycle society

36. The occurrence of severe health and environmental problems related with improper recycling of end-of-life products, such as e-waste, as well as with improper ship dismantling, in developing countries were considered. However, the potential resource value of such materials was also recognised. The hope was expressed that further collaboration between the 3R Initiative and the Basel Convention[2] will both promote capacity building for environmentally sound waste management in developing countries and facilitate sound international resource circulation.

Confirmation of the significance of collaboration for capacity development in developing countries

37. The importance of technical and financial support toward capacity development for the 3Rs in developing countries, building on existing frameworks, was observed. It was also observed that there is a need for improved coordination of international assistance related with the 3Rs and better synchronization of development agencies' activities in this field were called for. Furthermore, it was noted that effective capacity development requires a multi-stakeholder approach, involving the private sector, local governments and NGOs.

Agreement on Kobe 3R Action Plan

38. G8 Ministers agreed on the Kobe 3R Action Plan and to report the progress in 2011. Finally, Japan observed that it has launched its "New Action Plan towards a Global Zero Waste Society," which it hopes will stimulate further international co-operation in the spirit of the Kobe 3R Action Plan.

2 The United States is not a party to the Basel Convention.

rience. Such activities have laid the groundwork for the establishment of an East Asia SMC Society.

In addition, the Asia 3R Conference was held in Tokyo in October 2006. This was the first conference that brought together policymakers from Asian countries to discuss waste management and 3R promotion. The participants agreed on the importance of promoting the 3Rs. The conference convened for the second time in March 2008 in order to share updates on the recent progress of each country's 3R policies and exchange opinions on effective measures for promotion, directed towards future expansion. The results of the conference have provided valuable input to etc, G8 Environment Ministers Meetings, held in Kobe in May 2008.

Japan has made up Kobe 3R Action Plan as a chair at G8 Environment Ministers Meetings. This is very significant because it is going to promote each country set some targets such as Resource Productivity matched to particular each circumstance.

Section 2 Japan's efforts directed towards establishing a SMC Society

(1) The outline of the Fundamental Plan for Establishing of a SMC Society

The Fundamental Plan for Establishing a SMC Society approved by the Cabinet in March 2003 (hereinafter referred to as "the First Fundamental Plan") was modified, and the revision (hereinafter referred to as "the Second Fundamental Plan") was approved by the Cabinet in March 2008.

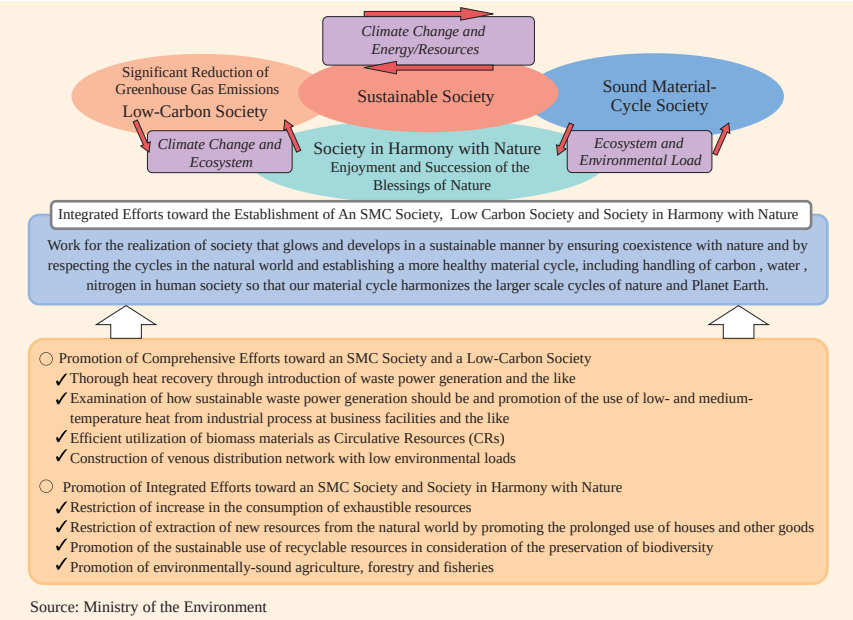
A major event related to Japan's environmental policy since the formulation of the First Fundamental Plan was the establishment of the Third Basic Environment Plan (approved by the Cabinet on April 7, 2006) and the 21st Century Environment Nation Strategy (approved by the Cabinet on June 1, 2007). The previous three reviews of the First Fundamental Plan's progress had highlighted the need for a more accurate assessment of material flows; a greater effort to raise public awareness; the promotion of SMC-based community development; and stronger measures to incorporate international perspectives in order to address the situation in which international movements of materials are increasing and waste generation and demand for resources are expanding, worldwide.

This was also the time when Japan was expected to take the initiative in rolling out 3R activities across the international community, with the G8 Hokkaido Toyako Summit scheduled for the following year.

In light of these developments, the Central Environment Council released, on August 24, 2007, a document titled "Detailed Guidelines for the Formulation of a New Fundamental Plan for Establishing a SMC Society." This document spelled out priority considerations to be addressed when developing specific measures needed for the formation of a SMC Society.

The guidelines suggested four issues on which further discussion should take place and specific measures should be set forth: (i) integrated efforts toward a SMC Society, a low-carbon society and a society in harmony with nature, to assist the creation of a sustainable society; (ii) formulation of the quantitative vision for a SMC Society, including the redefinition of target levels and introduction of new supplementary indicators, as needed; (iii) establishment of SMC blocks, in which resource cycles of optimal size are formed in accordance with the region's characteristics and the properties of the CRs available, and the waging of a national campaign to promote the 3Rs involving increased efforts to reduce and reuse waste; (iv) dis-

Figure 4-1-7 Deployment of Integrated Efforts toward A Sustainable Society



Source: Ministry of the Environment

Figure 4-1-8 Overview of the 2nd Fundamental Plan for Establishing a Sound Material Cycle Society (decided by the Cabinet on March,2008)

Current situation and Issues

- All three indicators; "resource productivity", "cyclinical use rate" and "final disposal amount" improves towards year 2010 targets set by the 1st fundamental plan and are expected to achieve the targets. However, reduction of household waste progresses rather slowly. Need to respond to global environmental issues such as worldwide resource limitation as well as global warming
- Thus, it is necessary to further develop sound material cycle societies both domestically and internationally by implementing the 3Rs thourughly

Mid-to-long term image of SMS

- Realize "Sustainable Society" by integrating with activities to realize "low carbon society" and "nature harmonious society"
  Realize "Stock-based Society" by stocking and utilizing goods to achieve wealthy society
- Regionally-characteristic SMS (Spheres of sound material cycle) , Lifestyle along the concept of Mottainai, Collaboration and partnership between stakeholders, and dissemination of the 3Rs into economic activities including manufacturing

Activities of stakeholders

◯ Partnership and Collaboration
Mutual collaboration of every stakeholders to establish sound material cycle society

◯ Citizens
- Campaign of life style change such as "my chopsticks" and "my bag"

◯ Businesses
- Prevention of illegal dumping and implementation of the 3Rs
- Advanced waste management, inter-industrial collaboration

◯ NGO/NPO and Universities and others
- Interface of collaboration and partnership
- Accumulation of knowledge and reliable information

◯ Local governments
- Partnership with stakeholders and implementation of nation-wide activities

◯ National government
- Partnership among stakeholders and implementation of nation-wide activities

① Integrated efforts with low carbon and nature-harmonious society (waste power generation and biomass utilization),
② Establishment of "spheres of sound material cycle",
③ National campaign on the 3Rs,
④ Promotion of sound material cycle business through various measures such as green purchasing,
⑤ Development of 3R mechanisms focusing on reduction,
⑥ Advanced 3R technology and system,
⑦ Information gathering and development of human resources,
⑧ Establishment of international sound material cycle society based on action plan to promote global zero waste societies, East Asia vision of sound material cycle society, or improving resource productivity

Source : Ministry of the Environment

Figure 4-1-9 Enhancement of material flow indicators and effort indices

Enhanced Indicators in the New Fundamental Plan (Material flow indicators)

Directions

1. Establish new numerical targets with FY 2015 as the target year.
2. Measure the progress of the integrated development of the efforts toward a low-carbon society and a sound material-cycle society.
3. Assess imports and exports of CRs as well as the environmental loads generated overseas through the extraction and use of resources by incorporating international viewpoints into the indicator system.

1 Indicators for which Quantitative Targets are Set
(1) "Inlet": Resource Productivity (= GDP/Natural resources and the like input)
(2) "Cycle": Cyclical Use Rate (= Amount of cyclical use / Total material Input)
(3) "Outlet": Final Disposal Amount (= Final disposal amount of waste)

2 Supplementary indicators for which quantitative targets have been set
(1) Resource productivity excluding earth and rock resources input
(2) Coordination with efforts toward low-carbon society
[1] CO_2 emission reduction in the area of waste
[2] Greenhouse gas emissions from waste and greenhouse gas emissions from fossil fuel, which can be replaced by recycling of waste into raw fuel, waste power generation and the like (measurement)

3 Indicators to monitor changes
(1) Resource productivity of fossil resources
(2) Biomass resources input rate
(3) TMR (Total Material Requirement) as a hidden flow (Measurement example: About 21 times the import of metallic resources)
(4) Indicators based on international resource cycles
(5) Resource productivity by industry area

4 Issues to be examined
Development of inventory concerning the computation of environmental loads and conversion factor that can be share internationally should be clearly defined as agenda to be examined in the future.

Enhanced Indices in the New Fundamental Plan (Effort Indices)

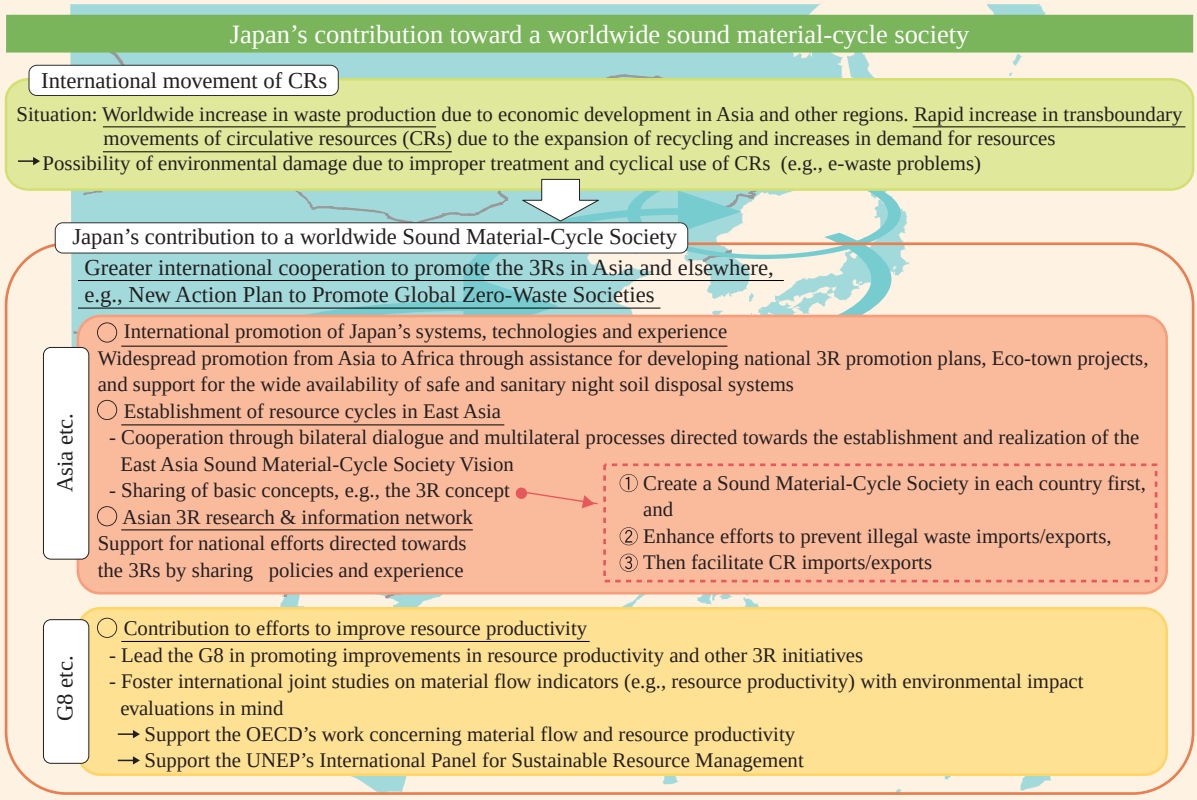
1. Enhance and strengthen effort indices by dividing them into Indices for which targets are set and Indices to monitor changes.
2. Define Indices to promote reduce and reuse, e.g., reduce in general waste and the rate of refill products shipped.
3. Strengthen Indices to measure efforts by local governments, which play a key role in establishing an SMC society, e.g., municipalities most active in promoting the 3Rs and the number of environmental workshops and mutual exchange sessions held.

1 Indices to set a target
(1) Reducing the Quantity of Waste
a. Reducing the quantity of municipal solid waste
b. Reducing the amount of industrial waste
(2) Changes in awareness of and attitude toward an SMC society
(3) Promoting SMC Society Businesses
a. Promoting green purchasing
b. Promoting environmental business management
c. Expanding SMC society business market
(4) Steady implementation of individual recycling laws and the like

2 Indices to monitor changes
(1) Size of the market for rental and lease businesses and the shipping rate for refill products
(2) Rate of refusal of free plastic shopping bags (rate of "bring my own shopping bags") and the volume of sales of disposable products (e.g. imported chopsticks)
(3) Size of the market for secondhand goods and the rate of use of returnable bottles
(4) Number of stadiums introducing "reusable cups" and the like
(5) Number of fundamental plans for sound material cycles and the like at local levels
(6) Percentage of local governments that are implementing paid garbage collection and top municipalities in terms of waste reduction efforts
(7) Number of resource recovery facilities (recycle plazas and the like)
(8) Rate of recycling of municipal solid waste, total amount of waste collected, top municipalities in terms of recycling efforts, percentage of local governments that are implementing sorted collection, and amount of sorted collection by municipalities by item, and the like
(9) Number of environmental learning and exchange meetings held by local governments and the like, and number of applications to the "Assistance Program for local communities Establishing an SMC Society"

Source: Ministry of the Environment

Figure 4-1-10 Outline of the establishment of a worldwide Sound Material-Cycle Society



Source : Ministry of the Environment

semination of Japan's systems, technologies and experience related to 3R promotion to the international community and the implementation of measures to ensure correct resource circulation in East Asia, from an international viewpoint.

The Second Fundamental Plan, which was formulated in line with the above guidelines, sets out the basic direction of the national efforts. Since the natural material cycle, and the material cycles in socioeconomic systems that are part of it, are inseparable, the government will need to take both into account in order to ensure an environmentally sound water cycle and foster the appropriate cycling of nitrogen and other materials in nature. The plan's details are described below (Figures4-1-7, 4-1-8, 4-1-9, 4-1-10).

Pursuant to this Second Fundamental Plan, the government will comprehensively implement various other related measures.

(2) Indicators and numerical targets for establishing a SMC Society

To quantitatively evaluate progress in the development of a SMC Society, the Second Fundamental Plan defines material flow indicators and effort indices.

Effort indices are used to measure the progress of measures and initiatives being implemented by different entities to assist the establishment of a SMC Society.

A Material flow indicators

Intensive discussions were held in order to define material flow indicators during the 10 meetings of the Material Flow Study Group (chaired by Dr. Itaru Yasui, former vice-rector of the United Nations University), from June 2006 to January 2008. In addition, the government and the OECD jointly hosted an international seminar on material flows and resource productivity, at which the general chair was Dr. Yuichi Moriguchi from the Research Center for SMC and Waste Management, the National Institute for Environmental Studies. The aim of this seminar was to bring together experts in indicators and statistics from OECD member states, China, India and Russia. The indicators were improved and enhanced by means of these processes, based on cutting-edge knowledge from Japan and abroad.

When establishing a SMC Society, it is essential to know what kinds of waste are generated where, and in what quantity. The accurate acquisition of this information allows the causes of waste generation to be identified and facilitates both restraining generation and the cyclical use of waste.

Such information is not only applicable to the waste generation process but is also useful for promoting the efficient

use of the total material input to a society. Japan should, therefore, first clarify its nationwide material flows. This will then be of great help in future policymaking.

The government has created a diagrammatic illustration of material flows (Material Flow Chart) by calculating the material flows that encompass all movements of materials in an economic society and then collecting data that show how much resources were input into the Japanese economic society, how much were reserved in society, consumed as energy, or turned into waste, and how much of the generated waste was recycled or disposed of in final disposal sites (Figure4-1-11).

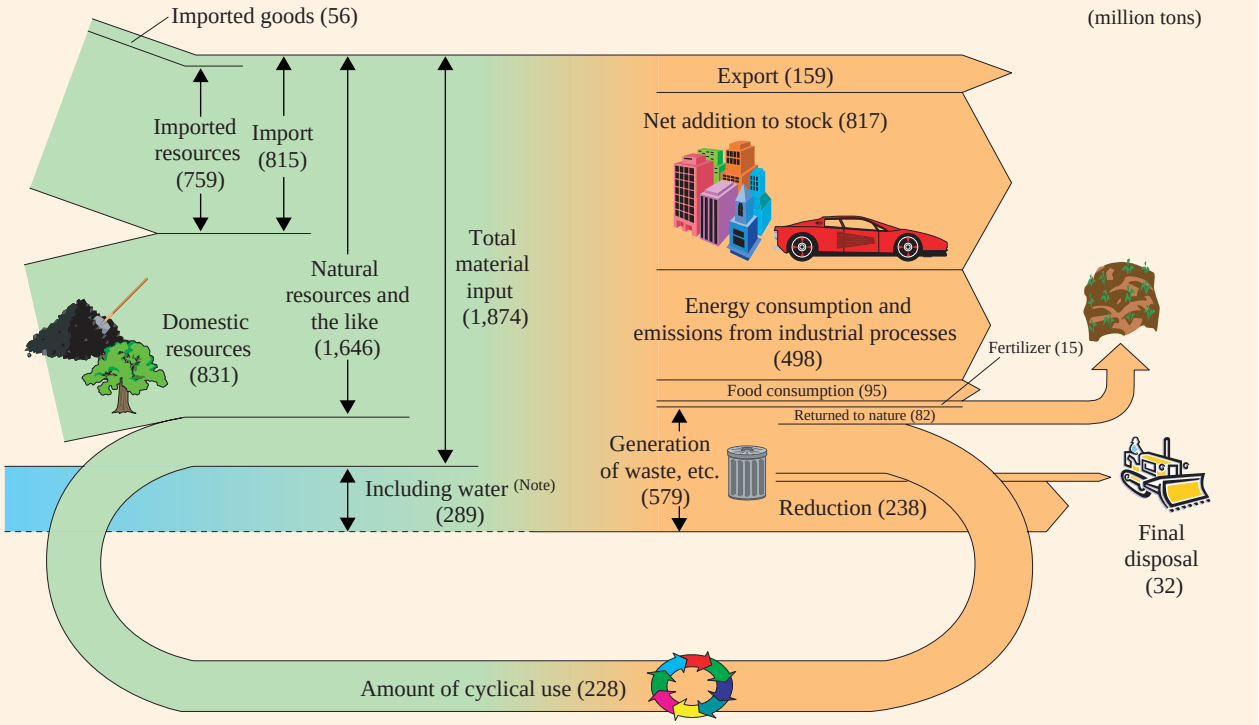
The Second Fundamental Plan sets targets for three indicators -- resource productivity, the cyclical use rate, and the final disposal amount -- referring to the "inlet," "cycle," and "outlet" aspects of Japan's nationwide material flow, respectively. These targets are to be pursued through the joint efforts of the government and other concerned parties. The target year for the Second Fundamental Plan is FY 2015, envisaging a society even farther ahead, in FY 2025.

The target for the inlet has been set by resource productivity: approximately ¥420,000 per ton in FY 2015. This indicator is designed to comprehensively measure how effectively industries and people are using products. Since natural resources are exhaustible, generate environmental burdens associated with extraction, and eventually turn into wastes, this indicator should be increased so that adequate gross domestic product (GDP) can efficiently be achieved from smaller inputs of resources. The target figure is double the rate in FY 1990 (approximately ¥210,000 per ton) and roughly 60% higher than the rate in FY 2000 (approximately ¥260,000 per ton) (Figure4-1-12).

The target for the cycle has been set by the cyclical use rate: approximately 14-15% in FY 2015. In principle, this indicator should be increased so that appropriate cyclical use can be expanded in order to reduce the amount of final disposal. The target figure is about 80% higher than the rate in FY 1990 (approximately 8%) and about 40-50% higher than the rate in FY 2000 (approximately 10%). Note that the total input in an economic society is the sum of the natural resources input and the amount of cyclical use (Figure4-1-13).

The target for the outlet has been set by the final disposal amount: approximately 23 million tons in FY 2015. The final disposal amount is an indicator that is directly linked to the urgent problem of a shortage of final disposal sites. Being expressed as the sum of the final disposal amount of municipal solid waste and industrial waste, this indicator should be reduced. The target figure is about 80% lower than the amount in FY 1990 (approximately 110 million tons) and about 60% lower than the amount in

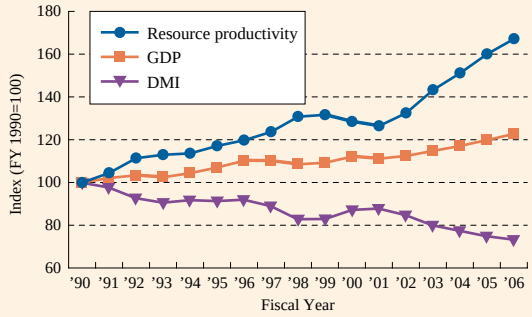
Figure 4-1-11 Material flow in Japan (FY 2005)



(Note) Including water: Input of water included in waste and the like (sludge, animal manure, human waste, waste acid, waste alkali) and sediment and the like associated with economic activities (sludge from mining, building and water works and tailing from mining)

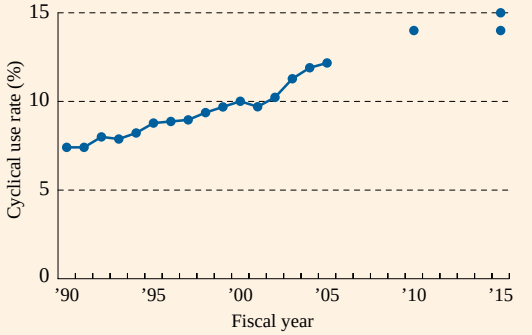
Source : Ministry of the Environment

Figure 4-1-12 Trends of Resource Productivity



Source : Ministry of the Environment

Figure 4-1-13 Trends in the cyclical use rate



Source: Ministry of the Environment

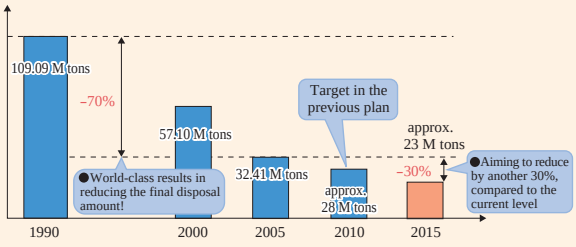
FY 2000 (approximately 56 million tons) (Figure4-1-14).

In addition to these three indicators, above, two supplementary indicators were also set as targets: (i) resource productivity excluding the input of earth and rock resources and (ii) coordination with efforts directed towards a low-carbon society.

As a result of a progress review of the First Fundamental Plan, it was pointed out that, as far as resource productivity is concerned, the input of non-metallic mineral resources (earth and rock resources) has a large impact on the total natural resources input. This point was addressed by setting an additional target that supplements current resource productivity, namely, (i) resource productivity excluding the input of earth and rock resources. The target figure is about ¥770,000 per ton in FY 2015, which corresponds to 30% improvement compared to approximately ¥590,000 per ton in FY 2000.

In order for the indicator to measure (ii) coordination with efforts directed towards a low-carbon society, a target for emission reduction measures in the waste sector was set in line with the revised Kyoto Protocol Target Achievement Plan: a reduction of 7.8 million tons of CO2 by FY 2010. In the future, it would be desirable that a target be set for net greenhouse gas emissions from the waste sector (calculated by subtracting greenhouse gas emissions derived from fossil fuels for which waste power

Figure 4-1-14 Trends in the final disposal amount of waste, since 1990



Source: Ministry of the Environment

generation and wastes recycled as fuels or raw materials is to be substituted). However, since there is no internationally recognized and agreed common method of calculation available, including that for sector-specific distribution, Japan will just collate this data for the time being.

The Second Fundamental Plan also introduced the following indicators to monitor changes for use as reference indicators for future policy implementation.

One of these indicators is the resource productivity of fossil resources. This is a noteworthy indicator from the viewpoint of anti-global warming measures, considering that fossil resources are exhaustible and therefore need to be used efficiently.

Total material requirement (TMR), or the hidden flow, was included as an additional indicator to help increase awareness of global environmental problems. TMR includes hidden flows such as materials that are extracted in conjunction with target resources during resource extraction and are then removed as waste. TMR is considered as a quantitative measure of the sustainability of resource use and the global environmental burdens derived from resource use. Reducing new resource extraction from nature and promoting cyclical use of metallic resources will help reduce the domestic and overseas environmental burdens caused by resource use in Japan. This indicator can also be used to evaluate progress in the recycling of rare resources (difficult to measure simply by weight). An example of TMR measurement can be seen with regard to imported metallic resources, which are closely related to 3R measures. Estimates show that the TMR associated with Japan's imports of metallic resources is approximately 2.1 billion tons, which is 21 times the amount of actual pure metal imported (about 0.1 billion tons).

When measuring TMR, accurate information needs to be gathered on the grade of ore collected from each mine for the extraction of metallic resources. However, since Japan imports most of the metallic resources in demand, it is not very easy for Japan to gather accurate information on ore grades and so on from overseas mines. Therefore,

those who make use of this indicator must be aware that a significant proportion of all the source data are just estimates. Another point that should be taken into consideration is that the value of TMR is not a direct representation of the impact on environmental destruction. There are initiatives underway to minimize environmental burdens by planting trees in order to restore the modified environment after resource extraction.

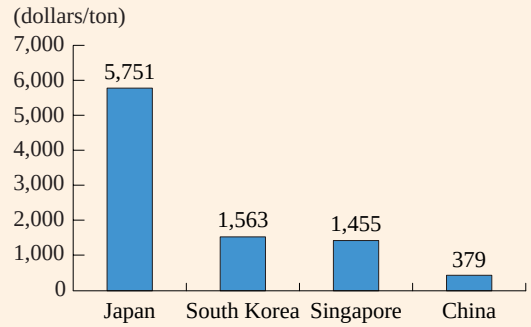
Securing a stable supply of metallic resources from overseas is vital for Japan. However, overseas mines are experiencing degradation in ore grades and the deepening of ore deposits, and these trends can have an impact on TMR values. To address such changes, Japan should continue collecting and accumulating data at the global level.

For resource productivity purposes, the government has decided to keep track of not only nationwide indicators but also industry-specific resource productivity. This focuses on resource-intensive goods and services in order to obtain estimates for each industry sector, and allows a more accurate analysis of the factors affecting change. In the future, it is hoped that industry-specific resource productivity will be measured in many countries so that international comparisons can be made of the effectiveness of resource use.

The Second Fundamental Plan also identified various issues that need to be examined further.

One of these issues is the development of material flow indicators that allow international comparisons to be made so that Japanese data can be compared with those of other developed countries and other Asian countries. This requires the establishment of common calculation methods and the construction of relevant databases. With this in mind, Japan will make a proactive contribution to the international accumulation of knowledge. In particular, Japan will assist Asian countries in collecting and organizing statistics on resource productivity, the cyclical use rate, and the final disposal amount (Figure4-1-15).

Figure 4-1-15 Resource productivity in Asian countries (2004)



*1 Natural resource input does not include nonmetallic minerals.
*2 GDP data are real GDP figures based on purchasing power parity in 2000 , cited from the "World Development Indicator" of the World Bank
Source: Created by the Ministry of the Environment, mainly based on UN statistics

On the other hand, there is also a concept called environmental efficiency, which measures the relative efficiency between environmental burdens and the added value of goods and services by using the corporate or product value instead of GDP, and by using environmental burdens instead of resource consumption, such as natural resources input. Using this concept, the government will be able to collect and analyze the information needed for the quantitative assessment and evaluation of environmental burdens associated with resource extraction and the use of resources and products, and will create inventories relevant to the calculation of these environmental burdens. In particular, the government will seriously consider promoting joint research projects between Japanese research institutes and between Japanese and foreign research institutes or international organizations.

In the case of conversion factors that involve statistical imperfections or a lack of international consensus, the government will continue to contribute to discussions in the OECD and the UNEP directed towards the definition of internationally shared conversion factors and will make good use of the results.

[An example of resource extraction with a high impact on the environment]
Source: Masatsugu Taniguchi, United Nations University

[An example of resource extraction followed by afforestation]

B Effort indices

When establishing a SMC Society, it is essential that not only the government but also all the entities concerned play their respective parts. Unlike the material flow indicators, which are designed to measure the entire country's progress in creating a SMC Society, the effort indices deal with measures taken by the entities concerned in order to establish a SMC Society. These indices are used to set targets for the activities of these parties and to help expedite their activities. By making it possible to carry out quantitative assessment and evaluation, these indices also help achieve a SMC Society.

The effort indices need to be flexibly modified and expanded in accordance with the results of annual reviews and analyses, in order to ensure that activities carried out by individual entities contribute to steady progress, overall. Given the possibility that new and more ambitious indices may be developed at the local and regional level, these effort indices are also expected to serve as a reference point when setting regional targets.

(An excerpt from "Effort indices" in Chapter 2, Section 2 of the Second Fundamental Plan)
1 Indicators for target setting
(1) Reduction of waste
a. Reduction of municipal solid waste
(a) The target for both the public and enterprises is a reduction of approximately 10% from the FY 2000 level in the effort index of per capita daily waste generation (calculated from the amount of municipal solid waste as the sum of the wastes collected through scheduled collection and group collection and the wastes carried in).

The target set by the First Fundamental Plan concerning both per capita daily residential waste generation and per capita daily commercial waste generation was a reduction of approximately 20% from the FY 2000 levels. This was a target that could be achieved by reducing waste generation and fostering cooperation on sorting and resource collection.

In addition to the indices used to evaluate cooperation on sorting and other efforts directed towards resource recovery, which followed on from the previous plan, the Second Fundamental Plan also defined targets directly concerning the reduction of waste generation. These indices are related to the "Reduce" component of the 3Rs, and the restriction of waste generation. It is hoped that efforts to "Reduce" (the most important factor in establishing a SMC Society) will be enhanced, as a result.

(An excerpt from "Effort indices" in Chapter 2, Section 2 of the Second Fundamental Plan)
2 Indicators used to monitor changes
(2) Rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags); volume of sales of disposable products (imported disposable wooden chopsticks)
As indices of the public's efforts to reduce waste, the government will monitor the rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags) and the volume of sales of disposable products (imported disposable wooden chopsticks).

As indices of the public's efforts to reduce waste, the government will measure the rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags) and the volume of sales of disposable products (imported disposable wooden chopsticks).

It is essential that the government assesses and examines certain factors in detail for each type of product used by people in their everyday lives. This includes reductions in usage, the amount reused, and environmental burdens throughout the life cycle of a product (life cycle assessment (LCA)), from resource extraction through to disposal.

(An excerpt from "Effort indices" in Chapter 3, Section 2 of the Second Fundamental Plan)
2 Indicators to monitor changes
(6) Percentage of local governments charging for garbage collection; municipalities most active in promoting waste reduction
As indices of local governments' efforts to reduce waste, the government will monitor the percentage of local governments charging for garbage collection and identify those municipalities which are most active in promoting waste reduction.

As indices of local governments' efforts to reduce waste, the government will measure the percentage of local governments charging for garbage collection and identify those municipalities which are most active in promoting waste reduction.

Since local governments play a key role in establishing a SMC Society, the government will use a broad range of indices to monitor changes and keep track of their activities. This will include those municipalities which are most active in promoting recycling, and the number of recycling centers and other resource recovery facilities.

Chapter 2

History of Japan's Sound Material-Cycle Society

History shows that Japan did once successfully create a society in harmony with nature, as did other countries and regions, based on "mottainai," the spirit of avoiding being wasteful with goods and a desire to keep things clean. This white paper calls this the primitive sound material-cycle (SMC) society and examines it in detail.

This chapter looks back on the Edo and later eras to analyze what kinds of systems Japan formed as part of this primitive SMC Society. In the Edo era, there were systems that are still applicable to modern society and can still serve as useful models for certain countries today.

The later part of the chapter describes Japan's 21st century path to a new SMC Society, while looking back over how Japan has, since the Meiji era, moved towards a mass-production and mass-consumption society in order to achieve economic growth.

Section 1 The Edo era and its systems for a sustainable society

It is believed that, in the Edo era, Japan had a SMC Society driven mainly by community activities. Compared with the modern world, people in those days were engaged in social activities involving lower carbon emissions and they lived their lives with a deeper awareness of being in harmony with nature. Evidence from this period strongly suggests that a sustainable society can be established through the comprehensive promotion of a low-carbon society, a society in harmony with nature and a sound material-cycle society.

(1) Edo's sanitary material-cycle system

The city of Edo is believed to have been more sanitary than any other city in the world at that time in history. This is because its social system was centered on rice-growing and all organic matter such as night soil and kitchen garbage was recycled as fertilizer and returned to the soil in rural villages so that it never remained in urban areas. Modern European cities failed to take such effective measures to dispose of night soil and, consequently, infectious diseases like the plague and cholera became rampant. In Japan, such diseases were relatively rare because night soil, which could potentially transmit pathogens, was made good use of and never left uncontrolled and unattended.

The concept of "SMC blocks," spelled out in the new Fundamental Plan for the Establishing a SMC Society, emphasizes the significance of forming a material cycle of optimal size, in accordance with the regional characteristics and properties of circulative resources (CRs). In light of this, the following sections outline how Edo successfully created a SMC Society, establishing regional SMC blocks based on the characteristics of the communities and products involved.

A Establishment of SMC blocks that take advantage of the characteristics of the communities and products involved

People in the Edo era considered it important to make the most of the characteristics of their local communities and products. For example, they used the expression "*sanri shiho*," which means that you can stay healthy and live longer if you eat vegetables grown within a radius of three ri (approximately 12 kilometers). There seems to be some variation in the travel distances cited for vegetables, as demonstrated by similar expressions such as "*shiri shiho*" (within a radius of four ri) and "*gori shiho*" (five *ri*) in other regions. However, these expressions all stress the importance placed on the characteristics of local com-

[A farmer carrying night soil buckets]
Source: Yowatari Fuzoku Zue (Collected Genre Paintings of the World)

munities and products. This concept has been passed down over generations and still exists in the modern expression of "local production for local consumption."

In the Edo era, night soil and ash from urban areas were effectively used to fertilize the soil in farmland and to grow vegetables. These wastes were not only accepted by farmers but also traded and bartered for money or vegetables. As well as helping suburban farmers fertilize their farm soil, such practices even fostered the development of SMC blocks between cities and the surrounding farm vil-

Column

Safe and sanitary night soil reservoirs in Japan

Rice cultivation was introduced to Japan from China during the Yayoi era. Initially, cultivation technologies were developed under the technical guidance of settlers from the Korean Peninsula. However, original irrigation technologies and farming methods, more suitable for the climate and the natural features of Japan, were also developed by the Japanese people themselves. In the early years of rice cultivation, fertilizer was available in the form of young leaves and weeds or ash from slash-and-burn agriculture. As the population grew and paddy fields expanded, farmers began using cow and horse manure. Later, when the double-cropping of rice and wheat began, during the Heian era, people also began using night soil as fertilizer.

However, there is a problem associated with handling night soil in that it can harm the living environment and has a bad odor if left untreated. If any live pathogenic bacteria or parasitic worm eggs are present, night soil can even spread infectious diseases. Another problem is that, if used as fertilizer without any treatment first, night soil may damage plant roots because it generates heat and releases hazardous gases such as ammonia during decomposition.

Hence, before being used as a fertilizer, night soil needs to be chemically or biochemically stabilized in order to prevent decomposition and it must be processed to ensure sanitary safety and prevent infectious diseases spreading throughout society. The key question here is how people, long ago, were able to stabilize night soil and make it safe to use.

The answer is the night soil reservoir. Night soil reservoirs are facilities to ferment night soil and convert it into fertilizer. These facilities could be as simple as a hole dug beside a field and covered with a lid.

Farmers mixed rice straw into the night soil inside the reservoir. When night soil, which is a mixture of carbohydrate, fat, nitrogen compounds and many other organic substances, is stored in an airtight chamber with the lid closed (under anaerobic conditions) and with rice straw added, it then decomposes into substances with a relatively simple structure (such as organic acids, fatty acids and amino acids) as a result of the metabolic activities of various anaerobic bacteria. Subsequently, methane bacteria then generate gases such as carbon dioxide, methane, hydrogen, nitrogen, ammonia and hydrogen sulfide. Eventually, night soil is stabilized and rendered free of almost all roundworms, which are killed by the heat generated during the fermentation process.

In the Edo era, the shogunate government ordered all citizens to install a large cesspool with each toilet, in order to efficiently store all night soil. This led to the installation of cesspools in rural and urban houses alike. The night soil stored in these tanks underwent partial anaerobic decomposition before being collected and transported to suburban farms by boat or by horse or ox-drawn wagons. This night soil was then stored in night soil reservoirs for stabilization and sanitation before being spread on the fields as fertilizer.

During the Edo era, Japan therefore had a true SMC Society in which night soil was sanitarily treated for effective use without affecting the living environment, thereby making the best possible use of the limited resources available. People today, who no longer make use of night soil, can learn a great deal from the sanitary recycling of night soil in the Edo era. It is important that Japan should share the benefits of its experience with developing countries, especially from the perspective of hygiene education and village development.

[Sanitary use of the night soil reservoir]
Source: Ministry of the Environment

lages, contributing to both the farmers' economic self-reliance and to urban development. This was a good example of a virtuous circle for both the economy and the environment.

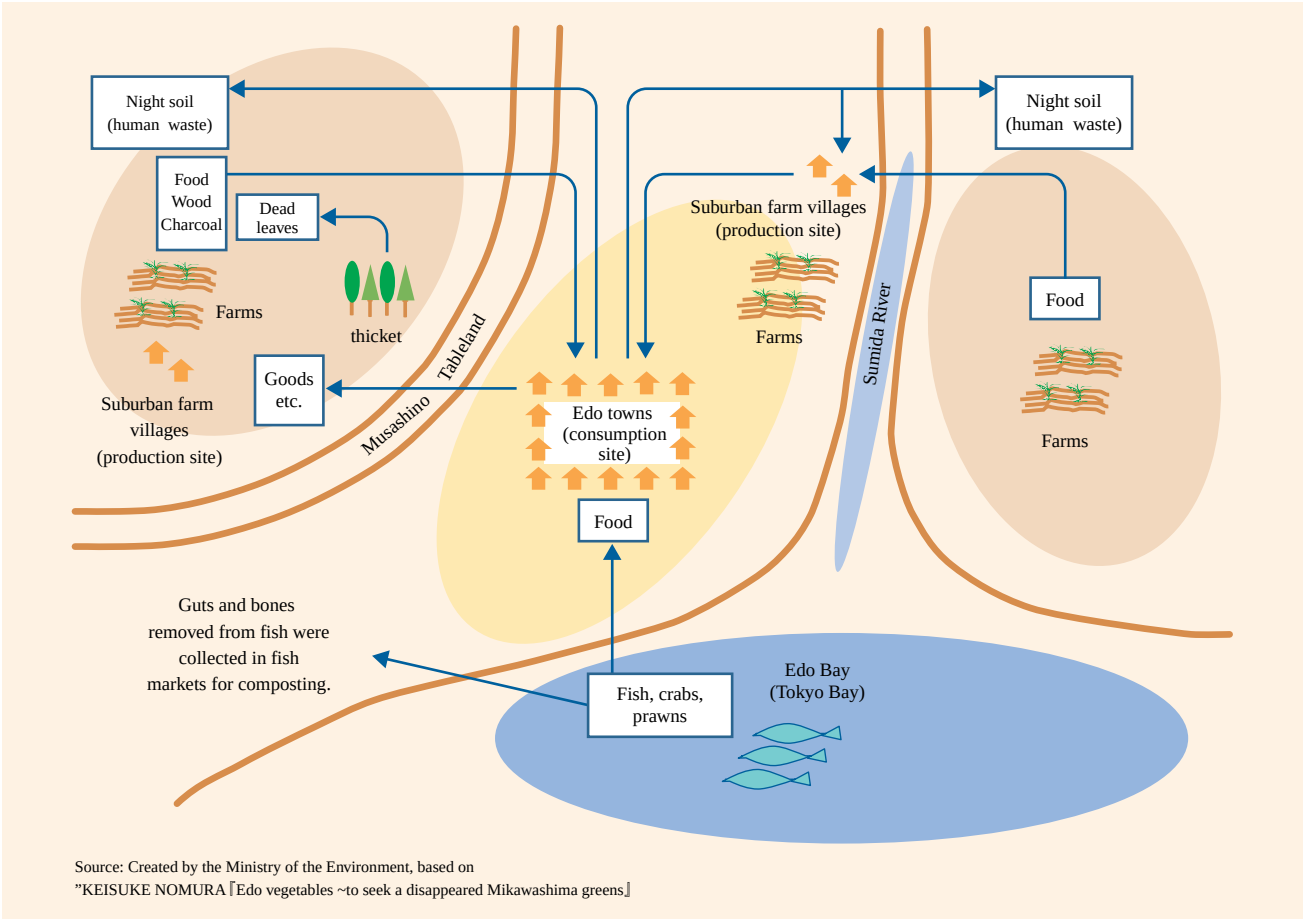
B SMC blocks, as demonstrated by the use of night soil as a fertilizer for rice and vegetable cultivation

Since rice production capacity was the key to political power in the Edo era, the shogunate government and domain governments considered the implementation of measures to develop new fields and improve rice production capacity a high-priority policy.

As a result, the cultivated area for rice increased from about 1.6 million hectares in the Keicho period (1596-1614) to about 3 million hectares in the Kyoho period (1716-1735). This means that an 80% increase in production area was achieved in about a century. Over the same period, the accumulation of experience and new technologies also contributed to improvements in rice productivity. For example, *Nogyo Zensho* (Encyclopedia of Agriculture, Yasusada Miyazaki, 1696), a leading agricultural book in the Edo era, includes descriptions of advances in fertilizer research: "There is an urgent need to put night soil on infertile land. Farmers must build a shack to store night soil. This should be used to store everything from rotten food to kitchen wastewater and bathing wastewater, and to fully ferment them for use as fertilizer. Cattle and horse feces should be stored in layers. Pile them up if you have too much. There are many kinds of fertilizers. Good fertilizers can be made by mixing night soil with oilcake, dried sardines and residues from whale processing." Other technologies developed in this era included the use of water wheels to pump irrigation water and sluices and dikes for stream management.

Such advances in agriculture were, in fact, closely related to the issue of how to secure adequate amounts of fertilizer for use on the fields. One solution to this was allowing large amounts of night soil and ash, generated in urban areas, to be effectively used in surrounding farm villages as fertilizer. As mentioned earlier, during the Edo era, a material cycle existed so that farmers could obtain the valuable urban night soil and ash, spread it on their fields as fertilizer, then grow rice and vegetables which provided food for the people in the city of Edo. Urban communities promoted a material cycle in which both they and the rural villages each played their respective

Figure 4-2-1 Night soil use



Source: Created by the Ministry of the Environment, based on
"KEISUKE NOMURA『Edo vegetables ~to seek a disappeared Mikawashima greens』

roles and maintained relatively high sanitary levels as a result. Night soil (human waste) was even a source of financial gain for urban citizens (Figure4-2-1).

Night soil remained a valuable organic resource throughout the Edo era. Night soil produced in the city of Edo, a megalopolis with an estimated population of 1 million, was transported to suburban farms and stored in special night soil reservoirs. These night soil reservoirs made use of the heat generated by fermentation to sanitize the night soil and produce good quality manure which was then used for suburban vegetable farming.

Toilets in the Edo era (called koka in Edo and secchin in the Kamigata region, including Kyoto and Osaka) were usually shared between several families in cities, where terrace houses called *nagaya* were common. Toilets were designed so that night soil could be easily collected from them.

To ensure an adequate supply of night soil for manure production, farmers in the suburbs of Edo contracted with the owners of samurai residences and *nagaya* houses in order to obtain the rights to collect night soil in exchange for money or goods. In the mid-Edo era, brokerage groups emerged to arrange night soil trading between urban citizens and farmers, boosting night soil use. The late Edo era even saw instances of farmers in Tokyo suburbs facing serious financial difficulties due to increasing night soil prices, and petitioning the shogunate government. This shows just how important the use of urban night soil for fertilizer production was for farmers.

Large amounts of ash were also produced during the Edo period because people used wood for cooking. This ash was also used as fertilizer by local farmers. Urban citizens accumulated their domestic ash, which was then collected by ash brokers who sold it on to farmers for use as fertilizer. Although ash had many other uses, it is a good example of CRs that were circulated between cities and rural villages.

[Cooking stoves in Edo]
Source: Ehon Edo Murasaki (Illustrated Book 'Edo Violet')

Figure 4-2-2 Edo vegetable-producing districts

Source: Ministry of the Environment

Column

Night soil prices

In the Edo era, a price was placed on night soil for trading purposes, and these prices varied depending on the person's class in society. Since the nitrogen and phosphorus contents were an essential determinant of fertilizer quality, it is believed that the value placed on night soil as a fertilizer was determined by the person's diet.

An analysis of night soil in the early Showa period (performed by Dr. Kerner, professor of the School of Agriculture and Forestry (now the Faculty of Agriculture, the University of Tokyo)) shows that the nitrogen and phosphoric acid contents of night soil differed between people with different jobs, such as farmers and soldiers.

Composition of night soil (%)

Contents \ Class	Farmer	Tokyo citizen	Middle class gov. official	Military person
Water	95.4	95.4	94.5	94.6
Organic matter	3.03	3.18	3.89	4.07
Nitrogen	0.55	0.59	0.57	0.80
Phosphoric acid	0.12	0.13	0.15	0.30
Potassium	0.30	0.29	0.24	0.21
Soda	0.51	0.41	0.45	0.26
Lime	0.01	0.02	0.02	0.03
Magnesium	0.03	0.05	0.06	0.05
Sulfuric acid	0.07	0.04	0.05	0.07
Chlorine	0.70	0.55	0.61	0.51
Silicic acid & sand	0.04	0.10	0.11	0.04
Iron oxide & aluminite	0.03	0.02	0.06	0.06

Source: Kazue Kurokawa, "A Study of Soil Fertilizers since the Meiji Era in Japan"

Many local products and specialties emerged during the Edo era. Vegetables were cultivated in and around Edo as local specialties. Nerima radish, Komatsuna greens (produced around Komatsugawa) and Takinogawa burdocks are examples of "Edo vegetables" which satisfied the appetite of Edo people in terms of both quality and quantity. The ability to produce large amounts of this sort of local produce was a major benefit resulting from the effective use of night soil as fertilizer (Figure4-2-2).

C SMC blocks, according to regional characteristics

Efforts to create a SMC in accordance with regional characteristics were also observed in regions outside Edo. In the Kamigata region, including Osaka and Kyoto, night soil was also utilized and fostered the formation of intraregional material cycles well-suited to regional characteristics. For example, farmers in Settsu and Kawachi contracted with urban dwellers in Osaka in order to collect night soil for use as fertilizer. Another example of the utilization of night soil was found in the domain of Kaga (governed by the Maeda clan).

As shown by these selected cases, SMC blocks were established in many parts of Japan in a way that took full advantage of regional characteristics.

(2) Systems for appropriate waste disposal

A typical example of waste disposal in the Edo era, and one that may still be applicable to today's society, is the system by which government-authorized contractors collected waste and carried it to final disposal sites in order to ensure its appropriate disposal. Establishing such a system for the correct disposal of waste is a necessary prerequisite to forming a SMC.

A Edo's waste disposal system

The initial waste disposal method used in Edo was the dumping of waste within the grounds of each residence or in empty lots, rivers and moats. Another dumpsite was a place called the "*kaisho-chi*," which was a vacant lot that each district of Edo had at its center and which was used partly as a dumpsite. However, dumping in these places had harmful effects, such as obstructing roads, waterways and firebreaks and bothering neighbors with bad odors, mosquitoes and flies.

In light of this unsatisfactory situation, the magistrate's

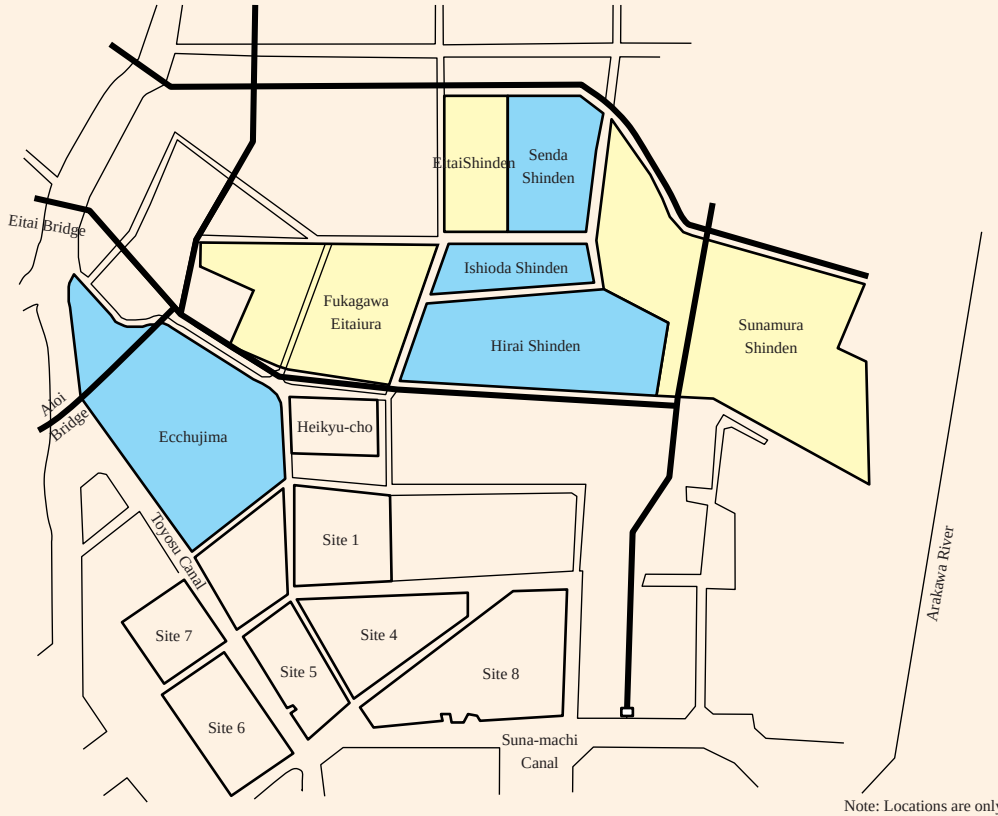
[Collection and transport in Edo]
Source: Yowatari Fuzoku Zue (Collected Genre Paintings of the World)

office issued an official town notice banning the dumping of waste in *kaisho-chi* in 1649 and designated a place named Fukagawa Eitaiura as a dumpsite in 1655. In 1662, disposal companies were designated, leading to the establishment of a mechanism in which wastes were gathered in designated places ready for disposal by these disposal companies. As a result of these efforts, the three key processes involved in waste management, namely collection, transport and disposal, were all successfully organized in Edo .

Policies such as these were adapted to people's real lives at the time they were implemented. The town magistrate sometimes even consulted members of the public over the acceptability of an ordinance before issuing it. Edo citizens are said to have been very good at integrating government ordinances into their daily lives. This sort of "community wisdom" probably contributed to Edo's success in establishing an effective waste disposal system at such an early date.

There were also many ordinances banning the dumping of waste in non-designated areas. By about 1699, ordinances were in place that banned the dumping of waste in rivers

Figure 4-2-3 Major landfill sites in the Edo



Note: Locations are only approximate.

Name	Current place name	Landfill period		Size of landfill	Notes
		Start	End		
Fukagawa Eitaiura	Around Tomioka, Fuyuki and Kiba, Koto Ward	Nov. 25, 1655	1724		Became the property of the shogunate in Dec. 1733.
Eitai Shinden (Eitaijima Shinden)	Around Ishijima and Sengoku, Koto Ward	Jun. 30, 1681	July 1730		
Sunamura Shinden	Around Minamisuna, Koto Ward	Jun. 30, 1681		495,900 m^2	
Senda Shinden (Juman-tsubo Tsukiji)	Around Senda, Sengoku and Kaihin, Koto Ward	1704	1711	330,600 m^2	Became the property of the shogunate in Dec. 1733.
Ishioda Shinden (Rokuman-tsubo Tsukiji)	Around Toyo, Koto Ward	1725		198,360 m^2	Same as above
Hirai Shinden	Around Toyo and Minamisuna, Koto Ward				
Fukagawa Ecchujima	Around Ecchujima, Botan and Furuishiba, Koto Ward	1730		495,900 m^2	

Source: Created by Ministry of the Environment , based on "Tokyo Seiso Jigyo Hyakunen Shi"

and required disposal companies to carry waste to disposal sites in an appropriate manner. Edo already had a responsible waste disposal mechanism that somewhat resembles today's measures used to prevent illegal dumping.

B Development of new agricultural land

The wastes carried to Eitaiura for final disposal were primarily household kitchen garbage and soil combined with the rubble removed from fire sites, all of which decomposed naturally in about a year. Since Eitaiura was originally a wetland, rubble and soil dumped there as waste eventually formed new land. The shogunate government, which was developing new farmland, found this reclaimed landfill site valuable and used it for agriculture.

Records show that, starting with the reclamation project in Fukagawa Eitaiura, the government reclaimed at least 10 sites, including Eitaijima Shinden and Sunamura Shinden (49.5 hectares), during the Edo era.

By the late 18th century, over 380,000 tsubo (approximately 1,254,000 square meters) of land had been reclaimed (Figure4-2-3).

This section provides an overview of the history of Japan's responsible waste disposal activities, from the Meiji to Heisei eras(Figure4-2-4).

Figure 4-2-4 Japan's history of appropriate waste disposal

Legislation and policy formulation	Organizational change	Changes in systems and technology	Per capita GDP (in US dollars)	
1954 Public Cleansing Law			1960	477
1967 Basic Law for Environmental Pollution Control				
1970 Waste Management Law	1971 Environment Agency established	(1970) Improvement in hygiene	1970	1,963
1976 Amended Waste Management Law		(1980) Measures against hazardous substances	1980	9,170
			1985	11,381
		(1990) Recycling	1990	24,815
1991 Amended Waste Management Law			1995	41,952
1995 Containers and Packaging Recycling Law			2000	36,790
2000 Fundamental Law for Establishing a SMC Society	2001 Ministry of the Environment established (waste management administration transferred from Ministry of Health and Welfare)	(2000) 3Rs	2005	35,675
2003 1st Fundamental Plan for Establishing a SMC Society				
2008 2nd Fundamental Plan for Establishing a SMC Society				

Source: Ministry of the Environment.

Column "*Kudaranai*" and SMC blocks for local production for local consumption

Compared with high-grade sake transported from the Kamigata region, local sake in Edo was cheaper and therefore called "*kudaranai*" sake, literally meaning sake not brought down from Kamigata. Some believe that the expression "*kudaranai*" in the modern Japanese language, meaning worthless, is derived from this.

However, this word also demonstrates that products from Kamigata had become easily available in Edo as a result of economic growth in areas around Edo. The fact that the word *kudaranai* and economic growth, two seemingly opposite elements, were actually more like two sides of the same coin suggests that things regarded as kudaranai today may have a more complex background than first thought and could actually be of some use.

Column

The Edo era and people's own efforts

People in the Edo era used their goods with care, in keeping with the spirit of mottainai. This is something that modern society can use as a guide in promoting new initiatives to establish a SMC. For example, as many as 1,000 organizations were engaged in recycling in the city of Edo and there were activities aimed at creating a SMC in all four classes of the population: warriors, farmers, artisans and tradesmen.

The expression "*shisso kenyaku*" (living a simple and frugal life), which also symbolizes the life of samurai, reflects the samurai's lifestyle of not wasting things. *Keizai Zuihitsu* (An Essay on Economy), a book describing the rules of the samurai lifestyle in those days, introduces tips on how to practice *mottainai*: "When buying clothes, buy those with the same pattern for all family members so that they may later be used for patching each other's clothes" ; "Waste threads can be used as a wick"

One piece of literature that describes how samurai and their rulers fostered the *mottainai* spirit is *Seiryoki*, written by a medieval general in the Iyo-Uwajima region. This book explains how people in his fief made effective use of night soil.

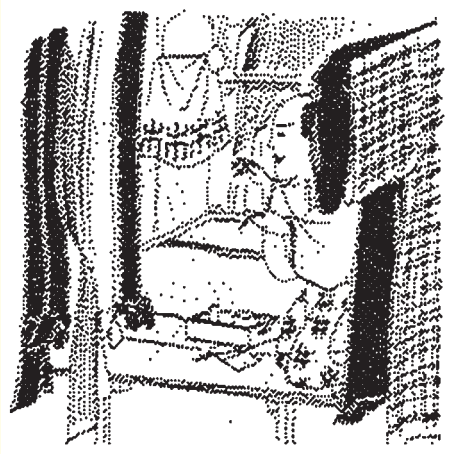
Even castles were built in keeping with the *mottainai* spirit. The Hikone Castle used some recycled construction materials for the castle keep, turret and walls. Castles like this are well-preserved and still exist today.

Since farmers in those times mostly cultivated rice, they used many common tools derived from rice cultivation. For example, rice straw left behind after harvest (and still used as fertilizer and feed today), was a necessity in every aspect of life, including food, clothing and shelter. This straw had many uses. It was used to make clothing, such as woven hats, rain capes and zori sandals. It was used to make rice bags, fermentation packets for *natto* (fermented soybeans), and for livestock feed. It was also used for shelter, providing roofing and mats, as well as handicrafts to decorate the house for the New Year. Even when these household goods made from rice straw were no longer useful and were discarded, farmers still gathered them up and used them as fertilizer.

Artisans and tradesmen also worked in a way that saved resources.

The industrial products in the Edo era were all made manually by artisans. This manufacturing process, although requiring a great deal of time and labor, minimized the wastage of resources. For example, in the color plate-making and printing processes used to create *nishikie* colored woodprints, the surface of each used wood-block was shaved flat so that it could be reused. Artisans making metal products used iron scrap as a raw material because, in those days, the process of refining metals from ores required advanced technology and much energy.

Many tradesmen in the Edo era were engaged in businesses corresponding to today's reuse and repair industries. For example, as "artisan-tradesmen," they ran shops to repair broken bowls and other kinds of china (by gluing the pieces back together), pans and pots, wooden tubs and barrels (by rebinding them with



[Used clothes store]
Source: Edo Shokunin Uta-awase (Edo Artisan Poetry Contest)

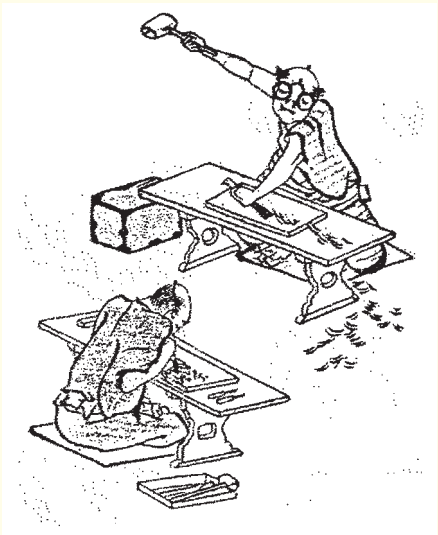
[Waraji sandals dumped at the roadside]
Source: Edo Meisho Zue (An Illustrated Book of the Sights of Edo)

new hoops), umbrellas and paper lanterns (by re-covering them). In addition, most kimonos, shoes and other sundry items were also reused. Tradesmen such as these are believed to have gone from door to door looking for business and are thought to have played an important role in supporting Edo's SMC. *Furoshiki*, the cloth wrappers that these peddlers used for carrying goods, have found new roles in today's modern Japan and are commonly used in many different ways .

Other tradesmen specialized in purchasing used metal products. They bought every kind of iron product, including old kitchen knives and pans that were no longer useful, and other metal products made of copper, brass and so forth in order to recycle them as raw materials. Ash from cooking stoves was collected by "ash men" for use as potash fertilizer by farmers (see Section1. (1). B) as well as for papermaking, dyeing and many other useful purposes. Haiya Joeki, a wealthy merchant and a well-known man of culture in the Edo era (and the person on whom the leading character in the novel *Koshoku Ichidai Otoko*, written by Ihara Saikaku is thought to be based), was engaged in the ash recycling business. "Haiya," which literally means "the ash store," was his popular name. In the Edo era, ash from cooking stoves was collected in order to produce fertilizer or for use in indigo dyeing, sake brewing and papermaking. This shows that recycling activities had developed much momentum in these fields.

The book rental business also boomed during this period. Records from 1808 indicate that book rental shops formed regional groups (*kumi or gumi*) and that Edo had 12 such groups, including Nihonbashi Minami-gumi, Honmachi-gumi, and Kanda-gumi, consisting of approximately 650 members in total. Osaka also had about 300 people running book rental shops. A document titled *Edo Hanjoki* (A Sketch of Edo's Prosperity), written in the 1830s, states that there were 800 book rental shops in Edo, indicating the popularity of this business. A typical shop had a clientele of 170-180 households and Edo, alone, is assumed to have had as many as 100,000 readers of rented books.

Some other examples of cooperation and collaboration are found in the *nagaya* terrace houses in Edo, which, although small in size, were the focus of ordinary people's daily lives. For instance, each *nagaya* building had a shared well (*ido*), which was a key area for the residents. As represented by the word "*idobata*" (well-side), the residents gathered around the well to carry out kitchen chores. *Nagaya* also had a shared dumpsite and shared toilets (mentioned earlier) that were jointly maintained by the residents. Another example, this time in the field of child education, is that textbooks for the students of *terakoya* private elementary schools were shared among siblings and relatives, with some books used for over 100 years as they were passed on from one child to the next.



[Edo artisans]
Source: Hokusai Manga (Sketches by Hokusai)

[Edo artisans]
Source: Hokusai Manga (Sketches by Hokusai)

Section 2 Japan's history of responsible disposal of waste, from the Meiji to Heisei eras

(1) From the Meiji to early Showa eras

As Japan entered the Meiji era, with large-scale industries and urban areas starting to develop, the government clarified the methods of waste disposal to be used. Although waste disposal during this period was much the same as that in the Edo era, the *mottainai*-based lifestyle gradually changed as Western cultures were imported. People began throwing away goods that had once been effectively reused or recycled, resulting in an increase in both waste quality and quantity. It was about this time that the government began promoting the construction of large-scale waste disposal sites.

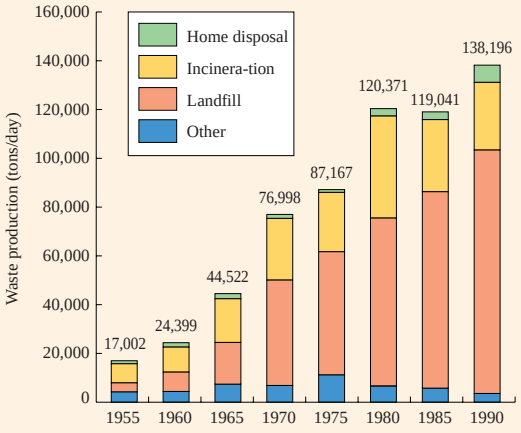
Also, as Japan's exchange with foreign countries increased, infectious diseases such as cholera and the plague were brought into Japan from overseas. The plague epidemic at the end of 1887 prompted the country to address the issue of waste and night soil disposal from the viewpoint of public hygiene. Consequently, the Unsanitary Substance Cleaning Law was instituted in 1900 in order to assign responsibility for waste disposal to municipal governments. In accordance with this law, the Tokyo City Government started collecting waste generated in central Tokyo. Records show that the daily amount of waste produced in Tokyo was approximately 800 tons, which translates into a per capita amount of approximately 290 grams, given that the population at that time was about 2.75 million.

(2) The Post-World War II period (before the period of high economic growth)

After World War II, farmers stopped using night soil as fertilizer because of the widespread availability of chemical fertilizer and because of the major changes in farm villages triggered by the process of agrarian reform. With the loss of the traditional disposal methods, night soil disposal posed a problem. Waste disposal became another serious problem as the Japanese economy entered the postwar recovery period, accelerating urban development. In those times, waste and night soil were dumped in the ocean or in landfills. Many landfill sites were unsanitary and bred large numbers of mosquitoes and flies (Figures4-2-5).

Japan instituted the Public Cleansing Law in 1954. With the stipulated aim of improving public hygiene, this law was intended to enhance the waste disposal system by

Figure 4-2-5 Trends in waste disposal methods



(Note) The data for FY 1970 and before are total waste production in the special cleaning districts under the Public Cleaning Law. The FY 1975 data do not include waste directly brought in, such as waste associated with house-moving.

Source: Ministry of the Environment

making the municipal governments responsible for providing sanitation services and defining disposal zones through the establishment of a special sanitation zone system. In other words, following on from the concept of the Unsanitary Substance Cleaning Law, this new law defined waste and night soil as "unsanitary substances" and sought to dispose of them for public hygiene reasons so that a sanitary and comfortable living environment could be maintained.

In the Showa 30s (1955-1964), the production of chemical fertilizer increased as the economy grew. The widespread availability of chemical fertilizer throughout Japan led to falling demand for night soil on farms, forcing municipal governments in urban areas to address the problem of developing new waste and night soil disposal technologies. This was a time of great difficulty for the municipal administration for waste management because major changes in both the quantity and quality of waste produced during this period of rapid economic growth distorted the traditional frameworks that had previously been used for waste disposal.

In 1963, the government set up the First Five-Year Plan for Development of Living Environment Facilities, presenting the principles of its new urban waste disposal policy involving incineration, with residues disposed of in landfills. This prompted municipal governments in urban areas to construct incinerators. By defining incineration and residue landfill as the basic method for urban waste

disposal, the government aimed to both stabilize waste in a sanitary manner and reduce the volume of waste.

(3) The post-high economic growth period

As its economy grew, Japan faced problems such as increases in the amounts of waste generated by business activities and the amount of water pollution caused by illegally dumped waste oil. During the so-called Pollution Diet session in 1970, the Public Cleansing Law was revised and renamed the Waste Management and Public Cleansing Law (Waste Management Law). This law defined the differences between municipal solid waste and industrial waste and, while holding municipal governments responsible for the disposal of municipal solid

Column

The history of composting

Since ancient times, Japanese farmers had been using waste as fertilizer, either incorporating kitchen garbage into the soil through plowing, for example, or distributing incineration ash over the fields. Even in the post-war era, urban waste was still used as fertilizer in rural farming villages until the Showa 30s (1955-1964) because only small amounts of plastic and metal were included in the waste in those days.

However, as more rapid changes occurred, such as the outgrowth of cities, the widespread use of chemical fertilizers, and the aging and exhaustion of farming villages, urban waste management reached a major turning point.

In Japan, a mountainous country with little spare land for landfill use and a climate often characterized by high temperature and high humidity, incineration became more common in the Showa 40s (1965-1974) for the sake of sanitation and to reduce the volume of waste. There was also a move by municipal governments towards the machine composting of kitchen garbage (a process also known as fast composting) so that the compost produced could again be used by rural farmers, as before. Many such composting facilities were built and operated by municipal governments in the Showa 40s to 50s (1965-1984).

However, composting projects involving urban waste, especially household waste, encountered several problems, as described below. As a result, no users could be found for the compost produced and it had to be eventually disposed of in landfills, forcing municipal governments to withdraw from those projects.

(i) Foreign substances

As living standards rapidly improved in the Showa 30s to 40s (1955-1974), consumers started to buy a wider variety of goods. This resulted in the inclusion of greater amounts of foreign substances in waste, such as glass from glass bottles, metals from cans, and plastics from containers and other sundry items. Since the idea of sorting wastes was not common in those days, compost made from waste inevitably contained foreign substances. Farmers noticed that a field fertilized with compost made from such waste glittered in the sunlight. As a result, farmers began to avoid using compost made from waste.

(ii) Odors

Since Japan has a hot, humid climate, kitchen garbage easily goes rotten. For this reason, composting requires that appropriate measures be taken to minimize odors. Since insufficient measures to control odors were taken at composting facilities during this era, local people often regarded these facilities as an annoyance.

(iii) Farmers' labor

The Showa 30s to 40s (1955-1974) was a period in which young workers moved from rural to urban areas, leaving behind an aging population of farmers. Although the farmers knew that organic fertilizer was needed for sustainable agriculture, they found it increasingly difficult to apply organic fertilizer because of the heavy workload required. Older farmers preferred to use chemical fertilizer because it was then easier to distribute only those substances actually needed.

There has been little promotion of composting since then, except by certain municipalities in rural farming regions, but composting again began attracting attention in recent years as a means of biomass use. In 2000, the Food Waste Recycling Law was instituted and recycling targets were set. In 2007, this law was amended, mainly to define exceptions in those cases where "a recycling loop" is created by all parties concerned. Supported by these frameworks, new efforts towards composting have now been launched in many regions. While solving the problems described in (i) and (ii), above, these projects are also attempting to address the problem described in (iii) by establishing a face-to-face relationship with farmers in order to encourage collaboration.

waste, as before, assigned the responsibility for the disposal of industrial waste to waste-generating businesses, based on the Polluter Pays Principle.

With respect to the disposal of hazardous industrial waste, particularly strict standards were imposed on the final disposal of sludge and slag containing mercury, cadmium and other harmful substances following the entry into effect of the Waste Management Law in 1971, aimed at safeguarding people's health.

Disposal facilities were also enhanced, following the institution of the Waste Management Law. On the other hand, negative effects of economic growth surfaced in connection with various waste disposal issues. One of these was the so-called Tokyo Waste War, a waste disposal dispute that started in 1971 between a municipal government and local residents over waste disposal. This became an issue of serious public concern. In those days, since the final disposal site within metropolitan Tokyo only had a limited incineration capacity, some domestic kitchen garbage was carried to a final disposal site in Koto Ward. Meanwhile, while Suginami Ward had a plan to build new incineration facilities in order to reduce the volume of waste, it could not implement this plan because of community objections against the construction project. The Suginami Ward Government had no other choice but to continue to carry waste to the final disposal site in Koto Ward. The Koto Ward Government, which regarded this act as forcing it to accept unwanted waste, began refusing to accept waste from Suginami Ward and this issue then developed into a serious public dispute. It is safe to say that this incident was the very first formative experience from which Japan leaned valuable lessons on how to select a site for waste disposal facilities and how to cope with local residents opposing the project.

After overcoming the first and second oil crises, Japan achieved a level of economic growth driven by many technological innovations, leading to the production and consumption of a wide variety of products. This also brought about changes in the composition of urban waste and created concerns over the emission of hydrogen chloride and other hazardous substances from incinerators, an issue that attracted attention as an emerging environmental problem. This was the starting point for Japan's efforts to ensure that waste incineration facilities had adequate environmental conservation capability, including measures against dioxins. To address the problem of night soil disposal, an advanced system for sanitary night soil disposal was established for traditional Japanese vault toilets, while sewage systems and Johkasoh were made widely available in order to meet the needs of flush toilets. In particular, as a result of technological advances, new Johkasoh were developed which were small enough to be installed in homes yet still had the same capability for high-quality treatment as public sewage systems. These tanks are now widely used.

Column

Introduction of sorted waste collection (Hiroshima City)

In the postwar high economic growth period, Hiroshima City experienced a sudden increase in waste generation, as did many other cities throughout Japan. In Hiroshima City, kitchen garbage, categorized as "Hiroshima garbage", was once used for fertilizing farmland in islands and other rural areas of the city. However, demand fell as chemical fertilizers came into general use. The existing waste disposal system was abolished in 1960. With no other place to go, most of the waste in the city was disposed of in landfills in the Showa 30s to 40s (1955-1974), but the city government increasingly found it more and more difficult to secure enough landfill sites. At Hesaka Junior High School, which was built on a former landfill site, there was even an incident in which methane erupted from the school yard.

In response, the Hiroshima City Government declared a state of waste disposal emergency in 1975 and urged the public to consider the waste disposal issue as their own problem. In an effort to reduce waste generation, in the following year (1976) the city introduced the sorted collection of waste for the first time in Japan. In this collection system, everyone was required to separate their own garbage into five categories: (i) combustible waste, (ii) non-combustible waste, (iii) recyclable waste, (iv) large-sized waste, and (v) hazardous waste. Although people were confused at the beginning, the new collection system gradually became established and has since come to be widely known throughout Japan as "the Hiroshima system". This has now become a landmark in the history of waste disposal and a pioneering example demonstrating that even a big city like Hiroshima can operate a sorted waste collection system by gaining the understanding and support of its citizens.

(4) The Heisei period (from 1989 to the present)

A Amendment of the Waste Management Law and related efforts

The Japanese economy continued to grow, even after the high-growth period, creating a society with a high degree of material affluence. On the other hand, the country underwent social changes that led to the increased adoption of a lifestyle based on mass consumption and the throwaway principle. These changes resulted in an increase in the amount and the diversity of waste and made it harder to dispose waste appropriately. These developments have led to several phenomena and incidents such as municipal solid waste in the Kanto region being carried to the distant Tohoku region for disposal because of lack of incinerating facilities and the difficulty of securing final disposal sites; a large amount of industrial waste, primarily shredder dust, being illegally dumped in Teshima, Kagawa Prefecture; and a large amount of industrial waste, primarily waste oil, being illegally dumped in an abandoned mine in Fukushima Prefecture.

Since the beginning of the Heisei era, Japan has improved its framework for responsible waste disposal by amending the Waste Management Law and introducing a range of other initiatives to cope with a situation in which the waste disposal issue needs to be addressed not only as an environmental conservation problem but also as the more fundamental problem of how to deal with the wastes that are produced each and every day.

In order to become a member of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Japan amended the Waste Management Law in 1992, in addition to enacting the Law for the Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes. This amended law stipulated that, in principle, all wastes should be disposed of within Japan, and imposed the necessary regulations on waste imports and exports (e.g., the introduction of an export confirmation system and an import permit system). Rules on the international movement of wastes were also established pursuant to this law.

There were other developments concerning measures to be taken against domestic hazardous substances as well. One of them concerned batteries containing mercury. In 1983, the Kurashi no Techo (A Note of the Life) magazine pointed out the risk of environmental pollution from the mercury contained in waste batteries. In the same year, the Tokyo Metropolitan Research Institute for

Column

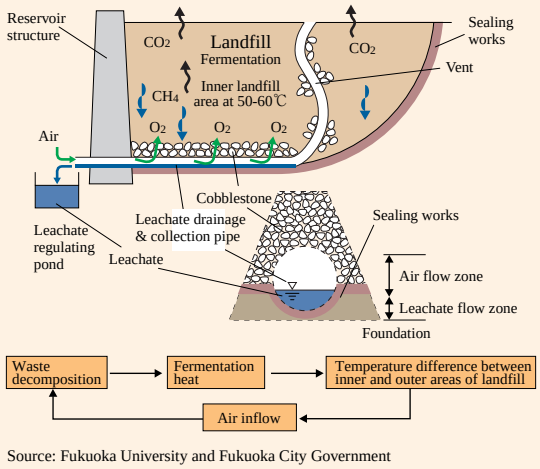
The semi-aerobic landfill structure (the Fukuoka method)

One of the landfill systems now used for final disposal sites is the semi-aerobic landfill structure (the Fukuoka method), which was first proposed in the second half of the Showa 40s (1970-1974) by Fukuoka University and the Fukuoka City Government. Because of its ease of construction and maintenance and its ability to quickly stabilize waste and improve the quality of the leachate, this landfill structure was adopted by the former Ministry of Welfare as the national standard and has been used by many municipal governments when constructing their landfill sites.

This structure uses large-diameter leachate collection and drainage pipes installed at the bottom of the landfill site in order to drain out the leachate and allow outside air to naturally flow into the inner landfill through these pipes via convection induced by the heat of waste decomposition. This design increases the decomposition capacity of the aerobic bacteria present and thereby improves the quality of the leachate. The ease of construction and maintenance is another advantage of this method, and there is no need to mechanically pump air into the landfill.

Since the semi-aerobic landfill structure allows cheaper construction and faster waste stabilization than the anaerobic landfill system promoted in the West, and since it can even restrict methane generation, it has recently attracted the attention of many developing countries as a sustainable technology and a suitable technology with which to help prevent global warming.

Conceptual image of the semi-aerobic landfill structure



Source: Fukuoka University and Fukuoka City Government

Environmental Protection announced that waste batteries could cause environmental pollution in the process of incineration and landfill. This issue became a major public concern.

In order to improve the management of the mercury contained in batteries, the government subsequently promoted source-oriented measures and recycling in cooperation with all parties concerned.

One of these source-oriented measures was stopping the use of mercury for manganese batteries (April 1991) and alkaline batteries (January 1992) through joint efforts with the Battery Association of Japan. This has enabled significant reductions to be made in the amount of mercury used in batteries sold in Japan.

Japan has also established a collection and recycling system to prevent the mercury contained in household batteries, as well as the mercury in waste fluorescent lamps, from being released into the environment. Many municipal governments now participate in the Liaison Meeting for the Amalgamated Treatment of Waste Batteries, etc., organized by the Japan Waste Management Association, and jointly collect waste batteries and fluorescent bulbs (by means of sorted collection) and then dispose of them (through mercury recovery and recycling).

As these examples show, one effective measure to minimize the release of the hazardous substances contained in these products is to establish a system for environmentally responsible recycling, in conjunction with other source-oriented approaches. It is also essential that countries with no appropriate disposal facilities at hand consider a wide-area recycling system in which hazardous wastes can be exported under the Basel Convention and then recycled overseas. (For example, Japan imports mercury-containing wastes from Thailand, the Philippines and other countries and recycles them.)

B Introduction of recycling laws

As shown above, the government set out specific poli-

Column The hexavalent chromium problem and the amendment of the Waste Management Law

The Waste Management Law, enacted in 1970, provided a clear definition of industrial waste and positioned it within the legal framework. However, because of the lack of an appropriate mechanism to accurately keep track of activities concerning industrial waste disposal, the monitoring and directions provided by the authorities were incomplete, leading to problems such as the frequent occurrence of illegal dumping and other violations, along with failures by the waste-generating businesses in exercising their responsibility. In addition, as the shortage of final disposal sites worsened, a growing number of companies simply piled up their waste out in the open, within their factory premises.

In the summer of 1975, an inappropriate disposal site for slag containing hexavalent chromium was found at a Tokyo factory that manufactured hexavalent chromium compounds, such as bichromate of soda. Environmental pollution was also discovered in the area around this site, along with potential health hazards to local residents. This incident developed into an issue of major public concern since pollution from hexavalent chromium slag was identified in many other regions following this initial discovery.

In light of public concern over waste disposal problems, the government amended the Waste Management Law in 1976. This amendment was mainly aimed at tightening regulation and supervision in order to ensure responsible final disposal.

Specifically, these amendments included redefining final disposal sites as waste disposal facilities, instituting a registration system, and introducing prior assessments based on technical standards. To enforce appropriate outsourcing practices concerning waste disposal, the amended law set up standards for the outsourcing of disposal work and banned companies from subcontracting any disposal work they have undertaken to another company. To keep track of industrial waste disposal activities and provide appropriate supervision and instructions, the amended law obliged enterprises and disposal companies to create and maintain disposal records, and added provisions on restoration orders to be issued in the event of any incident harmful to the conservation of the living environment.

This hexavalent chromium problem awakened Japan to the need to take environmental effects into consideration when addressing the final disposal of any waste, including industrial waste. It was also the starting point for efforts that have since led to Japan's success in reducing the amount of waste disposed of in final landfill sites by about 70% since the 1990s.

Column

Past initiatives

Prompted by the oil crises in the 1970s, pioneering initiatives such as recycling were started in many parts of Japan.

(1) Urban-Rural Environmental Connections Plan (URECs Plan)

In 1980, Toyohashi City started mandating its residents to separate their household garbage into five categories in order to facilitate the effective use of waste. In the same year, the following five plants were built on a single site to enable the integrated treatment of waste: (i) a waste incineration plant, (ii) a composting plant, (iii) a sorting and crushing plant, (iv) a chicken feces drying plant, and (v) a night soil disposal plant. The heat generated from the incineration of combustible waste and residues from the composting plant was used for heating in an adjacent greenhouse complex and for generating electricity for the internal facilities. The overall plan also involved the production of compost from combustible waste and night soil disposal sludge for use by local farmers to fertilize their farmland.

However, the usage of plastic by local residents increased year after year, eventually making it impossible to produce good-quality compost from combustible waste. Although Toyohashi was therefore unable to accomplish the plan's original goals, its attempt to construct a mechanism in which urban waste is used on rural farms while the food produced in rural farms is supplied to urban communities, in return, had something in common with today's concept of constructing a recycling loop under the Food Waste Recycling Law, and can be regarded as a pioneering attempt to establish SMC blocks.

(2) Stardust 80 Plan

In 1973-1980, to cope with the problems of urban waste disposal and the exhaustion of natural resources, the then Agency of Industrial Science and Technology, part of the Ministry of International Trade and Industry, working in cooperation with the Yokohama City Government, constructed and operated a research/demonstration plant for a resource recycling system centered on material recovery. In this system, mixed waste was divided into three groups: (i) garbage, glass and rubble, (ii) paper, and (iii) plastic and metal, so that resources could be recovered from each group by using (i) fast composting equipment, (ii) purifying and pulping equipment, and (iii) thermal decomposition and gasification equipment. However, limitations in the capability of the machine sorting stage for mixed waste prevented the production of good-quality compost and pulp and increased costs. Although the system did not, therefore, come into general use, the project raised awareness of the importance of sorting by waste generators and contributed to the improvement of more appropriate technologies, including those for waste gasification.

(3) Vacuum transport system for waste

Garbage is usually collected by a sanitation truck, but this method involves problems such as foul odors and pests released from the exposed garbage, and the mess made on the streets. To counter such problems and to meet the growing needs of the public for a better living environment and amenities, some municipalities constructed a system that combined waste incineration facilities and vacuum transport pipelines for the waste.

This system provided benefits such as (i) allowing citizens to throw away garbage whenever they liked, (ii) preventing odors and therefore improving sanitation, (iii) not marring the street appearance, and (iv) requiring less labor for waste collection and transport. However, it also had disadvantages such as the need for huge initial investments, long transport distance, a lack of flexibility, and the fact that it made people less motivated to reduce waste because of the "invisibility" of the waste. This attempt served as an unsuccessful example from which the 21st century, "the century of the environment," can learn a great deal on how to plan and implement more eco-friendly approaches such as reduced waste generation, sorted collection and recycling.

Although the above projects all had to be closed down without delivering as good a result as initially expected, Japan has leaned many lessons from them and has now developed new capabilities to convert its society into a SMC one.

Column

The PCB waste problem

Polychlorinated biphenyls (PCBs) are industrially synthesized compounds. Because they are resistant to heat, have high electrical insulation properties, and are chemically stable, they are often used as insulating oil in high-tension transformers, high-tension capacitors and voltage regulators, as well as the heating medium for heat exchangers. However, the Kanemi Oil Poisoning Incident in 1968 became a turning point, after which the toxicity of PCBs became widely recognized. In 1972, administrative guidance was given to PCB manufacturers to stop producing PCBs and collect them instead. In addition, the Law Concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., was enacted in 1974, principally to prohibit PCBs from being manufactured, imported and used from that year onward. Later, in 1976, standards for disposal by high-temperature incineration were introduced. However, some PCB wastes have been held in storage by domestic companies without being disposed of for over 30 years because of the opposition from neighbors, except for about 5,500 tons of liquid PCBs that were disposed of by high-temperature incineration at the Takasago plant of Kanegafuchi Kagaku Kogyo K.K. from 1987 to 1989. There was some concern that the negative legacy of these PCB wastes might cause environmental pollution in the event of loss or leakage during long-term storage.

In response, the government instituted the Law Concerning Special Measures against PCB Waste (PCB Special Measures Law) in July 2001 with the aim of ensuring and fostering the reliable and responsible disposal of the PCB wastes stored in Japan for long periods. The law stipulated the necessary regulations on PCB waste storage and disposal. In line with this law, the government took the initiative in constructing wide-area PCB waste disposal facilities to serve as key disposal centers, assisted by the Japan Environmental Safety Corporation (formerly Japan Environment Corporation), while the national and prefectural governments formed PCB waste disposal funds to reduce the financial burdens associated with disposal by small- and medium-sized enterprises. Through the use of these measures, Japan is striving to fundamentally eliminate the negative legacy posed by PCBs.

cies to address increasingly complex and serious waste disposal problems. However, the government also realized that it needed to address the situation in which a significant proportion of the ever-increasing amount of recyclable resources was being disposed of without being recycled. To meet this need, the Law for the Promotion of Utilization of Recycled Resources was enacted in 1991 to oblige manufacturers to promote the effective utilization of recyclable resources. On the other hand, municipal governments, especially big city governments, found it more and more difficult to secure sufficient final and other disposal facilities for solid waste, leading to the problem of "reverse-charging," or paying fees in order to hand over certain wastes (as in the glass bottle recycling system, for example, which had previously worked well). This raised the need for further recycling of containers and packaging, which accounted for a large part of all municipal solid waste. To meet this need, the Containers and Packaging Recycling Law was enacted in 1995. This law mandated manufacturers to engage in recycling activities and obliged municipal governments to introduce well-planned efforts to foster sorted collection. This law, which can be regarded as an example of early adoption of the concept now known as extended producer responsibility, has helped the development of full-fledged recycling systems by involving more members of the general public and attracting greater public attention.

In 1998, the Home Appliance Recycling Law was introduced, requiring home appliances to be disposed of by manufacturers, mainly by means of recycling. In 2000, the government also enacted the Construction Waste Recycling Law which obliges demolition companies that carry out demolition projects larger than the specified criteria to sort and recycle construction waste, and the Food Waste Recycling Law, which requires restaurant and distribution businesses to recycle food waste. To further enhance the legal framework for recycling, the End-of-life Vehicle Recycling Law was established in 2002, obliging automakers to collect and recycle shredder residues from end-of-life vehicles.

C The first year of the establishment of a SMC Society

Based on experience gained over the years, the government designated 2000 as the first year of the establishment of a SMC because this was the year when the Fundamental Law for Establishing a Sound Material-

[Open-air burning of waste in developing countries]
Source: Website of the Japan Industrial Waste Technology Center

Cycle Society (hereinafter referred to as "the Fundamental Law"), the Waste Management Law, the Law for the Promotion of Effective Utilities of Resources and a number of recycling laws were enacted or revised. This year, Japan took a large step toward establishing a SMC Society.

The Fundamental Law defines a SMC Society as one in which the consumption of natural resources is curbed and the burden on the environment is minimized, by means of:

1) Preventing products from becoming waste;
2) Promoting appropriate and cyclical use of CRs that have been generated; and
3) Ensuring that CRs which are not subject to cyclical use are disposed of appropriately.

In other words, a SMC Society is a sustainable development-oriented society in which the following concepts are adopted as the basic socioeconomic principles: socioeconomic activities and people's lifestyles based on the 20th century model of mass-production, mass-consumption and mass-disposal are reviewed; resources are used efficiently; waste generation is minimized; unavoidable wastes are recycled as resources; and wastes for which no means of recycling can be found are responsibly disposed of.

D Suggestions to put Japan's experience to good use

This chapter has described Japan's path to a SMC by providing an overview of the systems used from the Edo era through to the present. Although Japan already had an established SMC Society in the Edo era, as it later opened itself to the world and tried to model the country upon Western nations, the Japanese way of thinking about goods and production styles changed. The country moved towards a mass-production and mass-consumption society. A variety of products produced in and after the 1970s caused many waste disposal problems, but systems and technologies for the responsible disposal and effective use of wastes also developed gradually over the same period. Progress towards a SMC Society gained momentum through the amendment of the Waste Management Law and the establishment of recycling laws in the 1990s and, since 2000, Japan has been recognized as a world leader in forming a SMC Society.

Developing countries are now in the midst of economic growth just like that experienced by Japan during its period of high economic growth. The inappropriate disposal of waste is common in these countries, and this includes the open dumping of waste, often industrial waste, and the open-air burning of waste. Electrical and electronic appliances imported from overseas, nominally for the purpose of reusing and recycling them, are also often subject to inappropriate treatment, posing a threat to the local living environment.

With resource conservation programs in these rapidly developing cities still far from complete, developing countries are nowhere near being able to deal with issues of global concern, such as resource problems and global warming problems. Japan needs to help them by sharing its experience.

Japan's accumulated experience must be of help in solving many of the problems these Asian countries are faced with. Bearing in mind the history of Japanese systems described in this chapter, Japan should expand its program of assistance to other countries, especially in Asia, and help promote the establishment of a SMC Society, worldwide.

Chapter 3

Community-local-blocks-national-international-based SMC establishment

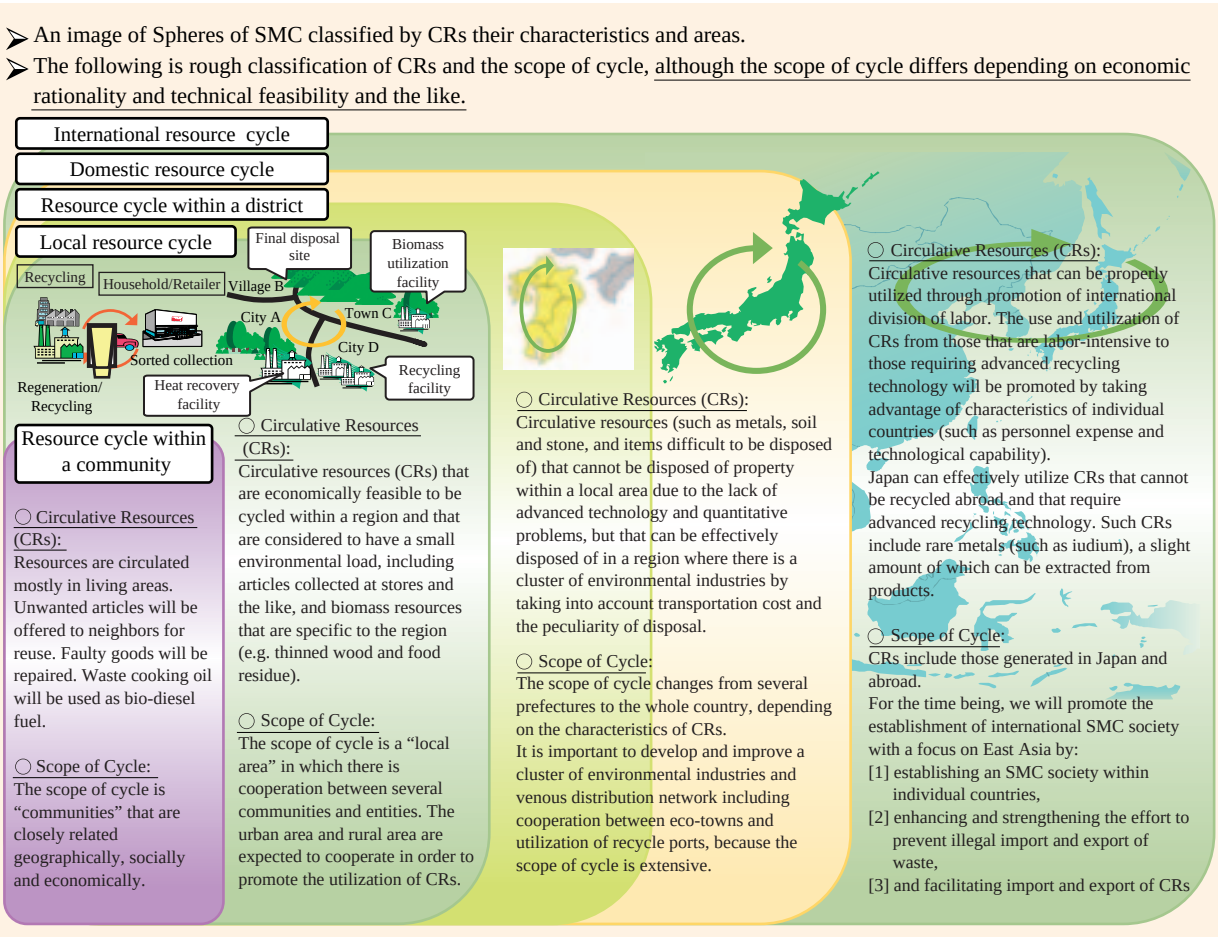
Section 1 Establishment of SMC blocks

(1) Significance of SMC blocks

The First Fundamental Plan for Establishing a SMC Society defined material flow indicators, which measure the macroscopic progress of SMC formation, and effort indices, which measure progress in terms of the efforts made by different entities, and set numerical targets for both. Since the formulation of this plan, progress has been reviewed in every fiscal year. The review results have been used for the development of the new fundamental plan, which has again defined material flow indicators and effort indices and introduced supplementary indicators as well as indicators for trend monitoring. By defining national-level indicators and numerical targets, the new fundamental plan has provided clear motivation for the establishing a SMC Society and is now capable of evaluating the results.

A new concept introduced to the second Fundamental Plan is the establishment of SMC blocks, in which a material cycle of optimal size is formed in accordance with the characteristics of the region and the properties of its CRs. With appropriate waste management as a precondition, the idea of SMC blocks is aimed at establishing the opti-

Figure 4-3-1 Various Spheres of SMC



Source : Ministry of the Environment

mal size of material cycle for each type of CR by considering regional characteristics from an environmental perspective (e.g., anti-global warming, biodiversity conservation), a resource perspective (e.g., scarcity, utility), and an economic perspective (e.g., transport efficiency, treatment costs). For example, circulation within the region would be suitable for biomass CRs, which are characterized as being generated in specific areas and are easily decomposed, whereas wide-area circulation would be more desirable for CRs requiring advanced treatment technology,etc. (Figure4-3-1).

(2) A vision for SMC blocks

Chapter 2 of the Fundamental Plan provides a medium- to long-term vision for the establishment of a SMC Society. This is a specific medium- to long-term vision of how a SMC is to be formed by around 2025, focusing on the creation of a sustainable society, and serves as a basis for cooperation and collaboration among the different entities which are essential for the establishment of a SMC Society. A particularly important component of this vision is the idea of creating a SMC in such a way that it makes the most of local and regional characteristics.

This basic concept underlying SMC blocks involves establishing a more customized and more effective SMC by forming SMC blocks of optimal size. The optimal SMC block can be based at the community level, the regional level, the special block level, the national level, or even the international level, in accordance with CR properties and regional characteristics. This concept is expected to become a driving force for local community revitalization based on self-reliance and mutual cooperation.

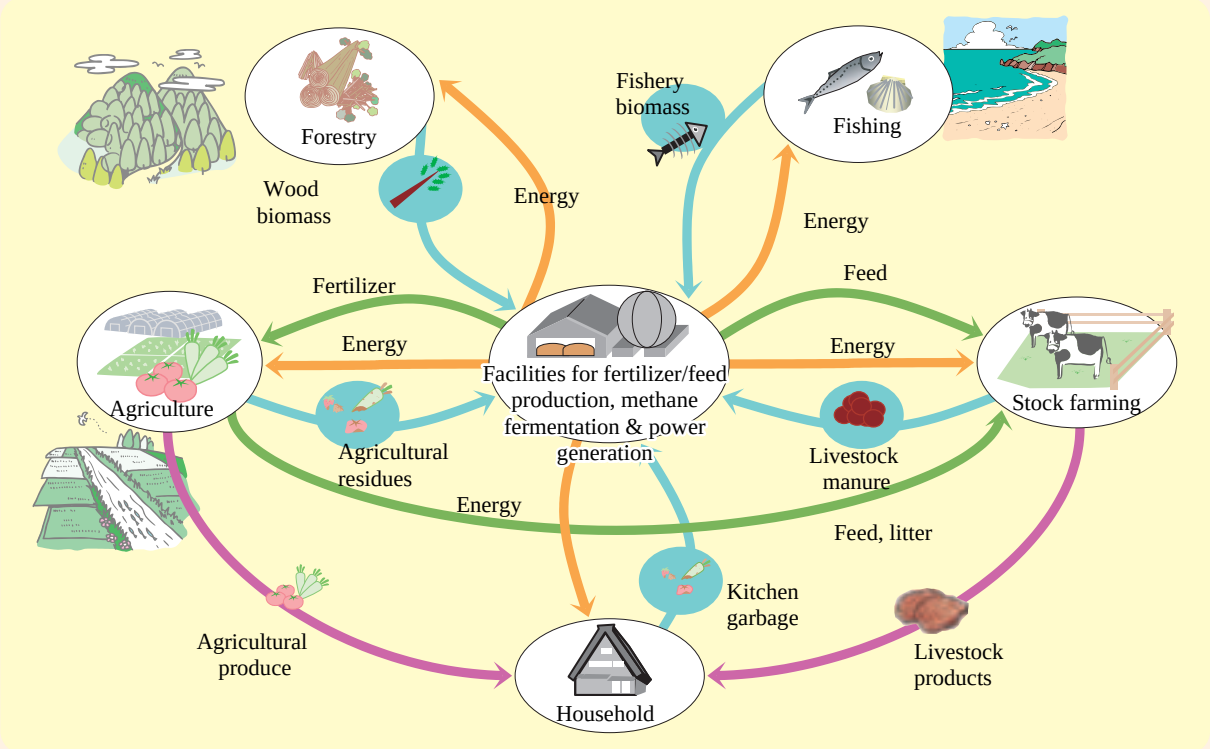
The following sections describe some of the concepts

Figure 4-3-2 Material cycle in agricultural, forestry and fishing villages

Agricultural, forestry and fishing villages

A conceptual image of a SMC based on community size and characteristics is described below.

- CRs produced in agricultural, forestry and fishing villages include lumber from thinning, livestock manure, and shells, as well as kitchen garbage, which is collected separately from other municipal solid wastes.
- These CRs, together with other CRs, are used as biomass resources for energy recovery through methane fermentation and the production of fertilizer, feed, soil conditioners, etc.
- This forms a material cycle in which agricultural products produced using this fertilizer are consumed within the same region (local production for local consumption)



Source: Ministry of the Environment

related to SMC blocks, as proposed by the Fundamental Plan as part of its medium- to long-term vision for the establishment of a SMC Society.

A Communities

At the community level, unwanted articles are reused through exchanges between neighbors or through their sale at flea markets. Broken-down products are repaired in order to extend their useful lives as much as possible. In addition to the reuse and recycling of goods through recycling centers, recycling activities involving citizens and NGOs/NPOs are also conducted, mainly at municipal recycling facilities that also have the capability to educate the public, leading to the development of community businesses. With regard to transport, contributions are made to the development of communities with low environmental burdens through initiatives such as the effective use of bicycles.

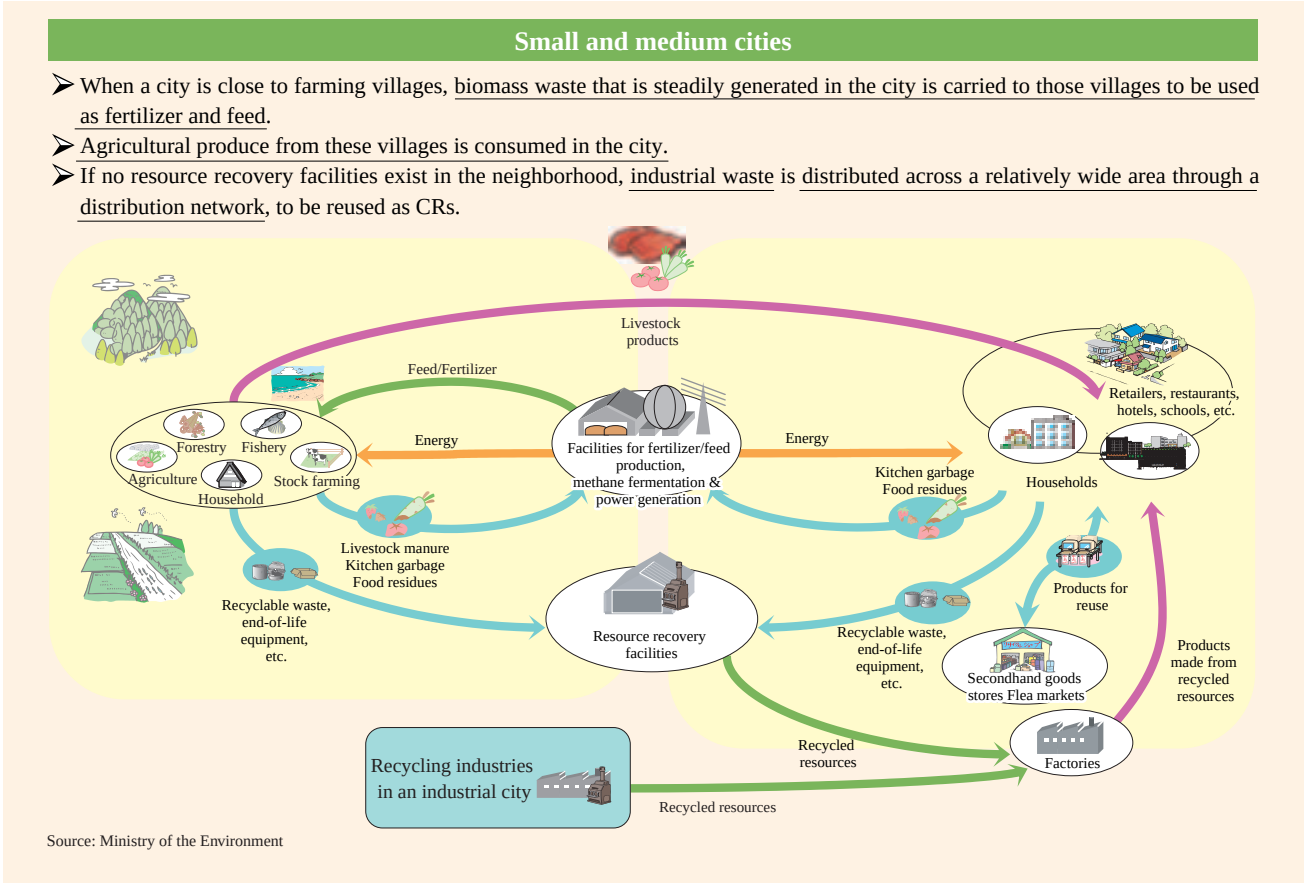
B Agricultural, forestry and fishing villages

CRs generated in agricultural, forestry and fishing villages include lumber from thinning, livestock manure, shells, and kitchen garbage subject to sorted collection. As biomass CRs, they are converted into fertilizer and feed which are then used for agriculture, stock farming and fishery, the products of which are then consumed within the same area. This forms a material cycle based on local production for local consumption. The formation of this type of material cycle, based on local production for local consumption, and other such efforts directed towards sustainable agriculture, forestry and fishery all contribute to the conservation of satochi-satoyama, which are community-based nature areas serving as habitats for wildlife (Figure4-3-2).

C Small and medium cities

Small and medium cities, if they are close to farming villages, form material cycles that connect urban and rural areas. In such a cycle, biomass CRs which are constantly generated in cities are carried to farming villages to be used as fertilizer and feed in agriculture and stock farming so that the resultant agricultural and stock farm products can be consumed in the cities. The use of such CRs as energy sources is promoted in accordance with local characteristics. If no facilities exist in the neighborhood, industrial waste is distributed elsewhere in order to be reused as CRs across a relatively wide area by means of a distribution network (Figure4-3-3).

Figure 4-3-3 Material cycle in small and medium cities



Source: Ministry of the Environment

D Large cities

In large cities, large amounts of wastes are constantly generated and collected because of the concentration of waste generators. Extensive resource recovery, waste reduction (by incinerating non-recyclable wastes) and heat recovery during these processes can therefore be carried out efficiently on a large scale. For example, the multi-stage, large-scale use of wastes can be implemented fully and efficiently through the recycling of residues from the primary cyclical use of biomass CRs and plastics or through heat recovery (Figure4-3-4).

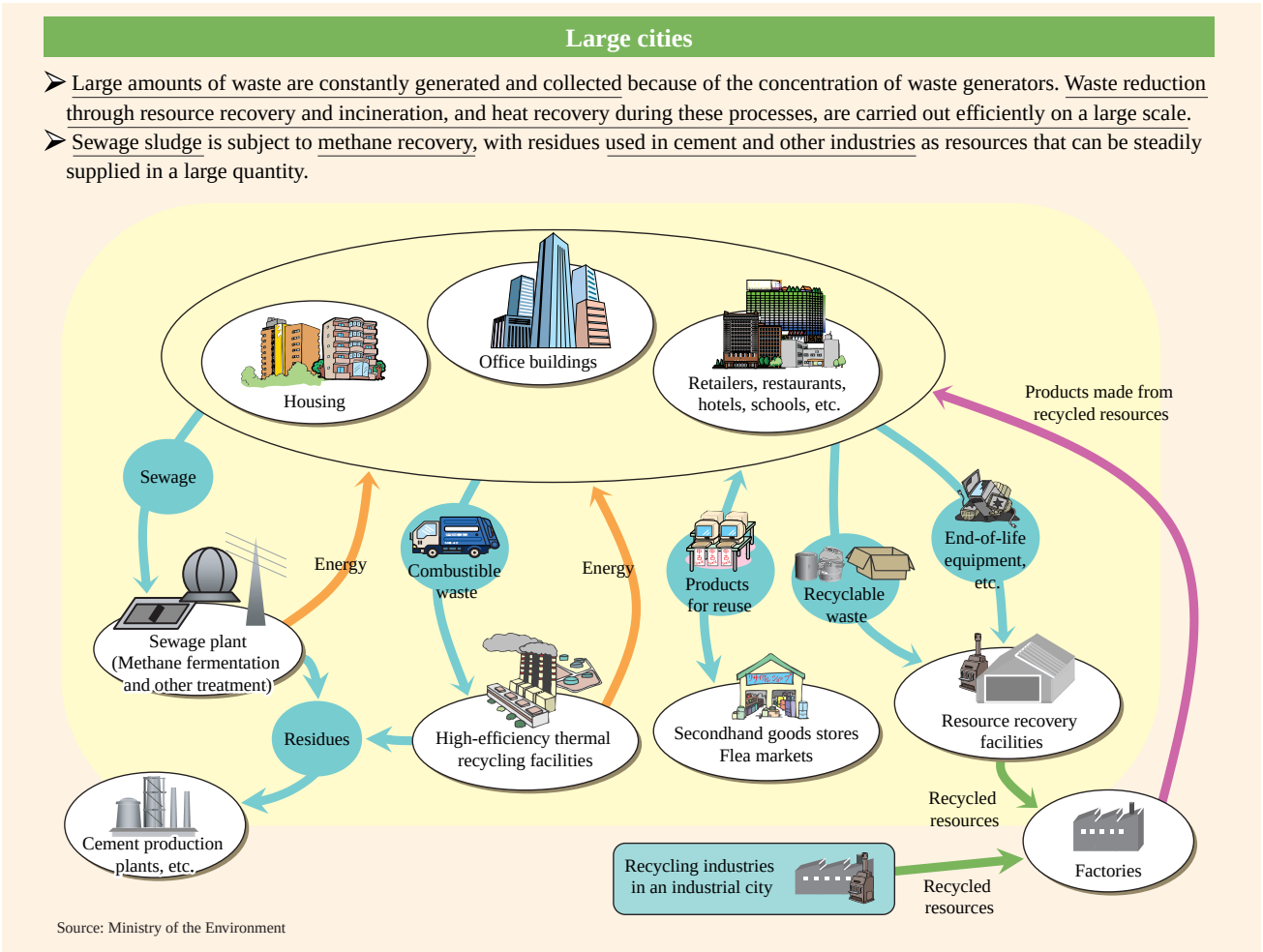
E Intra-block and national circulation

In SMC blocks formed within special blocks or at the national level, the material input required for production activities is strictly restrained in the industrial cluster at the center of the material cycle. Also, as recycling industries concentrate around these activities, the wide-area collection of CRs can be carried out by means of land and marine transportation, and the efficient use of CRs is facilitated by economies of scale and mutual cooperation within the cluster. Efforts directed towards zero emissions are intensified through the application of technologies, infrastructure and the expertise of arterial industries. In particular, CRs can be more efficiently utilized by means of new technologies, such as those used for recovering valuable CRs that are present in only limited amounts (e.g., rare metals) and those used for detoxifying hazardous wastes (Figure4-3-5).

F International resource circulation

In international SMC blocks, CRs are utilized in a way that makes the best use of each country's characteristics. Japan uses CRs that require advanced recycling technologies and are therefore difficult to recycle in other countries. First, a domestic SMC Society is formed in each country, followed by the enhancement of measures to prevent illegal imports and exports of wastes and the establishment of traceability procedures to monitor the transboundary movements of wastes. Consequently, transboundary movements of CRs are facilitated in consideration of a division of labor between the countries involved (Figure4-3-6).

Figure 4-3-4 Material cycle in large cities

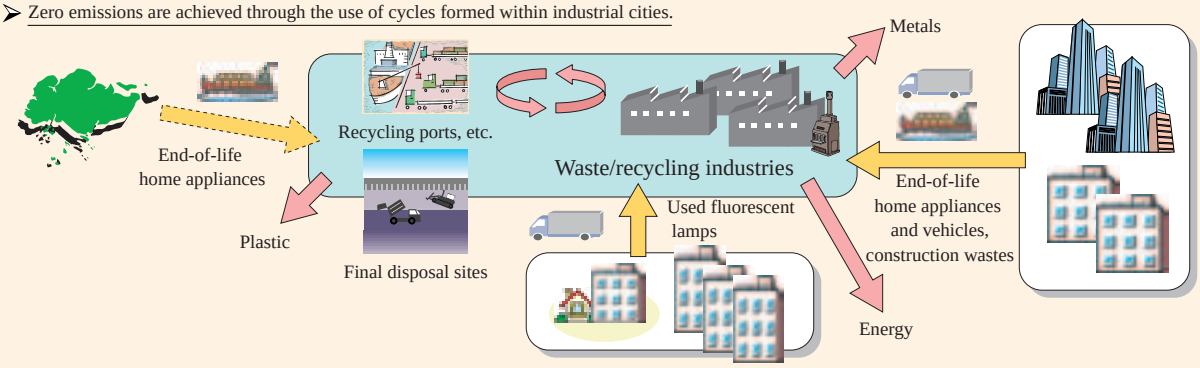


Source: Ministry of the Environment

Figure 4-3-5 Intra-block and national circulation

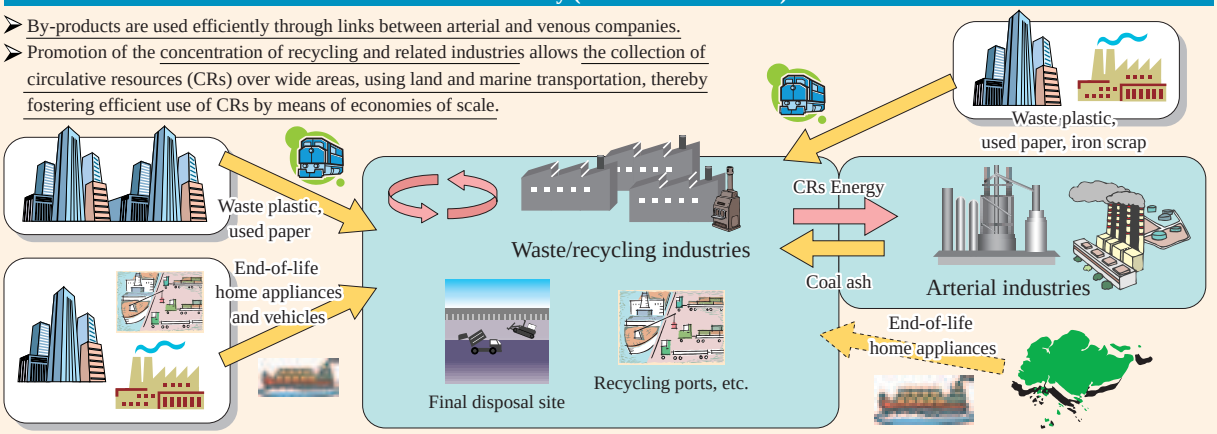
Industrial city (wide-area collection & high-efficiency disposal)

- Concentration of recycling and related industries allows the collection of circulative resources over wide areas, using land and marine transportation.
- Zero emissions are achieved through the use of cycles formed within industrial cities.



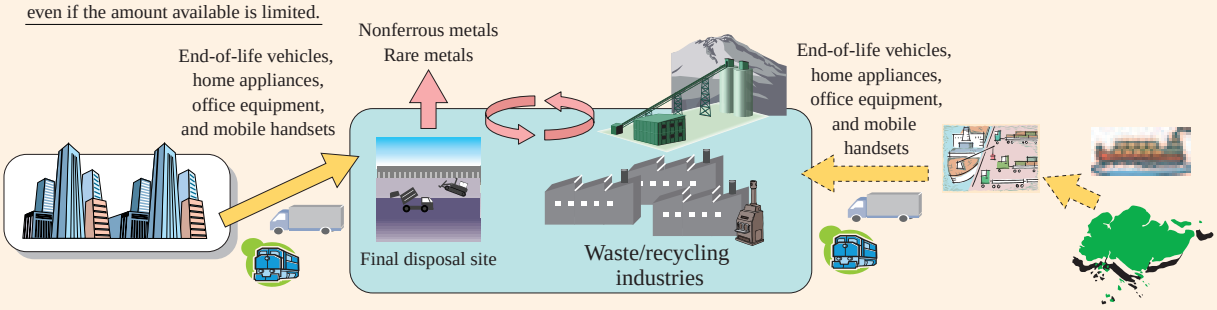
Industrial city (arterial-venous links)

- By-products are used efficiently through links between arterial and venous companies.
- Promotion of the concentration of recycling and related industries allows the collection of circulative resources (CRs) over wide areas, using land and marine transportation, thereby fostering efficient use of CRs by means of economies of scale.



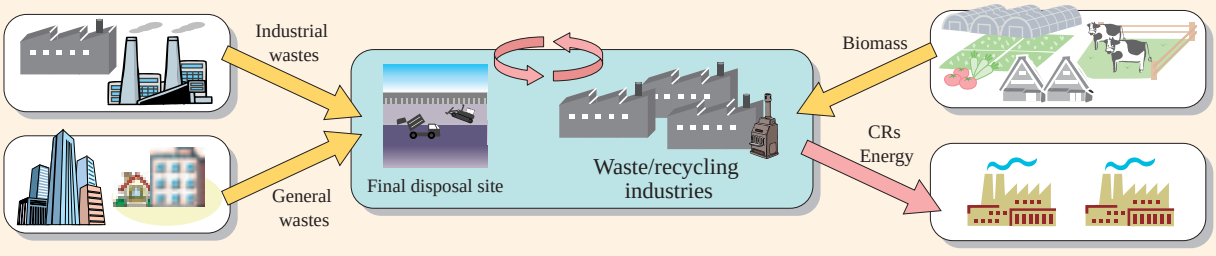
Industrial city (nonferrous metal treatment technology)

- Existing technologies, such as arterial industries' techniques, infrastructure and expertise, are applied in order to ensure the efficient use of CRs.
- A contribution is made to the creation of a sound material-cycle society based on original technologies, for example, by collecting high-value-added CRs, even if the amount available is limited.



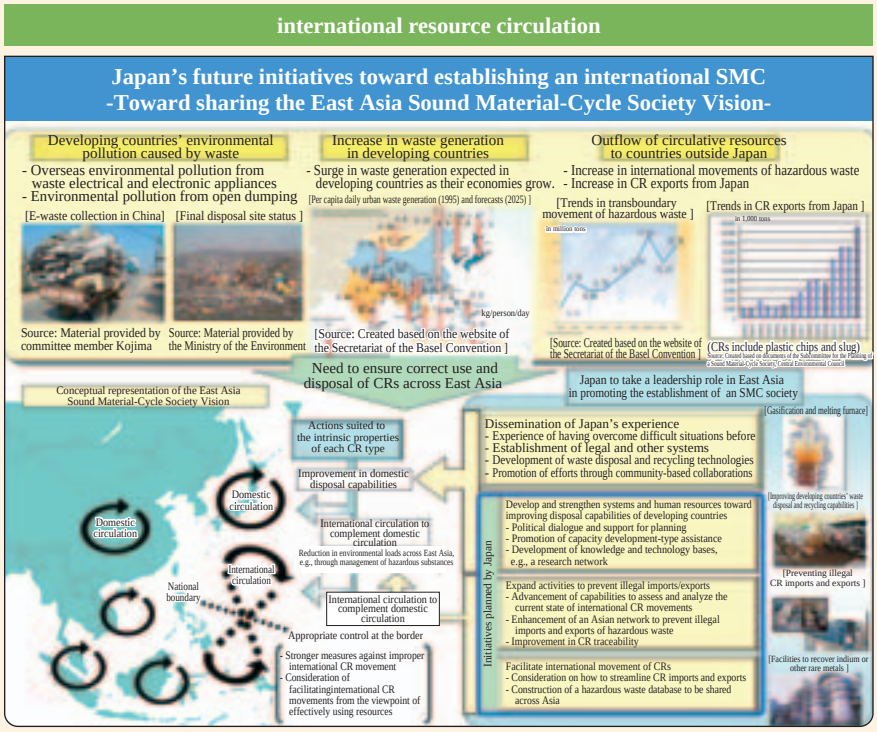
Industrial city (total waste treatment)

- Both general and industrial wastes are widely accepted for disposal purposes. With industrial wastes, in particular, both biomass-type wastes and industry-derived wastes are accepted for large-scale treatment if the disposal facilities are located halfway between urban and rural areas.
- The recycled CRs and the collected energy are reused for industrial activities, minimizing the amount of final disposal.



Source: Ministry of the Environment

Figure 4-3-6 international resource circulation



Source : Ministry of the Environment

Section 2 Resource circulation in SMC blocks~Examples that have led to successful revitalization of local communities

(1) Community-based and local resource cycles

A Rape Blossom projects

Rape Blossom projects are currently underway in many communities and involve collaboration between farmers and members of the public. In these projects, rapeseed oil is extracted from rape blossoms grown on land converted from paddy fields. The oil produced is used for cooking at schools (for school meals), restaurants and homes, while oilcake is used to make animal feed and compost, which is then returned to the rape blossom fields as fertilizer. Waste cooking oil is collected for use as biodiesel fuel. Some projects aim at a higher level of local involvement by incorporating beekeeping, advertising rape blossom fields as a tourist attraction, and providing environmental education programs for elementary, junior high and high schools. Efforts such as these, directed towards community development and focusing on resource circulation and energy independence, are being carried out in many parts of Japan .

B Motegi Town

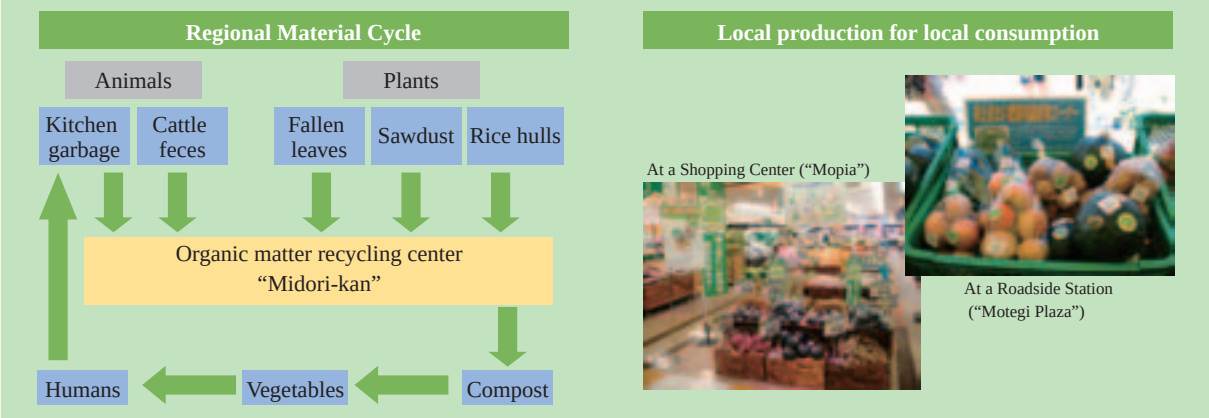
In the town of Motegi (Motegi-machi), kitchen garbage (collected separately from other waste) is mixed with fallen leaves from forests and livestock manure to produce compost at Midori-kan, the town's organic matter recycling center. Composting not only helps reduce incineration costs and hazardous substance generation, but also allows the restoration of traditional agriculture, involving soil improvement with compost and the promotion of eco-friendly agriculture which uses no chemical fertilizers or pesticides. This initiative aims to produce safe, high-quality agricultural produce. The town has established both a mechanism for local production for local consumption, in which the agricultural products produced are consumed by local people, and a system to supply food products for use in school meals, with the aim of providing better nourishment for children's minds and bodies (Figure4-3-7).

C Shibushi City

With no incinerating facilities of its own, Shibushi City has to dispose of all its wastes in landfills. By means of the sorted collection of wastes into 28 categories, the city government has successfully reduced the amount of landfill wastes by 80%. This was achieved by forming organi-

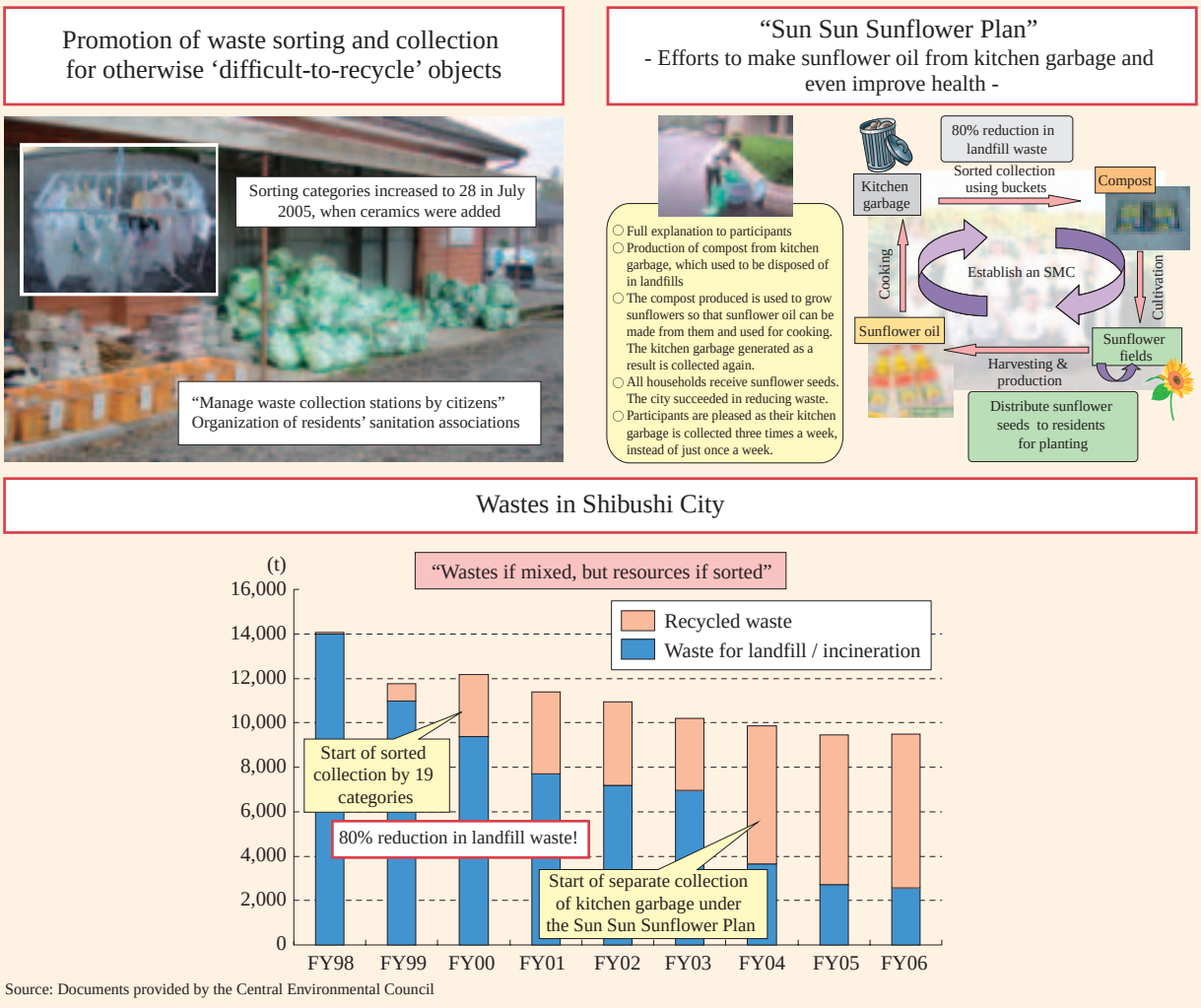
zations called residents' sanitation associations and by enforcing sorted collection in cooperation with the public under the slogan of "Promotion of tiresome things." To deal with kitchen garbage, the city also implements the "Sun Sun Sunflower Plan," which produces sunflower oil from kitchen garbage as part of its efforts to achieve zero landfill wastes through regional collaboration (Figure4-3-8).

Figure 4-3-7 Regional Material Cycle



Source: Documents provided by the Central Environmental Council

Figure 4-3-8 Efforts in Shibushi City



Source: Documents provided by the Central Environmental Council

D Aichi Prefectural Federation of Agricultural Co-operatives (together with Uny Co., Ltd. and Hirate Sangyo Ltd.)

These three entities have established a food recycling loop. Uny Co., Ltd., a food retailer, completely separates all food residues on the basis of category, then grades them and keeps them in cold storage in order to maintain quality until they are delivered to Hirate Sangyo Ltd., a food waste recycler. From these wastes, Hirate then produces fully fermented, good-quality compost that farmers can use. Aichi Prefectural Federation of Agricultural Co-operatives, while serving as a contact point between the various entities in the loop, also provide guidance on controlling the quality of recycled compost and producing and selling agricultural products. All the vegetables grown with recycled compost are purchased by Uny and then sold in its stores.

This is a successful example of a food recycling loop involving steady and continuous high-reliability inputs (Figure4-3-9).

E Effective use of fish of foreign origin

Shiga Prefecture has set up the "Lake Biwa Rules" to assist the restoration of Lake Biwa's diverse ecosystem. A policy to prevent the release of any fish of foreign origin (bluegill and black bass) caught in the lake is promoted as part of this initiative. Fish of foreign origin collection receptacles and collection boxes are placed around the lake and anglers are requested to cooperate in the no-release policy. All fish of foreign origin that anglers place in the collection receptacles are carried to the Dainaka Aguri no Sato (a business-oriented cooperative work center) for composting. The compost produced is used for eco-friendly vegetable farming and is sold as fertilizer, ensuring its effective use (Figure4-3-10).

(2) Wide-area resource circulation at the block, national and international levels

The previous section focused on efforts directed towards community-based and regional circulation of biomass CRs. However, there are also wider-area resource cycles formed in accordance with the characteristics and the uses of CRs and the location of the facilities that process and use them.

For example, the destinations (prefectures) of CR shipments from construction-wood crushing facilities in Chiba Prefecture vary widely, depending on the intended use. This is also the case with receiving facilities. For example, a recycling plant for a city located in northern Saitama Prefecture receives rubble, wood waste and waste

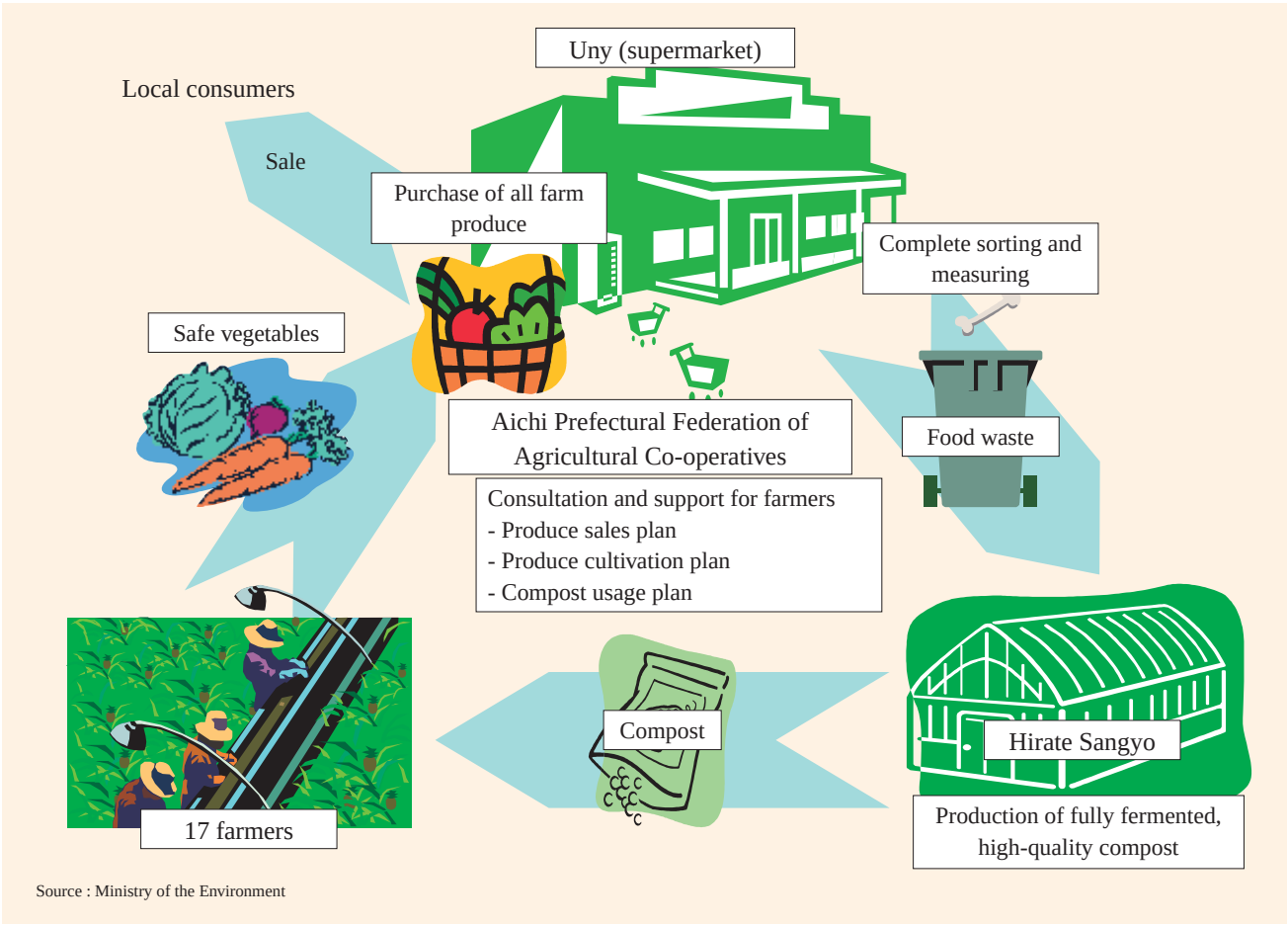
Column

Rate of food losses

Food losses refer to leftovers and other wasted food. A food loss survey of households and restaurants (conducted by the Ministry of Agriculture, Forestry and Fisheries in FY 2006) shows just how much food Japan wastes in the form of leftovers and garbage (only leftovers were surveyed in the food service industry). When compared with the number of people in each household, the rate of food loss can be seen to be highest (6.4%) in single-member households and only 3.5-4.0% in households with two or more members. In the food service industry, the percentage of food left uneaten in cafeterias and restaurants (3.1%) is greatly exceeded by banquet halls used for wedding receptions (22.5%) and facilities used for other parties (15.2%). When the data are examined on the basis of food type, beverages can be seen to account for over half the amount of the total leftovers. An analysis of leftovers in cafeterias and restaurants, based on the type of dish served, indicates that pickled vegetables are the type of food most often left unfinished, accounting for 11.0% of all leftovers. Based on the type of restaurant, those serving traditional Japanese cuisine account for the largest percentage (4.3%) of uneaten food.

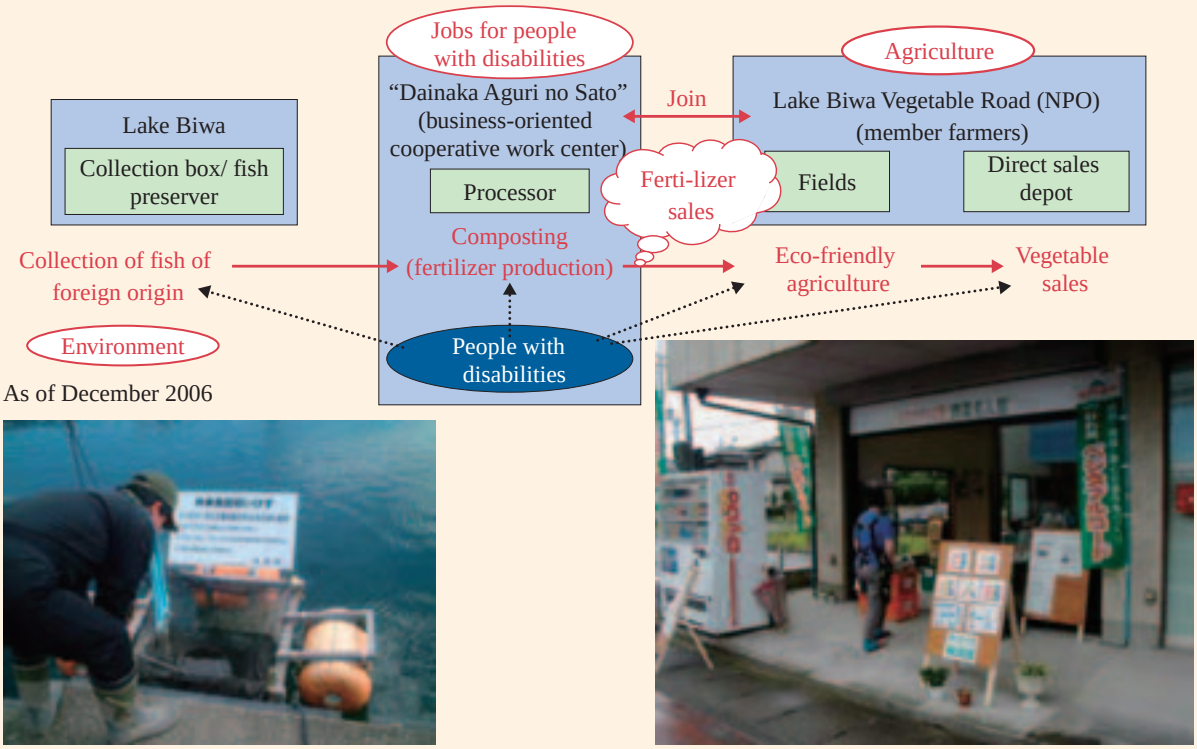
What kinds of measures should be taken to reduce such food losses? When families were asked about those things they took into consideration when purchasing food, the majority (72.5%) of respondents answered that they choose products carrying more recent dates of manufacture or those with longer shelf lives. However, overemphasis on food freshness can lead to an increase in waste at the retail stage. The First Food Consumer Monitor Survey in FY 2005, a survey of Food Consumer Monitors (selected from ordinary consumers living in major cities) conducted by the Ministry of Agriculture, Forestry and Fisheries, shows that what consumers want most is for restaurants to clearly explain on the menu, or by some other means, that customers can choose their preferred serving size, allowing them to finish all their meal (as cited by 45% or respondents). It is hoped that efforts to reduce food losses will expand in homes and restaurants alike.

Figure 4-3-9 Aichi Prefectural Federation of Agricultural Co-operatives



Source : Ministry of the Environment

Figure 4-3-10 Joining together welfare, agriculture and environmental conservation



Source: Shiga Prefectural Center for Support of Employment, Living and Participation

plastic from a different range of areas because of the difference in weight between these wastes (Figure4-3-11).

An analysis of the circulation of iron scrap, by region, suggests that the majority of iron scrap generated is used within the same regional block, both for economic reasons and because of the presence of electric furnaces that use iron scrap. Interregional circulation is observed only on a complementary basis (Figure4-3-12).

There are also attempts underway to recover valuable resources from hazardous or hard-to-treat wastes by using advanced technologies. Since the number of facilities capable of treating such CRs is limited, wider-area resource cycles should be formed to allow them to be used most effectively (Figure4-3-13).

A Northern Akita Prefecture

In the northern part of Akita Prefecture, which was once one of the world's richest mining areas, a project to recycle metals by making use of the local mines and refineries is now underway. Based on the zero-emissions concept, which aims to completely eliminate waste by using all industrial waste as raw materials in other sectors, the region has been approved under the Eco-town program which seeks to create communities in harmony with the environment while also fostering regional development. The region now serves as a wide-area recycling center for metals, including rare metals (Figure4-3-14).

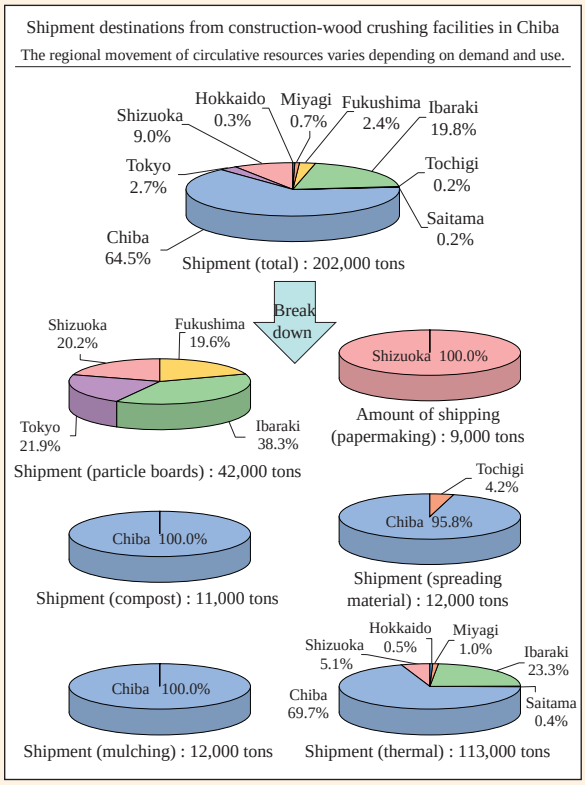
A private enterprise initiative in this region, carried out in cooperation with the Secretariat of the Basel Convention and participating Asian countries, is planning a project to collect used mobile phones from Asia and recover resources from them.

B Kawasaki City

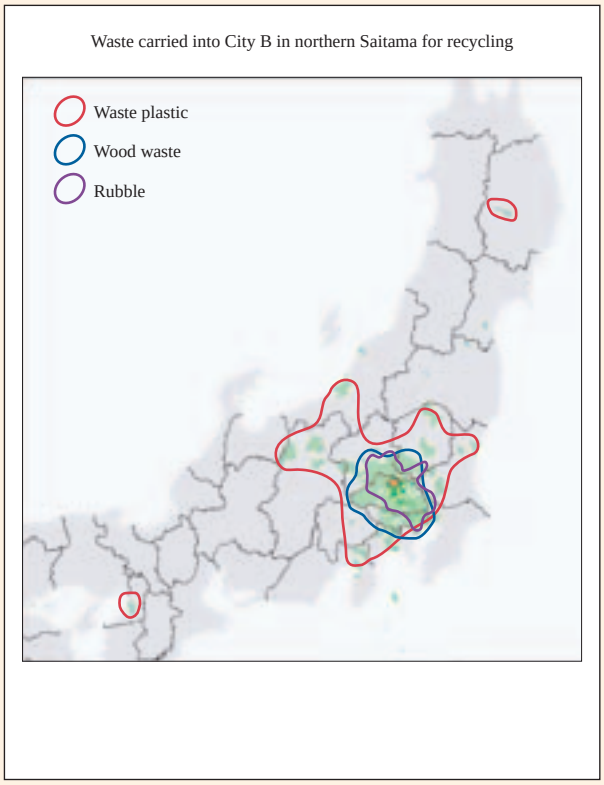
Kawasaki City has developed its coastal "Kawasaki Eco-town," which aims to minimize environmental burdens on the region and create a sustainable society in which industrial activities are in harmony with the environment. In this Eco-town, local companies seek to reduce environmental impact factors in every aspect of their activities, from production through to the disposal of their products. As well as promoting such company-level efforts, the Eco-town strives to establish a regional resource cycle through collaboration among companies and the use of recycling facilities. The material flow in Kawasaki Eco-town indicates that cyclical use has increased within Kawasaki (Figure4-3-15).

Figure 4-3-11 Examples of intra-block resource cycles

● Cyclical use of by-products from construction



Source: Action Plan to Promote Construction Wood Recycling in Chiba (Ministry of Land, Infrastructure and Transport)

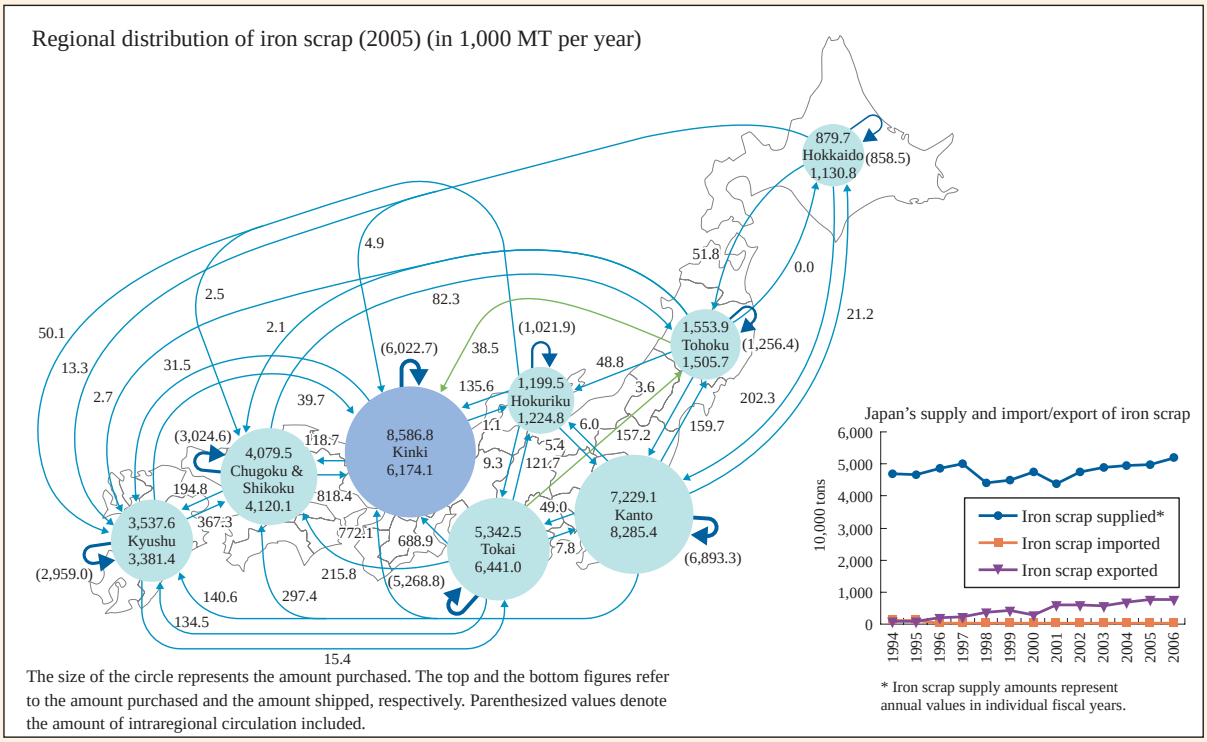


Source: National Institute for Environmental Studies

Figure 4-3-12 Circulative use of iron scrap

Examples of domestic resource cycles

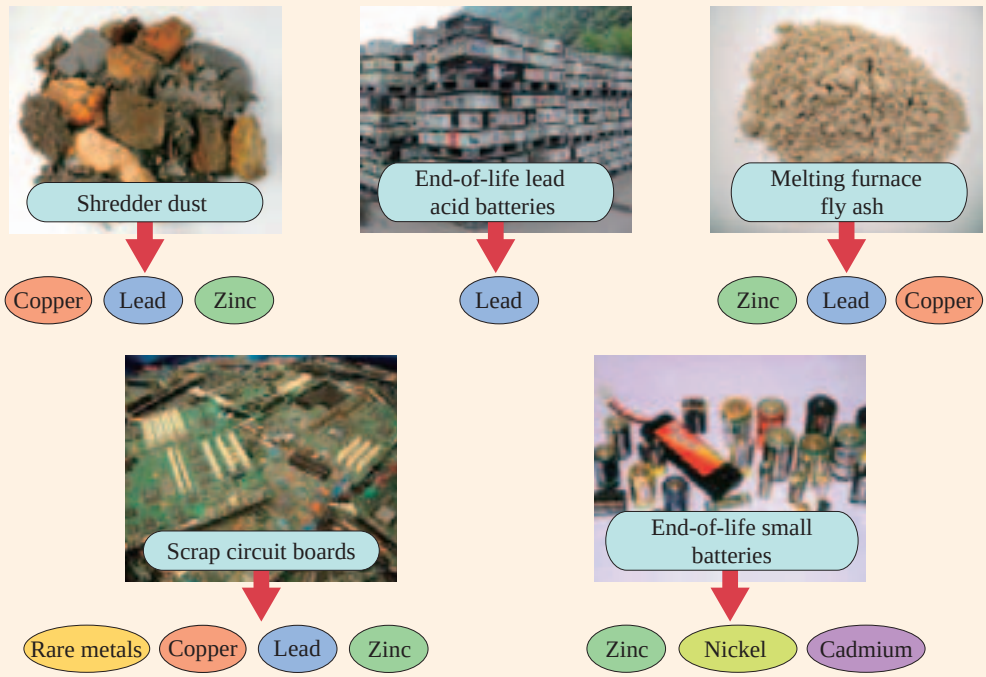
● Circulative use of iron scrap



Source: Left: Japan Ferrous Raw Materials Association; Right: Annual reports on steel, nonferrous metal and ferrous metal products, and trade statistics

Figure 4-3-13 Examples of waste disposal and collected items

Collection of useful metals from wastes considered difficult to dispose of and wastes containing hazardous materials and potentially having a serious impact on the environment if released



Source: Japan Mining Industry Association

Figure 4-3-14 Eco-town projects

Eco-town projects

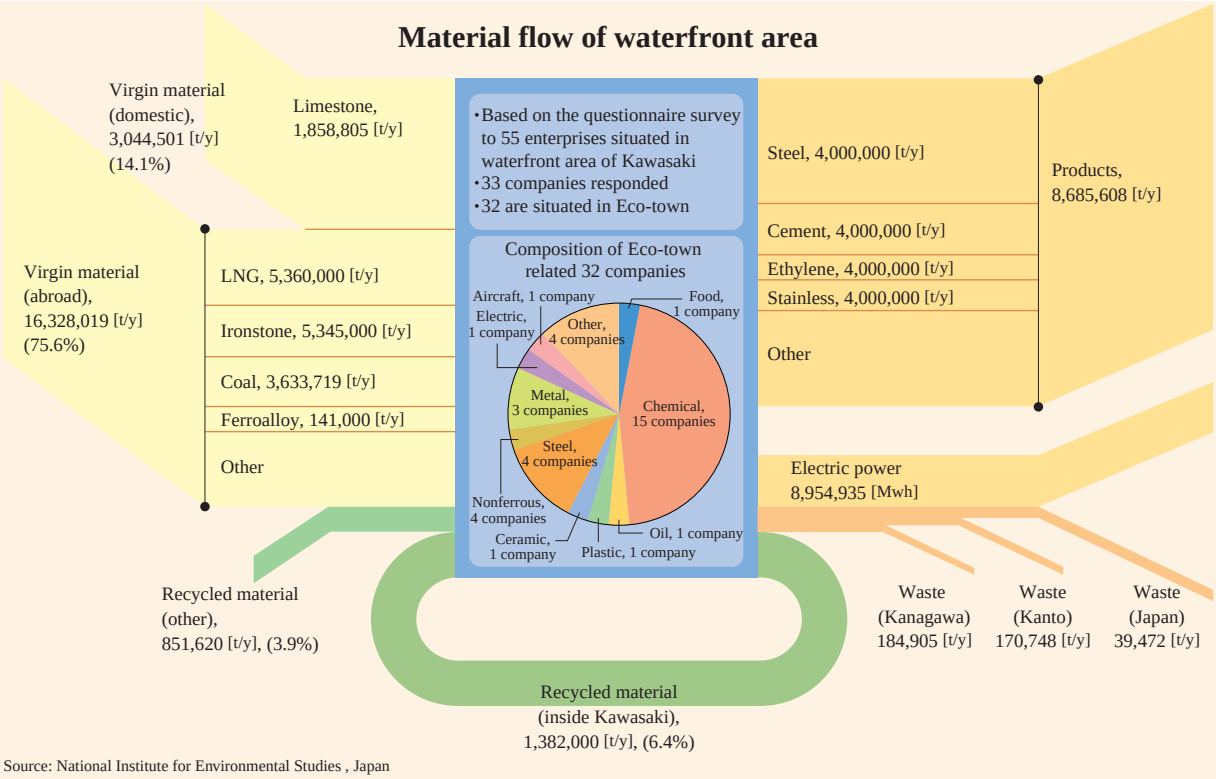
This is a program based on the zero-emissions concept, which aims to completely eliminate waste through the use of all waste from industry as raw materials in other sectors. Eco-town projects seek to create communities in harmony with the environment while fostering regional development. To date, 26 regions have been approved.
One project related to rare metals is the "Northern Akita Prefecture Eco-town Plan" (approved in November 1999), which intends to promote metal recycling in a region that was once one of the world's richest mining areas, by using its mine and refinery facilities.

<Outline of the Northern Akita Prefecture Eco-town Plan>

Facilities	Operating entity	Project description
Home appliance recycling facilities	Eco-Recycle Co., Ltd.	◆Recycles four types of home appliances pursuant to the Home Appliance Recycling Law, along with office equipment (6,000 t/yr in throughput) Four types of home appliances, etc. → Disassembly & crushing /sorting by material type → Ferrous & nonferrous metals, Cullet
Nonferrous metal collection facilities	Ecosystem Kosaka Co., Ltd.	Shredder dust, Waste circuit boards → Metallic vapor collection furnace → Gold, silver, copper, lead, etc. ◆Collects metals from circuit boards containing valuable metals (removed from end-of-life home appliances) by using them as recycled raw materials in a refinery (50,000 t/yr in throughput)
Facilities for manufacturing new building materials from	Akitawood Co., Ltd.	◆Mixes waste plastic with waste wood to produce energy-efficient construction materials by extrusion molding.
Coal ash and waste plastic recycling facilities	Akita Eco Plash Co., Ltd.	◆By using wastes such as plastic containers and packaging, produces secondary plastic products (materials for electrical facilities and construction materials)

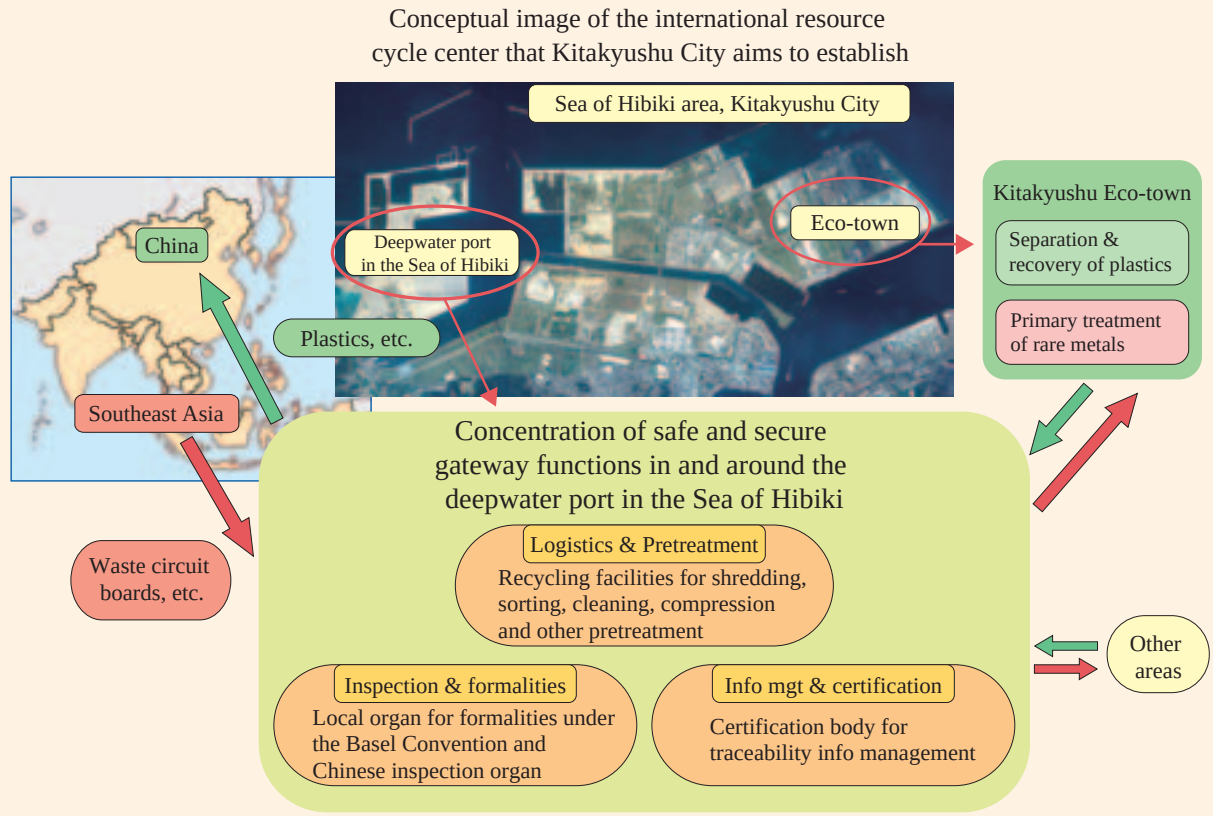
Source : Ministry of the Environment

Figure 4-3-15 Material flow of waterfront area



Source: National Institute for Environmental Studies , Japan

Figure 4-3-16 Kitakyushu City's efforts



Source: Documents provided by the Central Environmental Council

C Kitakyushu City

Based on its experience in overcoming serious pollution problems, and having already implemented Eco-towns and other projects for the establishment of a SMC, Kitakyushu City has been cooperating with other Asian regions on environmental issues. In an effort to construct a mechanism for international resource circulation, the city is conducting a field trial for waste tracking using IC tags. In this trial, waste circuit boards are imported from Asian countries for advanced recycling, while waste plastics are exported back to those areas. The city is also acting as a center for international resource circulation in other ways, considering such things as the inclusion of safe and secure gateway functions in its Eco-town and port, including inspection and formality execution and the certification capability needed for traceability information management (Figure4-3-16) (Table 4-3-1).

Section3 Implementing more effective measures

(1) Organic combination of institutional frameworks and support measures

The optimal size of a SMC block depends on the properties of the CRs involved. Therefore, when establishing a SMC block (with appropriate waste management as a precondition), the government will determine the optimal size for each type of CR by considering regional characteristics (e.g., the state of waste generation, the location of relevant treatment facilities) from an environmental perspective (e.g., anti-global warming, biodiversity conservation), a resource perspective (e.g., scarcity, utility), and an economic perspective (e.g., transport efficiency, treatment costs). On the other hand, the government will also follow the procedures described below in establishing SMC blocks whose optimal size is already fairly obvious. These include SMC blocks for biomass CRs, for which intraregional circulation is suitable because biomass is generated in specific regions and decomposes easily, and those for CRs requiring advanced treatment technology, for which wide-area circulation is more desirable.

Table 4-3-1 Major regional efforts (based on a hearing survey by the Subcommittee for the Planning of a Sound Material-Cycle Society of the Central Environment Council, after the formulation of the First Fundamental Plan)

Region	Major efforts
Hokkaido Prefecture	Formulated the Hokkaido Prefectural Fundamental Plan for Establishing a SMC Society to launch efforts to create a Hokkaido-style SMC, and strives to enact a municipal law as an institutional framework.
Yamagata Prefecture	Formulated the Yamagata Prefectural Fundamental Plan for Establishing a SMC Society (Zero-Waste Yamagata Promotion Plan), and takes measures to develop recycling-oriented industries and reduce the amount of final disposal to zero, with the aim of becoming the prefecture with the smallest amount of waste generation in all Japan.
Kawasaki City	Formulated the "Kawasaki Challenge 3Rs" policy, which addresses the transformation of industrial structures and the concentration of R&D-oriented industries, and set up a kitchen garbage recycling plan that takes account of regional characteristics.
Kyoto City	Formulated the Kyoto Waste Management Strategy 21, which incorporates a variety of numerical targets such as effort indices for the public, enterprises and government, and takes measures to address the upstream processes of waste management, sorting and recycling, and responsible disposal.
Kamakura City	Achieved the highest recycling rate for two consecutive years (in FY 2004 and 2005) among those cities with a population of 100,000 to 500,000, through the sorting of waste into 20 categories.
Hachinohe City	Works toward the goal of "creating a Hachinohe model for an eco-friendly city based on the establishment of a SMC Society" by making use of Eco-town and recycling port projects, and by becoming designated as a Special Zone for Aomori Prefecture Environment and Energy Industry Creation.
Shibushi City	Successfully reduced the amount of landfill waste by 80% after enforcing the sorting of waste into 28 categories.
Motegi-machi, Tochigi Prefecture	Seeks to achieve regional circulation based on local production for local consumption, by promoting eco-friendly agriculture which starts from the soil improvement stage, using compost produced at the organic matter recycling center.
Takigawa City	Seeks to reduce waste, mainly by making use of one of Japan's largest kitchen garbage biomass plants.
Funabashi City	Promotes recycling based on local production for local consumption and the reuse of unwanted articles, and has proposed the use of gift boxes that eliminate the need to use wrapping paper.
Ikeda-cho, Fukui Prefecture	Promotes advanced ecological farm communities by capitalizing on farm communities' capabilities through activities such as soil improvement by means of compost made from kitchen garbage, the sale of the products of organic farming, and an eco-point program to encourage consumers to bring their own containers.
Kamikatsu-cho, Tokushima Prefecture	Promotes zero waste, e.g., by declaring that the town will reduce the amount of landfill and incineration waste to zero by 2020, through the sorted collection of waste into 35 categories, and by means of other programs.
Fukushima Prefecture	Promotes a society in harmony with nature, a zero-waste society, and a society based on the mottainai spirit, in line with the municipal law for establishing a SMC Society and a plan for the establishment of a SMC Society.
Kyoto Prefecture	Formulated the Kyoto Prefectural Plan for the Establishment of a SMC Society, which sets specific targets over a wide variety of areas, and promotes enterprise efforts through certification and registration systems.
Aichi Prefecture	Aims to create recycling businesses that take advantage of the local concentrations of industries and technologies, in line with the Aichi SMC Society Establishment Plan and its action plan, the Aichi Eco-town Plan.
Nagasaki Prefecture	Working towards "zero-waste Nagasaki", and has established promotion and implementation plans and 221 actions to be taken as part of these plans.

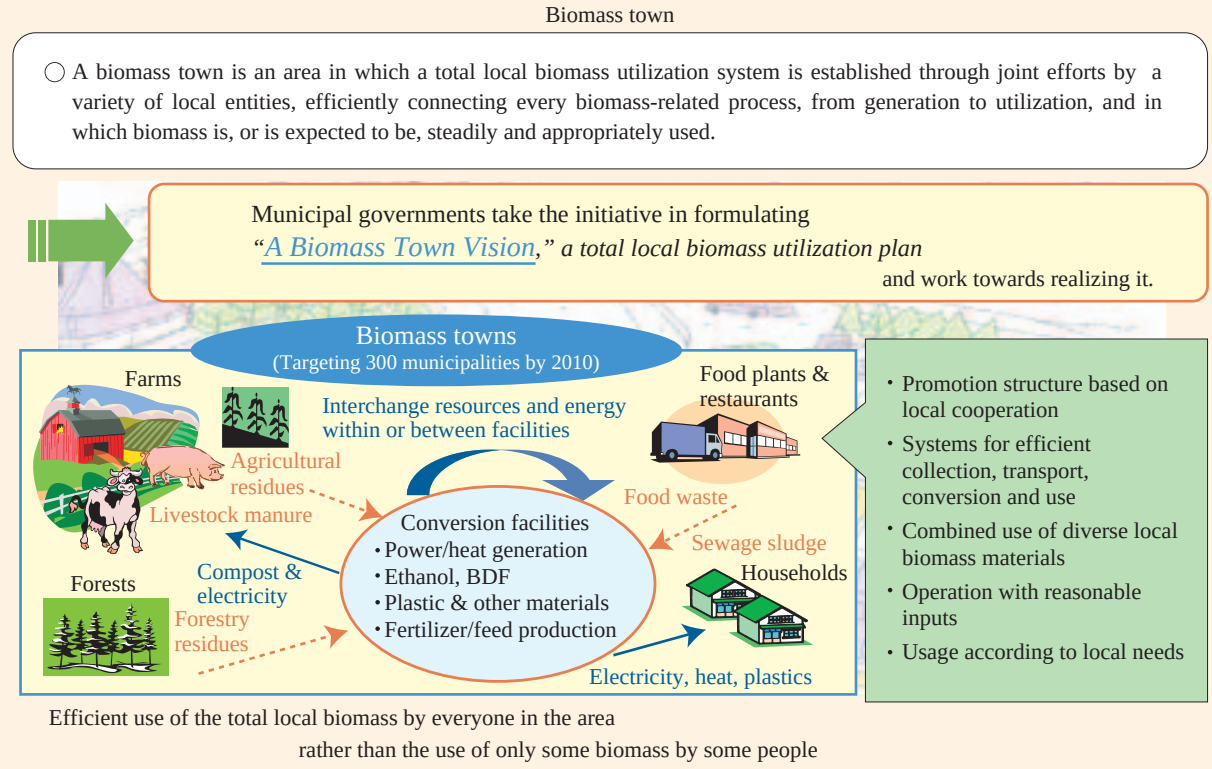
Source: Ministry of the Environment

In the case of biomass CRs, Biomass Town projects are already underway in many municipalities, in line with the Comprehensive Biomass Nippon Strategy, and based on community-based or local circulation. As of the end of April 2008, 141 municipal governments have announced their Biomass Town projects. A biomass town is an area in which a total regional biomass utilization system is established through joint efforts by a variety of regional entities, efficiently connecting every biomass-related process from generation through to utilization, and in which biomass is, or is expected to be, steadily and appropriately used. It is hoped that these towns will contribute to regional revitalization (Figure4-3-17).

As part of this strategy, the government will develop structures for local production for local consumption in the fields of food and energy, in accordance with regional characteristics (e.g., large cities vs. provincial towns) and through collaboration among the various entities concerned. One example is a program to certify food recycling loops under the Food Waste Recycling Law. The government will also foster the development of so-called local community businesses, continuously engaged in for-profit recycling activities such as the composting of kitchen garbage collected and disposed of by municipal governments or private enterprises and the production of feed or biofuel from waste oil. The effective use of biomass materials such as livestock manure and sewage sludge will also be promoted.

CRs derived from products and CRs containing exhaustive resources will be fully subject to measures under the

Figure 4-3-17 Biomass town vision



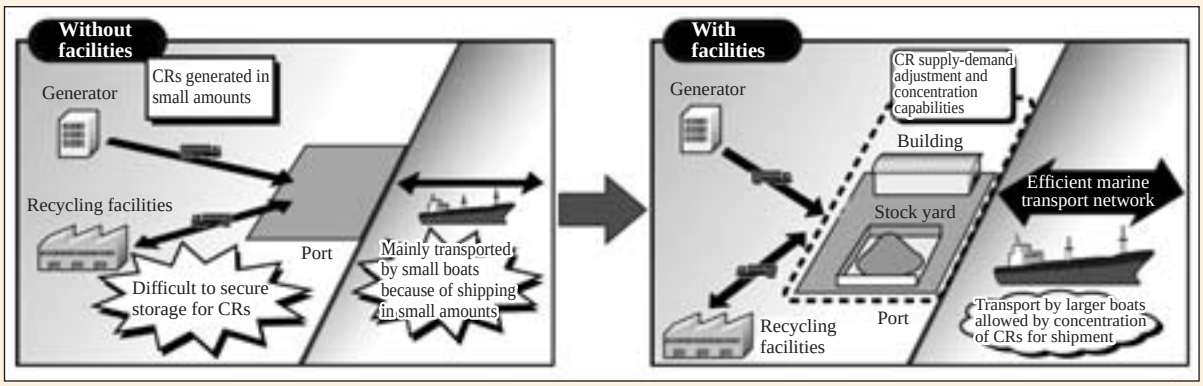
Source: Documents provided by the Central Environmental Council

Figure 4-3-18 Subsidy program to support circulative resource handling (other facilities expenses)

FY 2006: Outlaid as part of 800 million yen government expenditures

FY 2007: Outlaid as part of 1 billion yen government expenditures

- Eligible entities: Any legal person which a local government invests in or finances (e.g., third-sector companies)
- Rate of assistance by subsidies: One third of the total project costs in any region
- Eligible projects
- Projects which construct facilities to warehouse or store circulative resources in order to facilitate the efficient handling of CRs at ports designated as recycling ports.



Source: Documents provided by the Central Environmental Council

recycling laws and the Law for the Promotion of Effective Utilities of Resources, with a view towards wider-area circulation. The wide-area certification and recycling certification programs under the Waste Management Law will also be appropriately used for these CRs. Through inter-industry collaborations, the multi-stage recycling of CRs will be fostered by further restricting the resource input into supply chains and by promoting the wide-area use of

materials. In particular, in order to ensure the appropriate and strategic use of valuable resources contained in CRs, the government will take measures to make recycling technologies and systems more sophisticated, to expand collection structures, and to strengthen joint efforts with consumers while improving credibility.

The Eco-town program should be effective for such wide-area SMC blocks. This program was instituted in FY 1997 with the aim of promoting advanced community development projects, in harmony with nature, by using the zero-emissions concept (completely eliminating all kinds of wastes through the use of all industrial wastes as raw materials in other sectors) as the basic concept for communities trying to establish an eco-friendly economy and society, and by fostering this concept as the key to regional development. To date, 26 Eco-towns have been approved. They are expected to act as centers for wide-area regional circulation.

With regard to the medium- and long-distance transport of CRs, the government will work towards implementing a venous distribution network that has a low impact on the environment, by making the most of rail and marine transport. In particular, more efficient marine transport will be pursued through the promotion of recycling ports (Figure4-3-18).

As a major precondition for these initiatives, the government will ensure the correct use and disposal of CRs (e.g., correct waste disposal) and the conservation of the living environment. Considering the potential presence of regions where the amount of CRs, the availability of facilities to handle them, and demand for recycled products are not in balance, the government will also foster regional alliances based on appropriate information.

(2) Advances in technologies and systems

The establishment of SMC blocks, as mentioned above, calls for the development of suitable technologies to underpin them. By advancing the development of 3R-related technologies and systems, the government will promote efforts to achieve the 3Rs across the entire product life cycle and the entire supply chain, which will then contribute to the formation of SMC blocks. This requires effectively forging ahead with the R&D and commercialization of 3R technologies and systems, as well as the development and commercial application of 3R-oriented business models, with product life cycles and supply chains also taken into consideration.

During the manufacturing phase, it is important to decide priorities based on the toxicity of the materials to be used and the rarity of the metals and other substances present, and to further the advancement of those technologies and systems needed to design and manufacture DfE (Design for Environment) products in accordance with the functionality and properties of each product.

In the recycling phase where end-of-life or used products are subject to cyclical use or appropriate disposal, it must be ensured that product/component reuse, material recycling, raw material recycling, energy recovery and use, and correct disposal are all conducted step by step.

As well as focusing on each individual stage, including the reuse, recycling, energy recovery/use, and disposal stages, it is essential that technologies and systems be improved in order to reduce the impact on the environment associated with the cyclical use and disposal of materials. Strategically advancing technologies and systems to make the most of regenerable biomass materials is, therefore, just as important.

Furthermore, by integrating technologies that can evaluate the effects of the above 3R technologies and systems with other individual technologies, systems and social systems, the government will strategically promote the development of design technologies to implement a 3R-oriented production and consumption system (Table 4-3-2).

(3) Development of basic infrastructure

The government will implement measures to develop basic infrastructure for CRs. An example of this will be to provide support for regional model projects that help create a SMC and for the formulation of recycling-oriented community visions, with the aim of sharing and disseminating information to communities across Japan regarding outstanding contributions made by key contributors to recycling-oriented community development, such as municipal governments, NPOs and enterprises. Since FY 2005, the government has been implementing an assistance program that provides subsidies to promote the establishment of a SMC rather than the construction of waste disposal facilities, in order to support municipalities developing systems for the efficient recovery of resources and energy from wastes by building disposal facilities for municipal solid waste, based on their own voluntary and creative efforts. In addition to this, assistance will be provided for projects aimed at establishing SMC blocks. This will include active financial support for projects to build facilities for the effective use of regional waste-derived biomass.

Human resources for promoting a SMC will also be enhanced in terms of both quality and quantity. Specifically, this will involve prompting industry, academia and government, including enterprises, universities,

Column

Promoting the collection of mobile handsets

With the appearance of lighter, cheaper and more capable handsets, mobile phones are now so common that over 100 million people use them in Japan. Since mobile handsets contain gold, silver copper and rare metals such as palladium at concentrations higher than those found in natural ores (see "Valuable metals contained in mobile and PHS handsets"), they need to be appropriately recycled and disposed of from the viewpoint of effectively using resources.

For this reason, a voluntary collection and recycling system has been established by mobile and PHS carriers (the Mobile Recycling Network) in order to promote recycling (see "Changes in collected mobile handsets in number and weight").

However, the number of handsets collected has actually been declining over the years. Approximately 6.6 million units were collected in FY 2006, while about 50 million units were shipped to the domestic market in the same fiscal year. The factors behind this can be observed in the results of a consumer questionnaire. When asked about the reasons for keeping their old handsets, most respondents cited their desire to keep the phone as part of their personal collection or for sentimental reasons, while others answered that they still use their handset for purposes other than making telephone calls. On the other hand, 22.0% of respondents (a smaller percentage than in the previous fiscal year) cited no specific reasons, suggesting that many people hold onto their mobile phones for no valid reason. The percentages for those who did not know how to dispose of the handset (9.9%) and those who were too lazy to bring it to a store (5.9%) were also high. There is a need to publicize the collection system to consumers and enhance the current collection structure (see "Factors behind the reduction in the number of mobile handsets collected).

Valuable metals contained in mobile and PHS handsets

Type of mineral	Valuable metals contained in mobile and PHS handsets	Reference: Average content in ore
Gold (g/t)	400	0.92
Silver (g/t)	2,300	93
Copper (%)	17.2	1.2
Palladium (g/t)	100	181

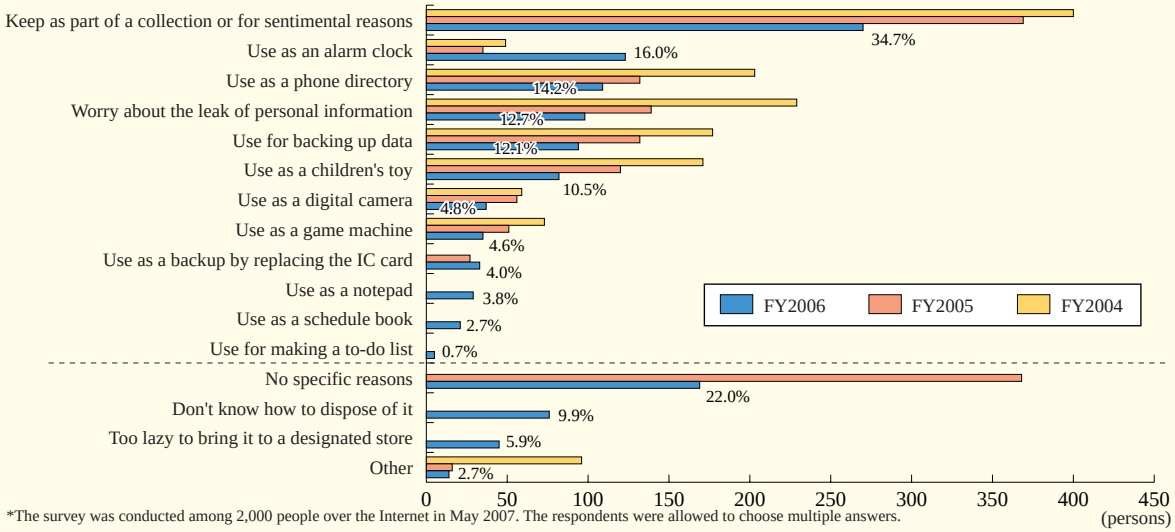
Source: Created by the Ministry of the Environment, based on the FY 2001 Annual Report for Establishing a Sound Material-Cycle Society and issued by the Ministry of Economy, Trade and Industry

Changes in collected mobile handsets, by number and weight **by fiscal year**

		Before MRN	After the Mobile Recycling Network					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
Collected bodies	Number in 1,000 units	13,615	13,107	11,369	11,717	8,528	7,444	6,622
	Weight in tons	819	799	746	821	677	622	558
Collected batteries	Number in 1,000 units	11,847	11,788	9,727	10,247	7,312	6,575	6,133
	Weight in tons	304	264	193	187	159	132	125
Collected battery chargers	Number in 1,000 units	3,128	4,231	3,355	4,387	3,181	3,587	3,475
	Weight in tons	328	361	251	319	288	259	234

Source: TCA and CIAJ

Factors behind the reduction in the number of mobile handsets collected



*The survey was conducted among 2,000 people over the Internet in May 2007. The respondents were allowed to choose multiple answers.

Source: TCA and CIAJ

Table 4-3-2 Major technologies to support a SMC Society

Technology		Description
Improvement in hygiene	Johkasoh	A purification tank for treating night soil and miscellaneous domestic waste water to discharge treated water
	Mechanical collection vehicle (packer truck)	Packer trucks to efficiently collect and transport wastes without any leakage or spillage
	Intermediate treatment (incinerator)	Incineration technology, suitable for use under Japanese conditions (during hot, humid summers and in areas where final disposal sites are scarce), to reduce the volume of waste and kill bacteria
	Intermediate treatment (gasification and melting furnaces)	Melting technologies that will reduce dioxin generation: ensuring complete high-temperature combustion, rendering incineration ash harmless by melting and solidification, and allowing the effective use of molten slag
	Final disposal	Technologies for the final disposal of the waste residue remaining after intermediate treatment
	Manifest control	A manifest control system that will improve transparency and accuracy when monitoring and managing waste flows, and the adoption of electronic manifest control technology
Measures against hazardous substances	Measures to reduce waste mercury levels	Recycling technologies for waste batteries and fluorescent bulbs
	Measures to reduce waste dioxins levels	Systems and technologies to reduce the amount of dioxins generated during waste incineration
	Measures to reduce waste PCBs levels	Methods and programs to ensure the responsible disposal of polychlorinated biphenyls (PCBs)
	Measures to reduce waste asbestos levels	Systems, final disposal methods, and studies concerning the responsible management of asbestos
	Measures to reduce infectious waste	Incineration for infectious waste from medical facilities
Technologies to support	Container and packaging reductions	Measures to reduce waste through the use of thinner PET bottles, the development of refillable bottled products, and the adoption of replacements for bottled products (e.g., liquid soap, detergent)
	Home appliance -related reductions	Technologies to reduce the number of component parts, produce smaller parts, reduce weight by means of modularization, and extend the useful life of PCs
	Vehicle-related reductions	Technologies to reduce vehicle body weight through the increased use of aluminum, and extend the useful life of engine oil by increasing designated replacement intervals
	Reuse of copiers	Initiatives to reuse exterior components through the development of improved cleaning technologies, in addition to the drive unit and other interior components, which have already been used.
	Reuse of slot machines	Initiatives to reduce the amount of resources needed to manufacture new models of “pachislo” slot machines by encouraging their reuse
	Reuse of vehicles	Initiatives to restore and recondition vehicles by replacing worn or broken components with new ones based on parts removed from end-of-life vehicles
	Eco-design home appliances	Designs incorporating “ease of decomposition,” using product assessment projects and washing machines as pilot cases
	Eco-design vehicles	Adoption of recycling-conscious resources, such as recycled materials and recyclable resources, and the use of the “Easy Disassembly Mark” labeling system
	Recycling of waste containers and packaging	Material recycling and chemical recycling for waste plastic and PET bottles
	Recycling of end-of-life vehicles	Recycling for aluminum wheels, shredder dust, and waste tires
	Recycling of end-of-life home appliances	An end-of-life home appliance recycling flow, and the utilization of recycling to provide more added value (closed recycling)
	Recycling of construction waste	Technologies to sort mixed construction waste and recycle construction sludge
	Recycling of food waste	Technologies to produce compost and eco-feed and to recycle food waste for other uses, such as fuel
	Paper recycling	Technologies to manufacture pulp from used paper in order to produce recycled paper
	Recycling technology for non-burnable waste and large discarded articles	Technologies to crush/shred and sort non-burnable waste and large discarded articles in order to effectively recycle valuable waste
	Recycling of incineration ash	“Eco-cement,” manufactured mainly (50%) from wastes such as urban waste incineration ash and sewage sludge
	Waste power generation	Waste power generation systems utilizing the waste heat from waste incineration facilities
	Biomass power generation	Power generation systems using biomass materials such as wood chips and bagasse (sugarcane chaff)
	RDF	Refuse-Derived Fuel (RDF), produced by shredding and drying burnable waste and removing any impurities
	RPF	Refuse-derived paper and plastic Fuel (RPF), produced mainly from the used paper and waste plastic (difficult to recycle) included in industrial waste
	Biodiesel fuel	Biodiesel fuel (BDF) as a substitute for light oil in automotive diesel engines
	Bioethanol	Bioethanol, produced mainly from waste construction wood with other wastes such as waste paper and food residues added
Metallic resource circulation technology	Iron, copper, aluminum	Technologies and material flows to recycle iron, copper and aluminum scrap
	Rare metals, heavy metals	Technologies to recover and recycle rare metals and heavy metals from waste, as an extension of existing smelting technology

Source: Ministry of the Environment

research institutes, central and local governments and NGOs/NPOs, to foster people-to-people exchanges as well as information exchange. In particular, the development of coordinators will be promoted through the nurturing of young researchers at universities, through the transmission of technologies in industries and universities from one generation to the next, and through people-to-people exchanges between NGOs/NPOs. In addition, the government will foster improvements in the capabilities of leaders, including central and local government officials and teachers engaged in environmental education and learning, by expanding their training programs.

As mentioned in Chapter 2, a prerequisite to the establishment of SMC blocks is that every entity involved plays its part through cooperation and collaboration with all others (linking ability). In particular, in order to strengthen such collaboration, local governments play a key role in promoting the establishment of regional SMCs and are expected to act as an essential coordinator between different entities. For example, they are expected to foster cooperation between companies from different sectors and provide a framework for their collaboration. To be more specific, the prefectural government should take the lead in aligning the efforts of the municipal governments and other entities involved, approaching the issues from a broad perspective. The municipal government should play its role as the fundamental governing body closely related to citizens' lives by carrying out activities such as the construction of a local circulation system. At the same time, the prefectural and municipal governments all need to work in close cooperation.

There are many kinds of information to sive the base of each entity's efforts: domestic material flows, the amounts of different types of waste generated, the cyclical use and disposal of different types of waste, future prospects, technical data on wastes (e.g., materials, composition, design), and the environmental effects of the use and disposal of wastes. It is essential that a system to gather all this statistical information be immediately reviewed and improved so that accurate information can be obtained swiftly.

Chapter 4

Prospects for establishing a SMC Society in East Asia, and Japan's cooperation

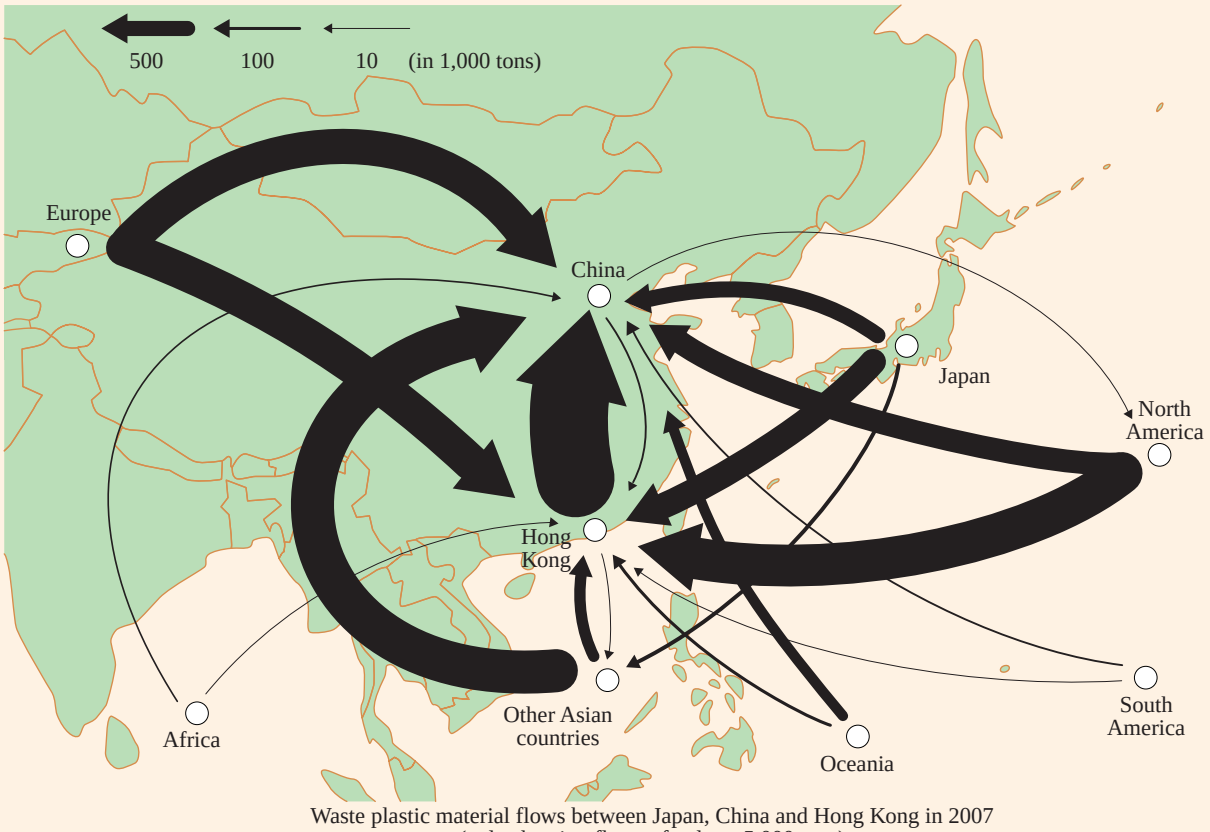
Section 1 Formulating an East Asia Sound Material-Cycle Society Vision

As explained in Chapter 1, the world is facing worsening waste management problems, a shortage of resources and energy, and an associated increase in the transboundary movement of CRs (Figure4-4-1). These all emphasize the need to create an international sound material-cycle (SMC) society as soon as possible.

Japan's Fundamental Law for Establishing a Sound Material-Cycle Society defines a SMC Society as one in which natural resource consumption is curbed and the burden on the environment is reduced, and which can be created by ensuring that (i) products are prevented from becoming waste, (ii) any wastes generated are used appropriately as resources whenever possible, and (iii) wastes with no uses at all are disposed of responsibly. An international SMC Society can be considered as a SMC Society established at the global level. The basic principles involved in the creation of an international SMC are:

1) Creating a domestic SMC Society in each individual country first,
2) Enhancing efforts to prevent illegal waste imports

Figure 4-4-1 International resource circulation



Waste plastic material flows between Japan, China and Hong Kong in 2007
(only showing flows of at least 5,000 tons)

Source: National Institute for Environmental Studies , Japan

and exports, and then

3) Facilitating imports/exports of CRs.

These principles were agreed among Asian countries at the Second Asia 3R Conference in 2008.

Creating a SMC Society in East Asia in line with these basic principles, with the properties of CRs also taken into consideration, is not only beneficial to East Asian countries but also meaningful in the context of sustainable development across the region. In addition, an East Asian SMC Society designed to allow optimal movements of CRs can also contribute to combating global warming and solving resource and energy issues. To achieve results such as these, Japan should share its experience with other countries and effectively and efficiently promote relevant efforts by combining initiatives to improve East Asian countries' capability to responsibly use and process CRs with initiatives to ensure the appropriate transboundary movement of CRs.

If this approach fails, the closely interrelated societies and economies of the East Asian region could face crises such as the expansion of environmental pollution and the exhaustion of resources. East Asian countries therefore share a common destiny and need to work in cooperation in order to realize a scenario for the responsible use and disposal of CRs in line with a common vision to establish a SMC Society.

Japan therefore plans to formulate an East Asia Sound Material-Cycle Society Vision by 2012, stipulating the basic principles and targets for the development of an East Asian SMC, as set forth in the Fundamental Plan for Establishing a SMC Society.

To achieve this goal, Japan is implementing several measures designed to improve East Asian countries' internal capability to responsibly use and process CRs. These measures include (i) support for the formulation of national 3R plans and strategies, (ii) policy dialogue, (iii) establishment of 3R-related information center and research networks, (iv) technology cooperation on the 3Rs and waste management and assistance for the development of associated infrastructure, and (v) international dissemination of 3R and waste management technologies. Japan is also working to ensure the appropriate transboundary movement of CRs by (i) strengthening the enforcement structure for Japanese regulations regarding illegal imports and exports, and clarifying which items are subject to regulation, and (ii) supporting joint initiatives with Asian countries to foster information exchange and improve the relevant authorities' enforcement capacity. The details of these initiatives are described in the following sections.

Section 2 Establishing a SMC Society in Asia and provision of cooperation tailored to the needs

It is essential that Japan contribute to the improvement of Asian countries' capability for CR use and processing so that they can implement the 3Rs and responsible waste management as a step towards establishing a domestic SMC Society. A major challenge for many developing countries is how best to manage waste appropriately, for example, by establishing a public waste collection system or by ensuring the sanitary disposal of wastes. In contrast, rapidly growing economies, such as those of many typical East Asian countries, are faced with the need to curb waste generation and recycle waste materials because the amount of waste has increased, even when waste collection and disposal systems have already been developed, especially in urban areas. In addition, concerns about soaring resource prices and constraints on resource supply are creating a growing need to use resources more effectively. This means that an essential challenge for Asian countries is to step up their efforts toward responsible waste management, while also promoting the 3Rs. Another important approach to the urgent issue of global warming is to take measures that bring about co-benefits (measures that can benefit both public hygiene and global warming issues) by promoting CDM (Clean Development Mechanism) projects and other initiatives directed towards responsible waste management and the 3Rs in order to prevent global warming.

Japan's new Fundamental Plan for Establishing a SMC Society stipulates that Japan should address the international dissemination of its systems, technologies and experience as follows:

"Japan will make its accumulated knowledge of advanced schemes and outstanding technologies and systems regarding the 3Rs and waste management, as well as the experience accumulated by domestic entities by means of relevant activities and collaborations, available to other countries. This will include rapidly developing Asian countries and potentially emerging African countries, and will thereby support these countries' establishment of a

domestic SMC Society. This accumulated knowledge will be provided in the form best suited to each country's needs, such as assistance in formulating national 3R promotion plans, cooperation to help develop sound material-cycle cities modeled after Japanese Eco-towns, and support to help increase access to safe and sanitary night soil disposal systems. To this end, each country's situation and needs will be assessed so that Japan's 3R technologies/systems and training programs can be tailored to each country's actual needs. Furthermore, Japan will foster international collaboration not only at the national level but also at a variety of other levels, including the public, enterprises and local governments."

Japan has already been helping other countries solve their problems by engaging in policy dialogue and addressing their needs through frameworks such as the Tripartite Environment Ministers Meetings between China, Japan and Korea. Now that countries in Asia, especially in East Asia, are enhancing their waste management policies by introducing the concept of the 3Rs, in accordance with their social and economic situations, Japan should explore a specific vision of international cooperation that meets these countries' needs. In this way, Japan can offer East Asian countries the benefits of its experience, gained through past reforms for the promotion of waste management and recycling, and let these counties make use of this information as a valuable resource (Table 4-4-1).

The FY 2007 White Paper on a Sound Material-Cycle Society mentioned Japan's outstanding technologies, policies and systems. Japan can make a significant contribution by making the most of its superior technologies and systems to assist other countries in establishing waste management mechanisms and formulating 3R promotion plans and visions.

Japan also needs to help other countries develop human resources and form organizations to implement technologies and systems related to responsible waste management and the 3Rs, through the use of existing technology development and training programs carried out by the Japan International Cooperation Agency (JICA) and other organizations. Japan should also pursue co-benefits to global warming prevention through CDM or similar projects, construct a network of researchers and experts through which to share the scientific knowledge and technical information needed to formulate and implement 3R policies, and promote initiatives implemented by local governments and NGOs/NPOs, which will play major roles in a SMC Society.

(1) Support for the formulation of national 3R plans and strategies

In order for each country to effectively and efficiently implement 3R initiatives, it is essential that the government declare its intention to promote the 3Rs as a national policy and formulate a plan or strategy that takes account of the existing legal framework for waste management and the regional status of waste management and recycling. Japan has been assisting countries such as Vietnam and Indonesia in developing 3R plans and strategies in accordance with their individual situations, in cooperation with the United Nations Centre for Regional Development (UNCRD), the United Nations Environment Programme (UNEP) Regional Resource Centre for Asia and the Pacific, and the Institute for Global Environmental Strategies (IGES). In providing such assistance, the approach taken by the Japanese government is to develop each plan or strategy with as much open consultation as possible by liaising with the recipient's environment ministry and involving all parties concerned, including the local governments in charge of waste disposal, as well as related ministries and NGOs. For example, Japan is trying to extend the results of, and the experience gained through, the development of Vietnam's national 3R strategy to other countries in the Mekong basin by coordinating its assistance with the support of the Asian Development Bank (ADB). JICA is also active in supporting the formulation of 3R-related plans. For example, it is assisting Malaysia to develop a plan to reduce solid waste.

(2) Policy dialogue

Japan has been engaging in policy dialogue with the government bureaus responsible for waste management and the 3Rs in various countries seeking to enhance their domestic systems for 3R promotion and implement relevant policies in a well-planned manner. In the case of South Korea, the Japan-Korea Policy Dialogue on Waste Management and Recycling was conducted between director-general level officials from Japan and the Korean Ministry of the Environment in June 2006 in Tokyo (the first time) and in May 2007 in Seoul (the second time). With South Korea's law on the recycling of electrical and electronic waste (e-waste) and end-of-life vehicles set to come into effect in 2008, both countries exchanged information and opinions on their respective policy developments, including the current state of recycling for these wastes and each country's associated experience.

In the case of China, the Japan-China Policy Dialogue on Waste Management and Recycling was conducted between director-general level officials from Japan and

Table 4-4-1 Examples of 3R initiatives in Asian countries

Bangladesh	**Community-based composting** (operated by Waste Concern (an NGO)) Project results -Employment creation (predicted to be able to create jobs for 90,000 people across the nation) -Involvement of informal workers in the compost production process
China	**Promotion of a sound material-cycle economy as a priority issue for the government** Integrated activities directed towards the realization of a sound material-cycle economy in the new five-year social-economic development plan at national and local government levels. Circular economy law (under consideration)
	Stricter management of end-of-life electrical and electronic appliances (establishment of laws, regulations, policies, etc.) Regulations to prevent pollution caused by home and information appliances (March 2007) National regulations regarding the management of electrical and electronic appliances in China (draft)
	Environmental industrial park policy Established about 20 pilot eco-industrial parks. Designated eight regions as pilot regions for establishing sound material-cycle economies at the regional level.
India	**Formulation of national environmental policy** (2006)
	Draft regulations on entities engaged in recycling, reprocessing and hazardous waste handling Environmental (Protection) Law (1986)
	Development of plastic recycling Amount recycled: 1.7 million tons (2004-2005)
Indonesia	**National action plan (2008–2015)** Establishment of regulations: Plans to institute new regulations over the next two years after establishing the municipal waste management law.
	Activities among SMEs Of the total amount of hazardous waste produced by industry, 35% was reused or recycled. There are excellent practices in place, such as clean production in the tofu manufacturing industry (reuse, waste/residue recycling).
	Composting subsidy program The composting/recycling rate increased by 2% as a result of composting subsidies allocated to 19 cities. Under this program, 217 tons of compost was produced per day, exceeding the target of 200 tons.
Malaysia	**National recycling program** (2000) Long-term goals to make recycling common practice
	National strategic plan for solid waste management (2005) Comprehensive efforts to promote the reduction, reuse, and collection of solid waste
	Establishment of a master plan to minimize national waste (2006)
Philippines	**National-level legislation: National 3R policies** Set the goal of achieving a waste conversion rate of at least 25% by 2006.
	Backyard composting and organic waste disposal Of the total amount of waste available for composting, 25% was collected and recycled as organic fertilizer.
	Initiative to improve the collection and recycling rates of waste lead-acid batteries Set the goal of collecting 3,600 tons of waste lead-acid batteries annually (amount collected in 2004: 398 tons).
South Korea	**Food waste minimization and recycling** Improvement in the recycling rate: 2.1% (1995), 41.1% (2000), 93.8% (2005) Extended the useful life of final waste disposal sites from 7 to 11 years.
	Charge system based on the amount of waste produced The amount of solid waste produced in urban areas was reduced by 0.62% in the period between 1994 and 2004.
	Extended producer responsibility (EPR) Improvement in the recycling rate for EPR items (end-of-life electrical and electronic appliances and end-of-life vehicles)
Singapore	**Recycling** The recycling rate in 2006 was 51%, up 2% from 2005. The recycling of construction and demolition waste, wood waste and plastic waste is being promoted.
	National recycling program -Launched a household recycling program in 2001. -Installed collection boxes for recyclable items in public places. -Promotes the recycling of construction and demolition waste (achieved a recycling rate of over 90%)
	Disposes of 90% of burnable waste at four incineration facilities. Disposes of 10% of non-burnable waste at an off-shore sanitary landfill site.
Thailand	**Program to collect used products** In 2005, 85% of all waste lead-acid batteries were collected. A program to collect fluorescent lamps was carried out in cooperation with the Japanese government.
	Initiative to create a recycling-oriented society Over 200 communities practice 3R, with some municipalities having successfully achieved a 30-50% reduction in the amount of waste produced.
	Industrial waste exchange program Over 450 industrial sectors are registered members (as of 2005).
Vietnam	**3R-related policies and legislation** 2005 Environmental Protection Law: 14 provisions were added in order to promote 3R and other related activities.
	3R national strategy 3R targets through 2020: Thirty percent of the total waste collected was recycled. Thirty percent of household waste and 70% of all commercial waste was sorted by source.
	Has identified a need to improve the recycling system in rural villages dependent on the handicraft industry

Source: Created by the Ministry of the Environment and the Institute for Global Environmental Strategies, based on materials provided at the Senior Officials' Meeting on the 3R Initiative in October 2007.

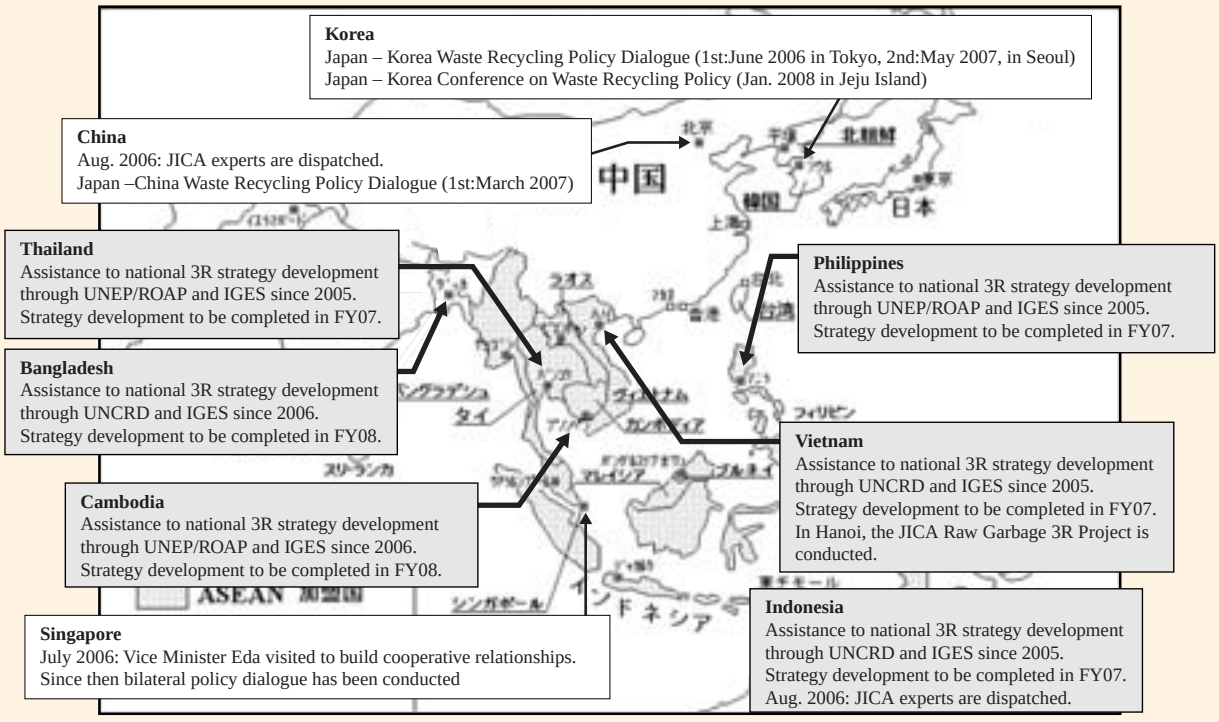
the Chinese Ministry of Environmental Protection (formerly the State Environmental Protection Administration) in March 2007 in Beijing (the first time) and in March 2008 in Tokyo (the second time). The two counties discussed the importance of bilateral cooperation on measures to counter hazardous waste and waste import and export controls. Japan also conducted talks at a similar level with China's National Development and Reform Commission in the Second Japan-China Policy Dialogue on the 3Rs in June 2007 in Beijing. The two sides discussed cooperation on the creation of SMC cities based on Eco-town projects in Japan.

Japan also promotes dialogue with China and Korea through the annual Tripartite Environment Ministers Meetings between China, Japan and Korea and the exchange of opinions on SMC Society establishment. At the ninth such meeting, held in Toyama in December 2007, the three countries agreed that sharing a single vision is essential to promoting the establishment of a SMC Society in each East Asian country and across this region, and all participating countries increased their understanding of Japan's proposal to formulate an East Asia Sound Material-Cycle Society Vision. China and Korea, along with Singapore, with which Japan has been conducting a separate dialogue, are all expected to join Japan in playing a leading role in establishing a SMC Society across East Asia. The Ministry of the Environment will continue strengthening the cooperative relationship with these countries (Figure4-4-2).

In order to establish a framework for policy dialogue across the Asian region, the Ministry of the Environment hosted the Asia 3Rs Conference in October 2006 in Tokyo, bringing together director-general level officials from 19 Asian countries and related international organizations to discuss the comprehensive promotion of the 3Rs and measures to manage kitchen garbage, e-waste and medical waste. Another example of policy dialogue is the Environment Congress for Asia and the Pacific (ECO ASIA 2007), which was held in September 2007 in Fukuoka. Environment ministers and other representatives from Asia and the Pacific freely exchanged opinions at this meeting. The participants recognized the significance of creating national and Asia-wide SMCs and agreed that, in order to achieve this goal, they should work in cooperation to more actively foster policy dialogue on the 3Rs and to disseminate information on 3R-related policies, technologies and good practices in order to develop regional visions.

In East Asia, the Regional Forum on Environment and Health was organized in August 2007 with the aim of promoting collaboration between environment ministries and health ministries in order to improve the regional capability

Figure 4-4-2 3R-related bilateral cooperation with Asian countries



Source : Ministry of the Environment

to cope with local environmental and health problems. The forum comprises 14 countries, namely, 10 Southeast Asian countries and Japan, China, South Korea and Mongolia. For about the next three years, the forum will conduct its activities through six thematic working groups (TWGs), one of which is the TWG on Solid and Hazardous Waste, chaired by Japan. Focusing on urban and medical waste, this TWG will collect and share good practices from different countries and compile recommendations for regional initiatives to tackle the common challenges facing member countries. The first meeting of the TWG was held in February 2008 in Singapore to share updates on national initiatives and good practices for medical waste management and to develop a future work plan. Japan expects that this TWG will conduct continuous follow-ups on the urban and medical waste problems discussed at the Asia 3R Conference and improve information sharing.

(3) Construction of information centers and research networks for the 3Rs

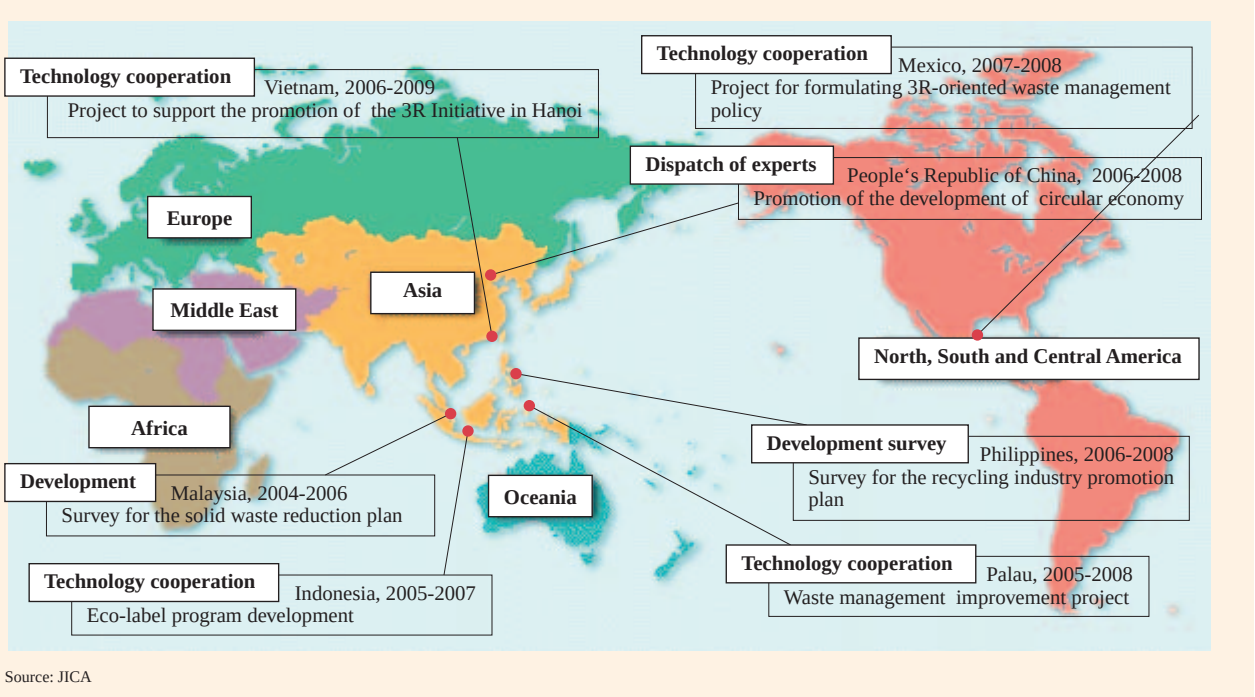
It is critically important that Asian countries adopt technologies and develop systems that are suitable for their own situations. To establish a SMC Society in Asia, it is also necessary to efficiently accumulate and provide 3R-related knowledge and technical information. Therefore, the Ministry of the Environment supports content creation for the 3R Knowledge Hub, an information center established and operated as part of an initiative led by the ADB and the UNEP Regional Resource Centre for Asia and the Pacific.

The Japanese government also assists the activities of the Society of Solid Waste Management Experts in Asia & Pacific Islands (SWAPI), organized under the leadership of the Japan Society of Waste Management Experts, in the expectation that this organization will develop as a network of Asian researchers and experts in waste management and the 3Rs. At the Third East Asia Summit in November 2007, Prime Minister Yasuo Fukuda announced "Japan's Environmental Cooperation Initiative," which states that Japan will "establish an 'Asia 3Rs Research and Information Network' with a view to assisting 3Rs-related activities in each country through the sharing of policies and good-practices." It declares Japan's determination to help foster coordination between the 3R Knowledge Hub and SWAPI and between these frameworks and each country's competent authorities.

(4) Technology cooperation and infrastructure development for the 3Rs and waste management

As part of official development assistance (ODA) to developing countries, JICA provides technology cooperation aimed at capacity building and improving coordination of the central government, local governments and the

Figure 4-4-3 Support provided by JICA in 3R-related fields



Source: JICA

private sector. Assistance to the central government includes supporting the establishment of a legal framework to promote the 3Rs and waste management at the national level and helping to formulate and implement a fundamental policy and plan for implementing legislation. Assistance to local governments includes helping them raise public awareness and develop a mechanism to promote the reduction of waste generation and sorted collection in cooperation with the public. For the private sector, support is provided for the study and formulation of policies such as green purchasing and the eco-label system in order to foster efforts by individual businesses and promote the growth of the recycling industry.

Japan also supports a variety of programs that invite engineers and government officials from developing countries to learn about waste management and the 3Rs. Some of the many training courses provided by JICA are the SMC Establishment course, a regional training program for environment officials from Asian countries to share information on related legislation, administration and technologies, and the 3Rs and Recycling of Waste course, a group training program for engineers engaged in the disposal and recycling of industrial waste.

In addition, financial assistance is also provided in the form of grants and loans for improving infrastructure, including waste management equipment and disposal facilities (Figure4-4-3).

(5) International promotion of 3R and waste disposal technologies

Disseminating Japan's 3R and waste disposal technologies internationally can constitute the central part of Japan's international cooperation for establishing an international SMC Society. Japan should step up 3R and waste management measures, some of which can even contribute to the prevention of global warming.

Companies in Japan have developed world-leading technologies in the fields of eco-friendly design and production, product reuse and recycling, and the recovery and use of energy from waste. These technologies can make a major contribution to the establishment of an international SMC Society, if they are disseminated through the promotion of the 3Rs across the entire life cycle or supply chain of the products moving across national boundaries.

In light of this, the government will take actions to allow such technologies to be adopted, where appropriate, by countries in Asia and elsewhere. With due consideration to the protection of intellectual property rights, the government will foster bilateral and multilateral policy dialogue and information exchange in order to assess each country's technology needs, while proactively providing and disseminating information on 3R and waste disposal technologies.

Here are some examples of such efforts with regard to night soil disposal. At a session on "johkasoh" systems during the Third World Water Forum, held in March 2003 in Kyoto, lectures were presented describing Japanese johkasoh, including their history, technologies, maintenance and institutional systems. This was followed by an exchange of opinions. At this forum, the Portfolio of Water Actions was compiled by collating information on water-related initiatives and specific actions taken to solve world water problems, from around the world. One of the Japanese water actions listed in this report was the "transfer of low-cost waste-water treatment technologies that allow installation to be carried out in a short period of time."

Information on Japan's johkasoh technologies has been effectively publicized at events such as the Asia-Pacific Water Summit, held in Oita Prefecture in December 2007 ahead of the start of International Sanitation Year 2008, the Asia Water Environment Partnership (WEPA)'s workshop in Jakarta on johkasoh in March 2004, and the 12th session of the Commission on Sustainable Development (CSD-12) held in New York in April 2004.

Furthermore, at the Japan-China Policy Dialogue in June 2007, the two countries agreed to implement joint projects to create SMC cities through cooperation between Kitakyushu City, which conducts an Eco-town project in Japan, and Qingdao City, and between Hyogo Prefecture and Guangdong Province. In September 2007, Kitakyushu and Qingdao started a joint survey and other preparations for further cooperation.

(6) Measures taken to address specific issues (using sanitation improvement as an example)

Japan's experience, technologies and systems can be of great help in establishing responsible waste disposal systems in Asian countries. However, these systems may not always be appropriate because the situation varies from one developing country to another, including differences in each country's needs and the properties of the waste generated there. For example, since sanitation is closely related to the sanitary use of water, the form of support provided needs to take account of each country's water system and usage, which are often very different from that in Japan.

One report shows that, as of 2004, 2.6 billion people

(41% of the total world population of 6.4 billion) had no access to improved sanitation[1]. There are many areas where less than half the population is provided with adequate sanitation, especially in Asia and Africa (*World Water and Sanitation facilities*, edited by WHO and UNICEF).

Lack of sanitation not only creates water pollution and an unsanitary environment, increasing the risk of disease among infants and pregnant women, but can also destroy the local ecosystem, exert a negative impact on fisheries and agriculture, and reduce the value of tourism resources.

In 2008 (International Sanitation Year), the need to improve sanitation coverage is expected to rise and Japan will consider how it can best make a contribution (Figure4-4-4).

Support for night soil treatment has to take the form of a comprehensive approach that encompasses every process from the installation of toilets through to the disposal of sludge. The design of the disposal system must also give careful consideration to geographical, economic and social factors in the target area.

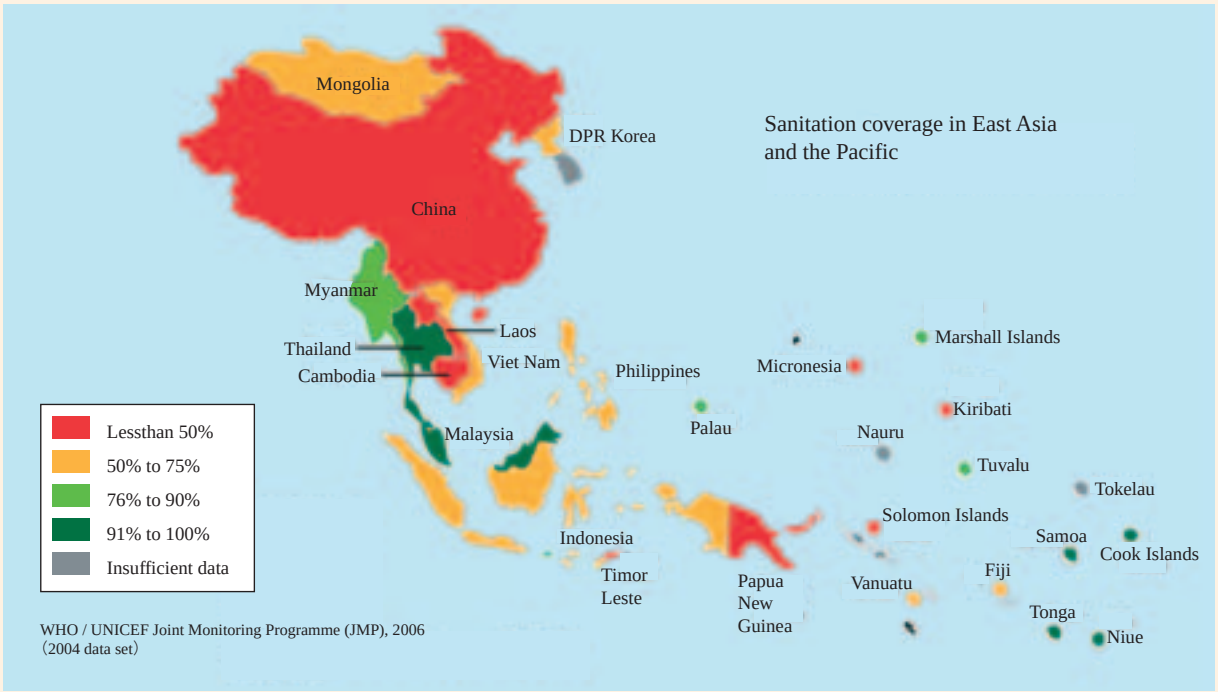
Since assistance for toilet installation is closely related to the issue of subsequent sewage and sludge treatment, taking the treatment process into consideration when selecting the type of toilet to be installed will help facilitate efficient night soil treatment and reuse. There are three steps that follow the installation of toilets: (i) sewage and sludge collection, (ii) sewage and sludge treatment, and (iii) release or reuse of the treated water and final disposal or reuse of the sludge. If these steps are followed and a system is constructed in accordance with regional characteristics, the region will most likely succeed in achieving sanitary night soil treatment and reuse.

There are various types of toilet, such as vault, power-flush, urine separation, composting, and flush toilets. The collection and treatment of sewage and sludge can be divided into two types: on-site treatment, in which waste water is treated on the spot, and off-site treatment, in which waste water is collected and carried to treatment facilities elsewhere. Methods of final disposal or reuse include landfill and recycling for uses such as composting, production of combustion improver through carbonization, and energy recovery after methane collection.

One effective measure to improve sanitation coverage is to provide recognizable benefits to users. Policy packages that can make the most use of sludge play an essential role in increasing access to sanitation.

When integrating efforts directed towards a low-carbon society, sludge recycling projects that can be coordinated with CDM projects should be promoted.

Figure 4-4-4 Sanitation coverage in East Asia and the Pacific



Source: UNICEF『Wash for Children』

1 This refers to sewage systems, johkasoh, flush toilets and power-flush (PF) toilets connected to pits, ventilated improved toilets, enclosed toilets, and composting toilets.

Column

Waste water treatment in mountainous areas

Waste water treatment in mountainous areas provides a valuable insight into some of the problems encountered when considering assistance for developing countries, raising issues such as the urgent need for improvement and the difficulty of maintenance.

There are many different initiatives underway to install eco-friendly toilets in mountainous areas in Japan. For example, bio-toilets (which use biological treatment) and toilets operated by natural energy (such as solar energy and wind power) have been built and have proven highly effective in terms of ease of maintenance.

[Waste water treatment in mountainous areas]
Source: Ministry of the Environment

Section3 Efforts to prevent illegal waste imports and exports

To supplement the above initiatives in order to improve East Asian countries' capability to responsibly use and process CRs, the government should expand its efforts to prevent illegal waste imports and exports.

(1) Trends in waste imports and exports

In Japan, imports and exports of goods that are designated as specified hazardous wastes by the Law for the Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes (the Basel Law) or are designated as wastes by the Waste Management Law are subject to various statutory formalities.

Statistics on Japan's imports and exports of specified hazardous wastes under the Basel Law show that exports primarily consist of lead acid batteries bound for developed countries for use in metal recovery, and that none of these wastes are exported to developing countries. Imports mainly consist of metal-containing sludge and scrap electronic parts from Asian countries for use in metal recovery.

On the other hand, statistics on Japan's waste imports and exports under the Waste Management Law show that exports consist of coal ash exported to South Korea for cement production, and that the volume of these exports is growing. In the case of imports, only a few cases have been reported, primarily consisting of mercury-containing waste batteries and fluorescent lamps from Asian countries, destined to be treated and recycled (Figure4-4-5).

(2) Efforts to prevent illegal imports and exports

To control imports and exports of wastes, especially hazardous wastes, many Asian countries have put relevant laws in place pursuant to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention). However, there are still problematic practices such as exporting hazardous wastes without conducting the necessary formalities, and different countries having different definitions of the hazardous wastes controlled under the Basel Convention. One example of this can be seen in cases where wastes determined to be exempt from control in the exporting country are found to be subject to control in the importing country and are consequently rendered illegal.

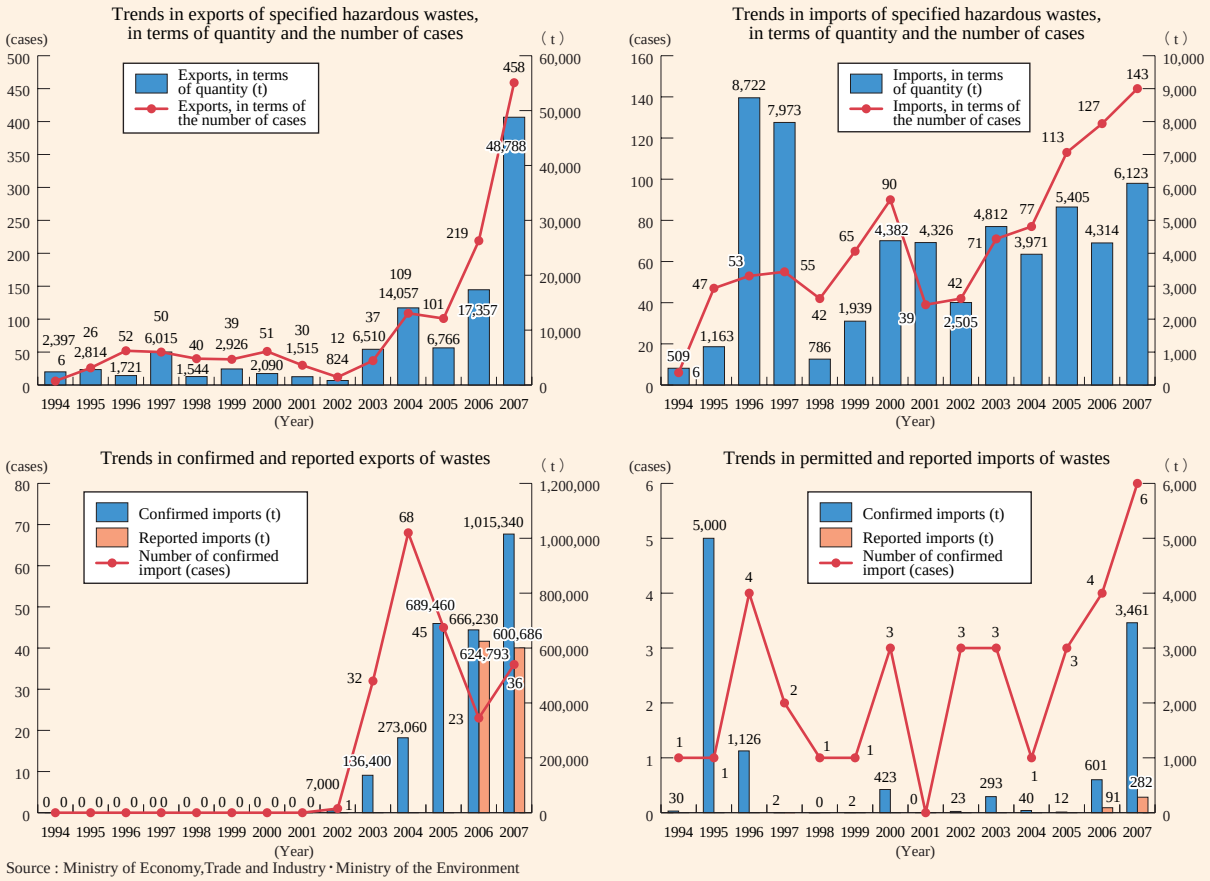
To address such problems, the government should take action to strengthen the enforcement structure for the relevant regulations, and take domestic and international measures to clearly define which items are subject to control.

A Domestic efforts

(a) Enforcement structure for regulations

The Japanese government is taking measures to ensure appropriate implementation of the Basel Law and the Waste Management Law in an integrated manner, and to strengthen the enforcement structure. This includes hosting explanatory sessions for businesses, providing preliminary consultation on individual import/export cases, and

Figure 4-4-5 Trends in waste imports and exports



Source : Ministry of Economy,Trade and Industry・Ministry of the Environment

imposing stricter controls at the border through coordinated efforts by the customs authorities and agencies responsible for the enforcement of the Basel Law and the Waste Management Law.

a. Explanatory sessions on the Basel Law

A prerequisite to constructing an appropriate structure to control waste imports and exports is to ensure that businesses engaged in imports and exports are familiar with the Basel Convention and all other related laws. With this in mind, the Ministry of the Environment (MOE) and the Ministry of Economy, Trade and Industry (METI) have been jointly hosting explanatory sessions on the Basel Law and other related laws in order to help companies understand the key points of the legislation concerning waste imports and exports and to prompt them to import and export regulated goods in an appropriate manner. These sessions provide an overview of the Basel Convention, the Basel Law and the Waste Management Law and explain the statutory formalities associated with all imports and exports. In FY 2007, these sessions were held in 10 places throughout Japan.

[An explanatory session on the Basel Convention]
Source: Ministry of the Environment

b. Preliminary consultation on individual import/export cases

MOE and METI provide preliminary consultation services for companies planning to import or export wastes. Companies can receive advice on whether the goods being imported or exported are designated as specified hazardous wastes under the Basel Law or as wastes under the Waste Management Law.

Companies applying for this consultation service are

expected to fill out a designated preliminary consultation form and submit this along with related documents, including the invoice, the contract, the domestic transaction voucher, a photograph of the whole item and, where necessary, an analysis of the components and a photograph of the analysis sample. The submitted documents are then used to decide whether the item in question is subject to control under the Basel Law or the Waste Management Law.

c. Stricter controls at the border

The customs authorities conduct careful examination and inspection at the point from which CRs are shipped overseas, in order to prevent any items regulated under the Basel Law or the Waste Management Law from being exported without compliance with the necessary formalities. A variety of measures have been introduced, such as improving the capacity to collect and analyze information and the upgrading of inspection equipment. For example, a large x-ray container inspection system has been installed at 16 sites across Japan in order to improve the speed and accuracy of container inspection. In the event of discovery of a suspicious cargo during customs examination or inspection, the customs authorities are required to work in close cooperation with MOE and METI to inspect the cargo and take strict measures pursuant to the law.

MOE and METI also cooperate with the customs authorities in the implementation of this policy by proactively providing information and periodically exchanging opinions.

(b) Clear definition of regulated goods

The Basel Convention allows each country to set up its own criteria for defining the hazardous wastes subject to control, including criteria for deciding toxicity and separating wastes from non-wastes. Therefore, the definition of regulated goods may differ between the importing and exporting countries. To avoid such situations, each country should provide as much objective information as possible in order to decide whether an item being imported or exported is subject to control.

In light of this, the government has provided a list of both regulated and non-regulated items in the form of an official notification based on Basel Convention Annexes VIII and IX. For certain items such as waste lead batteries and waste PET bottles, the government has defined key considerations to be taken into account when determining whether an item should be categorized as waste or specified hazardous waste and has made this information available to both importers and exporters.

To prevent household appliances which are no longer useful from being exported for the nominal purpose of second-hand use, the government will conduct studies to clarify the criteria for identifying exports for second-hand use under the Basel Law.

The government has announced key considerations to be taken into account when distinguishing wastes and determining the toxicity of each category of waste, such as waste lead batteries and waste PET bottles, and has been publicizing this information.

In the future, the government will consider setting the criteria for exports for second-hand use under the Basel Law in order to prevent discarded household appliances that contain hazardous substances and are inappropriate for second-hand use from being exported for this purpose.

B International efforts

To combat the illegal transboundary movement of waste, Japan has been joining forces with other Asian countries, promoting information exchange for the prevention of illegal waste imports and exports and supporting initiatives to improve the authorities' enforcement capacity.

(a) Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes

In 2003, Japan proposed the idea of establishing an Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes to serve as a framework (network) for improving the capacity to implement the Basel Convention and to foster information exchange between the countries concerned. Since then, Japan has, in cooperation with other Asian countries, been taking various measures to prevent illegal imports and exports, including the hosting of workshops, making country-specific regulatory information available on the web, and

[Asian Network for the Prevention of Illegal Transboundary Movement of Hazardous Wastes]

Source: Ministry of the Environment

exchanging information on illegal exports. In addition, Japan plans to strenuously implement the following measures: collecting information on the state of each country's ongoing initiatives to prevent illegal imports and exports of hazardous wastes; identifying other countries' definitions and criteria for hazardous wastes and reporting the results in order to narrow differences in the criteria used to identify items controlled under the Basel Convention; and sharing information on good practices for implementing the Basel Convention in order to enhance each country's implementation capacity.

(b) Partnership on the Environmentally Sound Management of Electrical and Electronic Wastes for the Asia-Pacific Region

Japan provides funds for the Partnership on the Environmentally Sound Management of Electrical and Electronic Wastes for the Asia-Pacific Region, an ongoing project within the framework of the Basel Convention. As part of this initiative, Japan supports projects conducted by the Basel Convention Asia-Pacific Regional Centre, including surveys on the criteria used to separate e-wastes (e.g., end-of-life TVs, PCs and refrigerators) from appliances for second-hand use and the creation of e-waste inventories.

(c) Collaboration under multilateral and bilateral frameworks

Japan exchanges information with its major CR trading partners on initiatives aimed at preventing illegal waste imports and exports.

One example of multilateral frameworks is the Tripartite Environment Ministers Meeting held between China, Japan and Korea (TEMM), which promotes information exchange concerning the measures used to prevent the inappropriate import and export of e-wastes and other hazardous wastes, and also hosts workshops addressing this issue.

Japan has also established bilateral frameworks with China and South Korea in order to exchange information on legal systems concerning waste exports and imports to and from these countries, and the mechanism needed to implement these systems.

Section4 Establishing an East Asian SMC block

As shown in the previous sections, the 3R Initiative proposed by Japan has expanded geographically to include not only the G8 countries but also OECD member states and Asian countries. As the global situation changes, this scheme is being adopted, worldwide, as an effective measure to address waste management issues and to improve resource productivity. Global 3R initiatives are entering a new phase (Table 4-4-2).

In light of the discussions held regarding the past G8 processes, initiatives in Asia, and the Second Fundamental Plan for Establishing a SMC Society, Japan has recognized the issues it should tackle in its role as a world leader. They include resource conservation through 3R activities, the pursuit of co-benefits to greenhouse gas emission reductions, and stronger international partnerships to help developing countries build their capacity for waste management and implementation of the 3Rs.

Japan plans to launch full-fledged initiatives to establish an East Asian SMC block. The first step will be to formulate an East Asia Sound Material-Cycle Society Vision by 2012 and help create a sustainable material cycle in Asia.

Table4-4-2 Examples or progress in 3Rs-related efforts in the G8 member Countries and by the European Commission

Canada	✓Waste diversion (recycling and composting) per person in 2004 improved by 24%, compared to 2000. ✓Implements green purchase programs at the national and state level, along with an extended producer responsibility program for specific waste flows. ✓Makes international contributions, as part of the OECD, to the development of environmentally responsible waste management guidelines and other activities. ✓Has successfully established links between improvements in energy efficiency through the promotion of recycling and reductions in greenhouse gas emissions, and addresses these issues in cooperation with neighboring countries.
European Commission	✓Formulated a thematic strategy on waste reduction and recycling (2005) and a thematic strategy on the sustainable use of natural resources (2005). ✓Established targets for the End-of-Life Vehicle Directive (ELV) as a result of WEEE and RoHS reviews in 2008. ✓Established an international panel on sustainable resource management, in collaboration with the UNEP. ✓Proposed the Waste Framework Directive. ✓Proposed action plans on sustainable consumption/production and sustainable industrial policies.
France	✓Formulated the National Plan for Waste Prevention (2004). ✓Has undertaken various awareness campaigns. ✓In addition to enforcing EU recycling-related laws, has applied extended producer responsibility to waste tires (2004), unsolicited flyers (2007), etc. ✓Grenelle de l'Environnement (environmental policy program) - Aims to reduce waste production by 5 kg per person, annually, over the next five years. - Aims to improve the recycling rate (e.g., collect organic materials) ✓Promotes sustainable production and consumption (by economic instruments, e.g., bonuses) and has broadened the applicability of extended producer responsibility to include household hazardous waste, waste furniture, etc.
Germany	✓As a result of the introduction of recycling laws, the rate of resource recycling from waste increased from 13% in 1990 to 58% in 2006. Landfills lacking intermediate treatment were banned in 2005. ✓The waste management sector is expected to contribute 10% of the greenhouse gas reduction target under the Kyoto Protocol. ✓Established the goal of doubling resource productivity by 2020, compared to 1994 levels.
Italy	✓Established original targets for the sorted collection of urban solid waste: 50% by the end of 2009 and 60% by the end of 2011. ✓Established the goal of reducing total material requirements by 25% by 2020, 50% by 2030, and 90% by 2050. ✓Active in introducing various market mechanisms under the new financial law of 2007. Uses environmental indicators and target setting (incl. waste production and management targets) when distributing EU Structural Funds.
Japan	✓Formulated the Fundamental Law for Establishing a Sound Material-Cycle Society as the framework law and the Fundamental Plan for Establishing a Sound Material-Cycle Society as an implementation program. Established targets to be achieved by 2015 for resource productivity (¥420,000/ton, gross domestic product (GDP)/direct material input (DMI)), cyclical use rate (14-15%, amount of cyclical use/(amount of cyclical use + DMI)), and the amount of final disposal (23 million tons in landfill). ✓The 21st Century Environment Nation Strategy, established in 2007, positions 3R activities as a key environmental strategy. ✓Revised recycling-related laws for the further promotion of waste recycling (e.g., the Containers and Packaging Recycling Law, and the Food Waste Recycling Law). ✓Actively promotes 3R through close cooperation with international organizations and diverse activities such as policy dialogue and capacity building.
Russia	✓Waste from mineral extraction processes accounts for 90% of the total waste generated. ✓Forty percent of all municipal solid and industrial wastes are collected as resources and subject to treatment. ✓Working on draft laws for 3R promotion, including a federal law on circulative resources. Enacted a permit system for hazardous waste management.
U.K.	✓Formulated a new waste strategy in 2007, setting stricter targets for recycling and household waste composting: 40% by 2010, 45% by 2015, and 50% by 2020. ✓Set new targets for reducing the amount of household waste (waste not subject to reuse, recycling or composting): a 29% reduction by 2010, compared to 2000 levels, and a 45% reduction by 2020. ✓Introduced economic incentives such as landfill tax. Plans to raise the rate of this tax from £32/te to £48/te in 2010. ✓In addition to setting targets for key waste materials (used paper, food, glass, aluminum, wood, plastic, fabric), conducts various activities to achieve sustainable consumption and production. ✓Under the framework of the Basel Convention, strives to prevent the illegal transboundary movement of hazardous wastes.
U.S.	✓Issued presidential directives in January 2007 to strengthen federal control of the environment, energy and traffic by incorporating the 3R concept. ✓The EPA has set a recycling rate target of 35%. ✓Promotes 3R principles through various activities, including product stewardship, e-waste reuse and recycling, and the promotion of remanufactured products.

Source： Ministry of the Environment

Appendixes

Appendixes

G8 Environment Ministers Meeting 2008
(Kobe, Japan May 24-26, 2008)

Chair's Summary
G8 Environment Ministers Meeting

1. The G8 Ministers and European Commissioner responsible for the environment met in Kobe from May 24 to 26, 2008. They were joined by ministers and senior officials from Antigua and Barbuda, Australia, Brazil, China, India, Indonesia, Mexico, Republic of Korea, Slovenia and South Africa and heads and senior officials of the Global Environment Facility (GEF), the Global Legislators Organization for a Balanced Environment (GLOBE), the International Union for Conservation of Nature and Natural Resources (IUCN), the Organisation for Economic Co-operation and Development (OECD), the United Nations Environment Programme (UNEP), the World Bank, the Secretariat of the Basel Convention, and the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). The meeting was held with a view to providing appropriate inputs to the G8 Hokkaido Toyako Summit to be held in July.
2. The meeting highlighted the global environmental issues that the international community faces at present, encouraged each country to further strengthen their efforts at all levels, including national, regional, and global levels, and underlined the importance of facilitating such efforts through international cooperation.
3. Three themes were set as the agenda of this meeting, namely biological diversity, the 3Rs, and climate change, and discussions were held on these topics accordingly. Prior to the discussions among the ministers and other participants, a dialogue with representatives of relevant stakeholders was held, generating valuable input. A summary of the G8 ministers and other participants' discussions during the meeting is as follows.

Climate Change

Transition to Low-carbon Societies for the Achievement of Long-term Goals

Long-term goals

4. Noting the findings of the Intergovernmental Panel on Climate Change (IPCC), the importance of setting long-term goals towards the realization of the ultimate objective of the UNFCCC was recognized. It was recalled that at the Heiligendamm Summit in 2007, the G8 leaders agreed to seriously consider reducing global greenhouse gas (GHG) emissions by at least half by 2050. Strong political will was expressed to go beyond this agreement and reach agreement on a shared vision of long-term global goal at the G8 Hokkaido Toyako Summit. It was noted that in order to halve global GHG emissions, developed countries should take the lead in achieving a significant reduction.

Transitioning to low-carbon societies and establishing an international research network on low-carbon societies

5. To realize such long-term goals, it is necessary to change the current socio-economic structures and transition to low-carbon societies. In so doing, there was general recognition of the importance of all the countries to have a clear vision of low-carbon societies. Strong support for establishing an international research network of institutions involved in the research on low-carbon societies was shown by a number of countries, and other countries also expressed their support for the consideration of its establishment.

Actions to realize low-carbon societies

6. To achieve low-carbon societies, all countries need innovations in their lifestyle, production and consumption patterns, and social infrastructure in addition to technological innovations. It was recognized that tech-

nology transfer and capacity building are necessary to achieve low-carbon societies at the global scale. The importance of research and development, information infrastructures and institutional planning was also pointed out. It was highlighted that there is a need to promote further development of technologies such as carbon capture and storage and biofuels. Carbon offsetting was also recognized as an effective mechanism that provides a wide range of stakeholders such as citizens, companies, and governments with opportunities to contribute to mitigation actions. It was observed that in shifting toward low-carbon societies, international cooperation on carbon offsets will play an important role.

Use of economic instruments for sound emission reductions

7. The view was shared that market mechanisms such as emissions trading, tax incentives, performance-based regulations, fees or taxes, and consumer labelling could assist in setting a price for carbon, send price signals to the market, serve as vital economic incentives that offer long-term certainty to the private sector as well as further incentives to promote CDM projects, and constitute a critical set of instruments for the greater reduction of GHG emissions. Especially regarding emission trading, there were descriptions of actions taken in several countries. It was recognized that countries should further explore the possible utilization of these economic instruments according to their own national circumstances. Such instruments should be designed in a way to avoid carbon leakage.

Carbon Disclosure

8. It was noted that, in the context of financial and capital markets, it is useful to inform shareholders of significant risks and opportunities raised by climate change through carbon disclosure efforts.

Cooperation among Developed Countries and Developing Countries

Co-benefits and technology transfer

9. The need for technology innovation, development and deployment as well as financial support for technology transfer to promote further mitigation actions in developing countries was recognized. In particular, it was indicated that a co-benefits approach can be an effective means to promote mitigation actions in developing countries. The importance of the following activities was pointed out: compiling best practices and developing technology maps and tools to identify projects generating significant co-benefits, especially in the area of pollution abatement, forest conservation, and the 3Rs. Also, the importance of assisting developing countries in building sufficient capacity to use these tools was emphasized. It was also acknowledged that it would be useful to consider how to mainstream policy and measures with co-benefits into development by expanding the current efforts by the OECD to mainstream adaptation into climate-related policy and development efforts. The necessity to improve the current CDM to enhance its contribution to sustainable development was highlighted.

Adaptation

10. Adaptation is an urgent issue for all, particularly for least developed countries and small island developing states. It was observed that adaptation requires immediate actions in a wide range of areas such as water resources, disaster prevention, food, public health, and coastal management and therefore, capacity building in such areas is urgently needed. As part of this, it is important to mainstream adaptation into development policies and strategies, and in this regard, the OECD's current efforts in this area were commended. For mainstreaming to succeed, it is essential to strengthen the capacity for scientific impact assessments in developing countries. In addition, it is necessary to strengthen international cooperation on observation and monitoring systems for current and future climate conditions as well as on early-warning for natural disasters. The importance of assisting developing countries with these matters was recognized.

Finance to assist developing countries

11. The gap between the need for sufficient flow of financial resources, both public and private, and current funding levels needs to be acknowledged. The ways and means to bridge such a gap should be elaborated. To support mitigation measures in developing countries, in addition to public funding, private sector investments are essential. The active use of carbon markets and public-private partnerships (PPP), as well as innovative funding mechanisms should be considered for these purposes. The World Bank presented its work to establish a comprehensive financial framework to address climate change and development. Mexico elaborated its proposal for a Multilateral Fund and Climate Change. Furthermore, it was explained that Japan, US and the UK are inviting other donors to join their efforts in establishing a new multilateral fund.

Capacity building and Education for Sustainable Development

12. It was pointed out that the UN Decade of Education for Sustainable Development (DESD) is important in order to promote capacity building for realizing a sustainable society and the World Conference on Education for Sustainable Development (ESD) to convene in Germany in March 2009 was welcomed. In order to further promote ESD, it may be helpful to share best practices such as partnership projects by related stakeholders and to assist capacity building in developing countries through networks among higher educational institution in developing and developed countries and international organizations.

Post-2012 Framework

Contribution to UN negotiations

13. The importance of concluding negotiations on a post-2012 framework in line with the Bali Action Plan no later than December 2009 was emphasized.

Mid-term targets

14. The need was expressed for effective mid-term targets which take into account the findings of the IPCC.

Commitment and actions by developed countries and actions by developing countries

15. It was recognized that there is considerable work already being undertaken by both developed and developing countries. At the same time, the need to strengthen our efforts to make a shift to low-carbon societies was emphasized. For the total global GHG emissions to peak and then decrease within the next 10-20 years, bearing in mind the principle of common but differentiated responsibilities and respective capabilities, developed countries must commit to quantified national emission targets, actively adopting measures to reduce GHG emissions, while further mitigation actions by developing countries are also necessary. Incentives for such actions by developing countries are also necessary. For countries with rapidly increasing GHG emissions, it is especially critical to strive to curb the rate of increase. Elaborating on such commitments and actions is an important element of implementing the Bali Action Plan, and providing support to the process is necessary.

Effectiveness of sectoral approach

16. Bottom-up analyses of GHG emissions reduction potentials can be useful tools for setting national reduction targets. In this context, a gap that might occur between reduction potentials based on a bottom-up approach on one hand and required emissions reductions levels calculated by a top-down approach on the other must be bridged to ensure environmental integrity. These gaps can be bridged by exploring further emission reductions using policies and measures, innovative technologies, and changes in lifestyles through national campaigns. It was clarified by a proponent of the sectoral approaches that sectoral approaches would be used to set national targets, not as a substitute for them. Analyses of the mitigation potentials can provide scientific and objective knowledge that contribute to the formulation of an effective future regime. It was pointed out that reduction potentials in developing countries are likely to be large and relatively inexpensive, and the cooperative sectoral approach backed by assistances from developed countries could contribute to realizing these potentials.

Assistance towards mitigation actions in developing countries

17. It was recognized that mitigation actions in developing countries require support and incentives from developed countries.

Measurability, reportability, and verifiability

18. It is essential to develop methodologies to enable the measuring, reporting, and verifying of countries' commitments and actions based on the Bali Action Plan. It is also important to collect methodologies to formulate and promote environmental policies, and to provide them to the UNFCCC process. It was noted that setting up and running GHG inventories in developing countries is of fundamental importance and G8 countries should consider supporting capacity building in developing countries for the collection and provision of data.

Importance of dialogues among major economies and the "Kobe Initiative"

19. A continuation of dialogues among major economies would be a valuable input for confidence-building towards the establishment of an effective post-2012 framework. There was wide support to follow up on the outcome of this meeting as the "Kobe Initiative". Appreciation was expressed to the UK and Italy for hosting meetings focusing on an international research network on low-carbon societies for later this year (UK), and next spring (Italy).

The Kobe Initiative involves:

i. International research network on low-carbon soci-

eties
ii. Analysis on bottom-up sectoral mitigation potentials
iii. Promotion of co-benefits among relevant policies
iv. Capacity building support for developing countries on inventories and data collection (measurability, reportability, and verifiability [MRV])

Biodiversity

Significance of biodiversity

20. It is underlined that a high proportion of ecosystems have been degraded and that many species are threatened with extinction by human activities. It is recognized that biodiversity is the basis of human security and that the loss of biodiversity exacerbates inequality and instability in human society. The three objectives of the Convention on Biological Diversity are reaffirmed, namely the conservation of biological diversity, the sustainable use of its components, and the access to and fair and equitable sharing of benefits arising from the utilization of genetic resources.

Achieving the 2010 Biodiversity Target and effective follow-up

21. It is recognized that further efforts, including the development and implementation of National Biodiversity Strategies and Action Plans, are necessary to achieve the 2010 Biodiversity Target, which was reaffirmed at the G8 Environment Ministers Meeting in Potsdam, Germany in 2007, and to develop effective follow-up.

Scientific approach to biodiversity

22. The significance is recognised of scientific monitoring, assessment, information provision and the strengthening of research activities. It is noted that some countries expressed their determination to provide leadership in improving the interface between these activities and the public and policy makers, building upon the Millennium Ecosystem Assessment and the outcome of IMoSEB consultations. It is also noted that some countries called for actions to engage with the UNEP-sponsored process, including a dedicated conference, to address operational steps relating to the above mentioned activities.

Sustainable use of biodiversity

23. In addition to the conservation of pristine nature, the importance is recognized of realizing biodiversity conservation and sustainable natural resource management in secondary nature such as satoyama in Japan, including agricultural lands and their surrounding ecosystems, where people utilize natural resources through such activities as agriculture and forestry, in order to realize conservation and sustainable use of biodiversity.

Tackling illegal logging

24. It is reaffirmed that deforestation leads to the loss of biodiversity and high GHG emission and the international community is urged to tackle illegal logging which is a contributing factor to deforestation. Recognition is shared on the effectiveness of actions by both importing and exporting countries to exclude illegally logged timber from the market as well as on the improvement of forest governance. The G8 Forest Experts' Report on Illegal Logging is welcomed and it is agreed to forward the report to the Chair of the G8 in 2008. Some concrete proposals on illegal logging presented by participants including GLOBE International are taken into consideration.

Access and benefit sharing

25. Concerns expressed by some outreach countries regarding access to and benefit sharing (ABS) of genetic resources are taken note of. The need to elaborate an appropriate international regime was emphasized by some countries. Attention was drawn to the fact that discussion on an international regime is being held at COP 9 of the CBD in Bonn right now.

Technology transfer and finance

26. The issue regarding technology transfer and financing raised by outreach countries is recognized. To promote conservation and sustainable use of biodiversity in developing countries, it is recognized that appropriate technologies and funding provided by the international community are necessary. In addition to the maximum utilization of existing financial mechanisms, further discussions are considered necessary to address this issue more sufficiently.

Promotion of private sector involvement

27. The importance is reaffirmed of promoting involvement of all social actors including actors from the private sector in facilitating conservation and sustainable

use of biodiversity.

Linkage to climate change

28. It is emphasized that climate change is expected to have serious impacts on biodiversity, even threatening the very basis of human survival. The need to pay sufficient attention to the linkage between climate change and biodiversity was pointed out.

Biodiversity and protected areas

29. The importance of protected areas is reconfirmed and emphasis is given to the significance of developing ecological networks of protected areas that carry significance in maintaining global biodiversity.

Call for action

30. The urgent need to engage in further efforts to tackle the aforementioned challenges on biodiversity is reaffirmed and G8 members agree on the "Kobe Call for Action for Biodiversity" proposed by the Chair. Japan, the Chair country, announced its "Commitments for the Implementation of the 'Kobe Call for Action for Biodiversity'" for the implementation of the "Call for Action," including the SATOYAMA Initiative.

The 3Rs

Progress of the 3R Initiative

31. The contributions of the 3R Initiative in advancing 3Rs activities in each G8 member country and other countries since its proposal at the G8 Sea Island Summit in 2004 were recognized. It was also recognized that the 3R Initiative has provided a platform for sharing information and exchanging views and experiences on 3Rs-related policies among the G8 and other countries. It was noted that the 3R Initiative has demonstrated the G8 countries' determination to contribute to the establishment of a sustainable society.

Prioritized implementation of 3Rs policies and increases in resource productivity

32. It was observed that the promotion of the 3Rs and increases in resource productivity are important for achieving sustainable development in both the G8 and other countries. Towards that end it was also observed that comprehensive policies comprising both regulatory and market-based tools, and addressing the full life-cycles of products are needed. Furthermore, the need for policies to further stimulate technological development and innovation and to create markets for resource-efficient products was acknowledged. However, it was also recognized that governments alone cannot produce the necessary changes and that the contribution of all actors and sectors of society is crucial.
33. In addition to environmentally sound waste treatment and recycling, high priority was placed on waste reduction. Several efforts to reduce the use of disposable plastic bags and other single-use consumer products were described. Japan observed that China, Japan, and the Republic of Korea will jointly call for other countries to follow suit. It was noted that substantial reductions of waste generation and resource utilization require fundamental changes in awareness and lifestyle.
34. It was noted that both G8 and non-G8 countries recognize that strong linkages and the co-benefits exist between the promotion of environmentally sound waste management and the 3Rs, and the reduction of greenhouse gas emissions. In addition, the views from non-G8 countries emphasizing the importance of developing and disseminating technologies for the promotion of the 3Rs in accordance with national circumstances were also noted.
35. The progress and achievements of the work by the OECD on material flow analysis and resource productivity and the contributions on sustainable resource management by UNEP were welcomed.

Establishment of an international sound material-cycle society

36. The occurrence of severe health and environmental problems related with improper recycling of end-of-life products, such as e-waste, as well as with improper ship dismantling, in developing countries were considered. However, the potential resource value of such materials was also recognised. The hope was expressed that further collaboration between the 3R Initiative and the Basel Convention[1] will both promote capacity building for environmentally sound waste management in developing countries and facilitate sound international resource circulation.

1 The United States is not a party to the Basel Convention.

Confirmation of the significance of collaboration for capacity development in developing countries

37. The importance of technical and financial support toward capacity development for the 3Rs in developing countries, building on existing frameworks, was observed. It was also observed that there is a need for improved coordination of international assistance related with the 3Rs and better synchronization of development agencies' activities in this field were called for. Furthermore, it was noted that effective capacity development requires a multi-stakeholder approach, involving the private sector, local governments and NGOs.

Agreement on Kobe 3R Action Plan

38. G8 Ministers agreed on the Kobe 3R Action Plan and to report the progress in 2011. Finally, Japan observed that it has launched its "New Action Plan towards a Global Zero Waste Society," which it hopes will stimulate further international co-operation in the spirit of the Kobe 3R Action Plan.

Kobe Call for Action for Biodiversity

We, the Environment Ministers of the G8, based upon our discussions in Kobe on biodiversity, 24-26 May 2008,

Emphasizing that biological diversity constitutes the indispensable foundation of our lives and of global economic development,

Recognizing the fundamental importance of biodiversity for human livelihoods, the eradication of poverty and achievement of the Millennium Development Goals,

Deeply concerned by the continued loss of biological diversity despite the significant actions already taken by a wide range of stakeholders, and acknowledging that unprecedented efforts will still be needed to achieve by 2010 a significant reduction of the current rate of biodiversity loss,

Recognizing the importance of following up on the Millennium Ecosystem Assessment,

Reaffirming our support for the three objectives of the Convention on Biological Diversity, namely the conservation of biological diversity, the sustainable use of its components and the access to and fair and equitable sharing of the benefits arising out of the utilization of genetic resources,

Noting the on-going work on access to and benefit sharing (ABS) of genetic resources under the Convention on Biological Diversity,

Recognizing the importance of the ecosystem approach as a framework for addressing the three objectives of the Convention in a balanced way,

Stressing that biodiversity and climate change are closely intertwined and that efforts are urgently needed to consider these important linkages in addressing biodiversity and climate change issues,

Reiterating our commitment to increase our efforts to achieve the globally-agreed target to significantly reduce the rate of biodiversity loss by 2010,

Adopt the "Kobe Call for Action for Biodiversity" to call upon all countries to work together to promote the following actions:

Achieving the 2010 Biodiversity Target and follow up actions

1. Further encourage implementation of the ten Activities included in the "Potsdam Initiative-Biological Diversity 2010."
2. Promote international collaboration for sharing technology and knowledge which is essential for developing, improving and implementing the National Biodiversity Strategies and Action Plans (NBSAPs) in accordance with the particular conditions and capabilities of the parties in order to achieve the 2010 Biodiversity Target.
3. Promote international collaboration for preparation and publication of the 3rd Global Biodiversity Outlook.
4. Encourage the provision of science-based information on biodiversity and ecosystem services to the public and to policy-makers, informed by discussions under the auspices of UNEP.
5. Initiate a dialogue process to consider options for following up the 2010 Target, including, for example, the development and adoption of a post-2010 target under the aegis of the Convention on Biological Diversity.

Sustainable use of biodiversity

6. Enhance the conservation and sustainable use of biodiversity taking into account international achievements in this area and considering models of sustainable natural resource management based on the benefits of living in harmony with nature as recognized in satoyama in Japan (SATOYAMA Initiative).
7. Promote sustainable forest management, including the conservation of forest biodiversity, by improving forest governance and by addressing illegal logging and related trade collectively and individually, as stated in the G8 Forest Experts Report on Illegal Logging, and reduce emissions from deforestation and forest degradation in developing countries (REDD).

Biodiversity and protected areas

8. Strengthen collaboration for identifying gaps in the

designation and management of protected areas, taking into account the situation of respective countries and existing international designations such as UNESCO's Man and the Biosphere Programme, the Ramsar Convention and the World Heritage Convention and integrate into networks of globally important ecosystems for biodiversity conservation, including forests, wetlands and marine and coastal areas, such as coral reefs.

9. Enhance the implementation of the Programme of Work on Protected Areas under the Convention on Biological Diversity by, where appropriate, supporting initiatives such as Germany's voluntary Life Web Initiative.
10. Welcome the International Year of the Reef: 2008 in this context as a means to raise awareness of the vital environmental and economic importance of coral reef ecosystems to people worldwide and to promote improved coral reef conservation.

Private sector engagement

11. Strengthen global initiatives and fora promoting dialogue, cooperation and joint activities among various stakeholders including the business sector, NGOs and researchers, such as the World Business Council for Sustainable Development and the Global Biodiversity Forum.
12. Work to mainstream the concept of biodiversity in society through, where appropriate, developing partnership with the private sector and extending exchanges of information about successful experiences and practice.
13. Encourage corporate social responsibility, with a view to making the private sector a full partner in biodiversity conservation, and promote enabling environments for private investment in sustainable management of biodiversity.

Strengthening scientific capabilities for monitoring of biodiversity

14. Further promote international collaboration in research, monitoring, assessment and information sharing of biodiversity in particular by strengthening cooperation among existing organizations focused on research and monitoring of natural systems, including through the use of remote sensing and ground observation so that impacts of climate change can also be monitored.

Kobe 3R Action Plan

We, the G8 Environment Ministers, based on our discussion in Kobe of the 3R Initiative, 24-26 May 2008,

Recognizing that the increase in waste generation and waste not treated in an environmentally sound manner is contributing to worsening environmental pollution worldwide including air, soil and water pollution as well as greenhouse gas emissions,

Recognizing, at the same time, that the quantity of raw materials wasted as a result of inefficient resource and waste management worldwide is immense,

Noting that the 3Rs, through initiatives to "reduce," "reuse" and "recycle" materials and waste, aim to promote efficient resource use and harmonization of the environment and the economy,

Acknowledging that, by promoting sustainable consumption and production, the 3Rs activities can contribute to increases in resource productivity and decoupling resource consumption and environmental degradation associated with economic activities,

Understanding that, in order to construct a sound material-cycle society by increasing resource productivity and decoupling, it is necessary to ensure efficient resource use and minimization of environmental impact along the entire product life cycle, starting with resource inputs and including the production process, consumer choices, and product use, reuse and recycling (sustainable consumption and production),

Emphasizing that, in order to reduce greenhouse gas emissions, it is necessary to further the promotion of energy recovery, material and chemical recycling, and biological and thermal waste treatment, taking into account the environmental benefits and costs across all waste management processes,

Emphasizing that an international point of view for efficient use of resources through the promotion of the 3Rs is required to respond to the advancing interdependence of the world economy, expansion of trade in materials and products, and resource constraints due to increasing demands,

Recognizing that, with limited technical capacity and knowledge of environmentally sound waste management and the 3Rs, many developing countries face health and environmental risks associated with the improper management of waste,

Noting that, in this context, 3Rs policy can contribute to the promotion of environmentally sound management of waste by supporting the implementation of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal,

Realizing that while the transfer of efficient technologies and knowledge to developing countries may help address these issues, such technologies and knowledge must be suitable for local circumstances, cost-effective, environmentally-sound and socially appropriate,

Noting that, in the context of poverty reduction in developing countries, 3Rs policy can contribute to the UN Millennium Development Goals by opening up new markets and creating employment opportunities, taking into account the role of the informal sector while at the same time protecting the environment and human health,

Recognizing that resource and waste management policy is a potential driver of innovation and jobs in industrialized and newly industrializing countries,

Recognizing that the consistent application of regulatory, economic and other instruments results in the development of a wide range of technologies, organizations and applications in all areas of the 3Rs as well as in waste management, and that at the same time, it gives rise to new job opportunities with higher skills requirements,

Recognizing the value of the work done by OECD to develop tools for the 3Rs, including tools for environmentally sound waste management, Extended Producer Responsibility, Material Flows Analysis, resource productivity, and sustainable materials management,

Reconfirming that the G8 countries need to show active

leadership by promoting sound waste management and effective resource utilization both domestically and at the international level through collaboration with other countries as well as international organizations,

Acknowledging the significant progress of the 3R Initiative in G8 countries and by the European Commission thus far as summarized in the Annex to this Action Plan,

Agree to take the following actions, as appropriate to circumstances in individual countries:

I Goal 1: Prioritize 3Rs Policies and Improve Resource Productivity

Action 1-1: Prioritize Implementation of 3Rs Policy

* Share the importance of the spirit of mottainai[1], prioritize the actions to curb unsustainable consumption of natural resources, and minimize associated life cycle environmental impacts.
* Give high priority to waste reduction and take concrete actions such as reducing the use of disposable plastic bags and other single-use consumer products, thereby calling for other countries to follow suit.
* Contribute to integrating the concept of the 3Rs in all relevant policy areas.
* Strive for the utilization and management of the inputs, materials and energy which are contained in waste in an environmentally sound manner and ensure that waste management processes, including separation and pre-treatment of waste, maintain high standards of protection of the environment and human health such as those developed under the Basel Convention.
* Recognize the importance of internalizing external costs so that the final price reflects environmental impacts and create incentives for more sustainable patterns of consumption and production.
* Work towards the improvement of the ability of national governments to measure the environmental and economic effects of 3Rs-related activities from a life cycle approach.

Action 1-2: Improve Resource Productivity and Set Targets

* Welcome the adoption of the OECD Council Recommendation on Resource Productivity and take the lead in implementing the recommendation in each country. Also, support international collaborative work that analyzes material flows and associated environmental/economic impacts towards sustainable resource management through agencies and initiatives such as OECD and UNEP[2].
* As agreed at the St. Petersburg Summit in 2006 by the G8 leaders[3], set targets[4] as appropriate taking account of resource productivity in furthering efforts to optimize resource cycles.

Action 1-3: Pursue Co-benefits between the 3Rs and Greenhouse Gas Emission Reductions

* Seek co-benefits between waste management and 3Rs-related activities and reducing greenhouse gas emissions and thus contribute to global climate protection by effective implementation of 3Rs practices.
* Encourage effective utilization of waste as one of the alternative sources of energy to fossil fuel resources, for example, by developing and utilizing technologies that generate heat and power from organic and other wastes.
* Encourage the use of organic materials contained in waste and its safe and lawful utilization for a variety of purposes, such as animal feed, composting, fermentation, and energy recovery. Promote reduced land-filling of organic matter for preventing emission of greenhouse gases, particularly methane.
* Together with individual businesses, promote the development of technologies and identify potential opportu-

1 Mottainai is a long-established Japanese concept meaning that it is a shame for something to go to waste without having made use of its potential in full. This expression incorporates a respect for the environment that has been handed down from ages past.

2 UNEP is host for the International Panel for Sustainable Resource Management which was established in 2007 with the overall objective to provide independent scientific assessment of the environmental impacts due to the use of resources over the full life cycle, and advise governments and organisations on ways to reduce these impacts. The panel members participate in their capacity of internationally recognized experts.

3 St. Petersburg Plan of Action on Global Energy Security, June 2006, paragraph 19: "As part of an integrated approach to the entire resource cycle we reaffirm our commitment to comprehensive measures to optimize the resource cycle within the 3R Initiative (Reduce, Reuse, Recycle). In furthering these efforts, we will set targets as appropriate taking account of resource productivity. We will also raise awareness of the importance of energy efficiency and environmental protection through national as well as international efforts."

4 Possible targets are, for example, resource productivity, abiotic raw materials used, total waste, hazardous waste generation, municipal waste generation, waste per capita, recycling rates, final disposal, energy intensity.

nities to contribute to the reduction of greenhouse gas emissions through the promotion of 3Rs.

Action 1-4: Promote Science and Technology and Create a Market for 3Rs-related Products

* Promote technological innovations in 3Rs-related technologies and environmentally conscious design by encouraging research and development, certification and standards, and collecting and disseminating information to the public.
* Encourage the market for 3Rs-related technologies and promote the development of more eco-efficient products through green public procurement and other policy measures.

II Goal 2: Establishment of an International Sound Material-Cycle Society

Action 2-1: Collaborate to Promote Sound International Resource Circulation

* To achieve sustainable resource circulation on a global scale, place high priority on the promotion of environmentally sound management of re-usable and recyclable resources within each country, in compliance with associated domestic regulations and applicable international agreements. In this context, encourage and support such environmentally sound management in developing countries.
* At the same time, work to prevent illegal transboundary movements of re-usable and recyclable resources (as wastes or non-wastes) and agree to respect the provisions of the Basel Convention.
* In cases where the above two safeguards are in place, facilitate the international trade of 3Rs-related goods, materials, products and services, including re-usable and recyclable resources and remanufactured products, which contribute to the reduction of environmental impacts and the effective use of resources without discouraging domestic efforts to improve re-use and recycling.
* As major world economies, support and collaborate with developing countries to establish an international sound material-cycle society.

Action 2-2: Promote International Trade of 3Rs-related Materials, Goods and Products

* Seek joint solutions to issues concerning the distinctions between waste and non-waste within the framework of international activities and agreements, notably the Basel Convention; in this context, the work undertaken by the OECD is especially important.
* Encourage the enhancement of multilateral trade in clean technologies, environmental services and sustainable products by promoting environmentally conscious design and the trade of remanufactured goods.
* Recognize the significance of reducing barriers to trade in remanufactured goods and support the recently submitted proposal[5] to liberalize trade in remanufactured goods under the WTO[6] Doha Round.
* Share information and cooperate internationally on mechanisms to support proper international resource circulation such as eco-labelling, certification schemes, or traceability technologies.
* Facilitate the import of materials, including hazardous and other wastes, for recycling, recovery or treatment from developing countries to G8 and other developed countries with appropriate and adequate technological capacities, in order to mitigate the environmental burden in such exporting countries that do not have environmentally sound management capacities.

III Goal 3: Collaborate for 3Rs Capacity Development in Developing Countries

Action 3-1: Promote Collaboration with Developing Countries

* Request that bilateral and multilateral aid agencies reflect the concept of the 3Rs in development projects and that private investors promote 3Rs in developing countries. Prioritizing the 3Rs in national development strategies in developing countries can facilitate the G8's support for endeavours to promote the 3Rs.
* Collaborate to improve 3Rs capacity in developing countries by helping to develop databases, information

5 Ministerial Decision on Trade in Remanufactured Goods (TN/MA/W/18/Add.16/Rev.1, 20 December 2007)

6 Russian Federation is not a member of WTO.

sharing and monitoring mechanisms, 3Rs-related institutional design and policy planning, and supporting the formation of development projects, by utilizing frameworks and initiatives of multilateral cooperation in an effective manner and capacity and expert knowledge of international organizations.

* Support the work programs related to capacity building in developing countries under the Basel Convention and assist the activities of Basel Convention Regional Centres.
* Seek co-benefits between 3Rs activities and the reduction of greenhouse gas emissions in developing countries, by identifying the environmental impacts of the waste and material management systems, potential opportunities for reducing GHGs from waste and material management systems, and utilizing multilateral collaboration mechanisms. For those who are Parties to the Kyoto Protocol such mechanisms include Joint Implementation and the Clean Development Mechanism.
* Work to ensure that waste is treated and disposed of or recycled in facilities which comply with high environmental and health standards, taking into account local social and economic circumstances.

Action 3-2: Promote Technology Transfer, Information Sharing and Environmental Education

* Promote the transfer of environmentally compatible technologies, management, and know-how for the 3Rs and low-waste generation processes including remanufacturing and efficient industrial technology, to developing countries, in order to initiate innovative reforms.
* Enhance knowledge and research networks for the 3R Initiative.
* Inform industries, NGOs and citizens about 3Rs-related activities at the national and international levels.
* Disseminate information on the effectiveness of 3Rs policies and actions and the potential negative environmental impacts of waste (on climate, air, water including ocean, soil, and biodiversity) through public awareness campaigns and environmental education programs

Action 3-3: Promote Partnership between Stakeholders

* Promote dialogue and collaboration with all stakeholders involved in the 3R Initiative at the national and international levels.
* Develop strategies to increase the involvement of the business community, including small and medium-sized enterprises, such as supporting technological development of innovative 3Rs processes, especially with a view to improving resource efficiency and state-of-the-art waste treatment.
* Welcome all efforts aimed at promoting international cooperation with other governments, international organizations, NGOs and the scientific community to achieve further progress in the 3Rs.

IV Follow-up on G8 Activities Based on the Action Plan

* We will report on the progress of activities, policies and measures implemented based on this Action Plan at the G8 Environment Ministers Meeting in 2011 or whenever such reporting is appropriate, and at appropriate intervals thereafter. We request the OECD to follow up on the progress of work related to resource productivity.

Annex Progress of the 3R Initiative

Based on the spirit of mottainai, the 3R Initiative aims to establish a sound material-cycle society which values limited resources and does not waste valuable goods or materials by promoting the capacity development of each country and endorsing the development of 3Rs-related science and technology through collaboration among countries, stakeholders and international organizations.

To promote international activities based on the 3Rs concepts, the 3R Initiative was proposed at the G8 Sea Island Summit in 2004 and was officially launched at the Ministerial Conference on the 3R Initiative in Tokyo in 2005. The importance of increasing resource efficiency through environmentally sound management in each country and establishment of the international sound material-cycle society through the 3R Initiative was reiterated at the succeeding G8 Summits.

The directions of the 3R Initiative have been discussed at the Ministerial Conference on the 3R Initiative in 2005, the First Senior Officials Meeting on the 3R Initiative in 2006, and the Second Senior Officials Meeting in 2007.

More specifically, these meetings addressed five major issues: (1) promotion of the 3Rs; (2) reduction of barriers to the international flow of 3Rs-related goods and materials; (3) cooperation between developed and developing countries; (4) cooperation among stakeholders; and (5) science and technological development for the 3Rs.

Through this process, a good deal of common understanding has been built up among G8 and non-G8 countries and international organizations as to the need for the prioritization of 3Rs-related policies in each country, capacity development in developing countries and concerted efforts at international/regional levels towards building an international sound material-cycle society, improvements in the infrastructure for information sharing and research, and the pursuit of co-benefits with actions to respond to climate change.

At the 2006 St. Petersburg Summit in particular, the G8 leaders agreed to "set targets as appropriate taking account of resource productivity" in furthering their efforts to optimize resource cycles within the 3R Initiative.

Over the three years since the 3R Initiative was launched, the G8 countries have found it to serve a number of important purposes and recognized its significance as follows:

* The 3R Initiative has provided countries with a platform for sharing information and exchanging opinions and experience on 3Rs-related policies. Some examples of such policies and activities are shown in Table 1 below. As a result, the Initiative has facilitated the realization of concrete cases of domestic activities and bilateral and multilateral collaboration. For example, in Asia, the 3R Initiative is functioning to generate momentum by setting timelines and suggesting an agenda to multilateral and bilateral collaboration towards 3R National Strategy Making and the creation and operations of the 3R Knowledge Hub. The 3R initiative can help to prioritize the 3Rs and waste management within each country's policy.
* The 3R Initiative can demonstrate the G8 countries' determination to establish a sustainable society through 3Rs-related activities, in light of the connections between 3Rs-related practices and other various pressing environmental issues including climate change as discussed at the G8 Environment Ministers Meeting in 2008.
* The 3R Initiative presents opportunities to discuss the challenges of the 3Rs and waste and material management in association with international, inter-regional and macro issues such as world economic growth and resource scarcity. The 3R Initiative helps to develop shared understanding of significant challenges to be overcome in attaining sustainability, such as international movement in reusable and recyclable resources, an issue which has both potentially positive and negative impacts on the environment as discussed in the First and Second Senior Officials Meeting on the 3R Initiative in 2006 and 2007.
* The 3R Initiative has started to function to facilitate environmentally sound practices by stakeholders, in particular the private sector's initiatives towards efficient use of resources and minimization of environmental impacts, such as the improvement of environmental management technologies and design for the environment, and active utilization of by-products and recycled resources in international supply and production networks.
* In addition, the 3R Initiative has facilitated close collaboration between the member countries and the 3Rs activities of OECD, UNEP, UNCRD, the Secretariat the Basel Convention and other international organizations and thereby strengthened these efforts.
* Furthermore, as the 3R Initiative progresses, it becomes more recognized for facilitating environmentally sound management of waste and promoting efficient resource use in developing countries. The 3R Initiative is expected to facilitate concerted efforts and role sharing among the G8 countries in the realm of international cooperation aimed at effective capacity building and assistance for non-G8/non-OECD countries towards environmentally sound international resource circulation, taking into account existing international agreements, such as the Basel Convention.

Along with the advancement of the 3R Initiative, each G8 country has shown leadership by initiating a number of 3Rs-related activities, both domestically and at the international level. Examples of such efforts are given in Table 1 below.

Table 1 Examples of progress in 3Rs-related efforts in the G8 member countries and by the European Commission

Canada	• Waste diversion (recycling and composting) per capita has improved by 24% from 2000 to 2004. • Implementing Green Procurement at Federal and Provincial levels and Extended Producers Responsibility programs for specific waste streams. • Contributed internationally to the development of guidelines for environmentally sound waste management under OECD. • The link between recycling, energy efficiency and reduced GHG emissions has been established and work in this area continues.
European Commission	• Thematic strategy on the prevention and recycling of waste (2005), Thematic strategy on the sustainable use of natural resources (2005) • Revision of the WEEE and RoHS directives (2008) and a target setting for the ELV directive. • Established an international panel on sustainable resource management together with UNEP. • Proposal for a revised Waste Framework Directive. • Proposal for an Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy.

France	• National plan for waste prevention (2004).
	• Implemented various awareness campaigns.
	• In addition to the implementation of recycling related regulations of EU, France applied EPR to waste tires (2004) and Unsolicited Flyer (2007).
	• “Grenelle de l’Environnement":
	  • reduction of waste production of 5 kg/inhabitant/year each year during five years;
	  • increase of recycling rates (e.g. organic matter recovery).
	• Development of sustainable production and consumption (through economic tools such as bonus/malus) and enhanced producer’s responsibility (on households hazardous waste, on pieces of furniture).

Germany	• Started introduction of extended producer responsibility in 1988 and later included it in the Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal. • Through the introduction of various recycling laws, the utilisation of municipal waste as resources increased from 13 % in 1990 to 58% in 2006. • Banned landfilling of waste without intermediate treatment. • Developed successful incentives for recycling and recycling through internalization of external costs by implementation of high environmental and technical standards. • Reduction of GHGs from the waste management sector would account for 10 % of Germany’s Kyoto Protocol target. • Set a target to double resource productivity by 2020 compared to 1994
Italy	• Set national targets for separated collection of urban solid waste of 50% by the end of 2009 and 60% by the end of 2011. • Achieve 25% reduction of Total Material Requirement (TMR) by 2020, 50% by 2030, and 90% by 2050. • Actively introducing various market instruments under a new financial law in 2007. Also, Italy is utilising environmental indicators and targets including those of waste generation and management for distribution of a part of EU structural funds. • Created new markets for materials through the Recycling Consortia forpackaging (glass, plastic, wood, paper, steel, aluminium), exhausted oilsbatteries, under industrial management & responsibility (CONAI system).
Japan	• Japan has a fundamental law (framework) and plan (implementation plan) for establishing a sound material-cycle society. In the fundamental plan, Japan sets targets to be achieved by 2015 for resource productivity [JPY 420,000/ton, GDP/Direct Material Input (DMI)], the cyclical use

	rate [14-15%, cyclical use amount/ (cyclical use amount + DMI)], and final disposal amount (23 million tons, as the amount of waste brought to landfill). • Japan achieved a 70% reduction in its final disposal amount between 1990 and 2005. • 3Rs activities were in 2007 incorporated as part of an important environmental strategy called "Becoming a Leading Environmental Nation in the 21st Century: Japan's Strategy for a Sustainable Society". • Recycling-related laws have recently been amended to further promote recycling of wastes, such as the recycling of packaging and container waste and food waste. • Japan has promoted the 3Rs in Asia through various activities such as policy dialogues and capacity building as well as by closely collaborating with international organisations
Russia	• Various laws for the promotion of the 3Rs are being drafted, including a federal law on recoverable resources. Also there are regulations licensing activities related to hazardous waste treatment. - Decree of the Government of the Russian Federation of August 29th 2007 No. 545 "On Amendments made to RF Governmental Decree of June 16th 2007 No. 461 "On Rules of Development and Approval of Standards of Waste Creation and Limits on it's Disposal." - 40% of consumer and industrial waste is being recovered for reuse or subject to waste treatment.
United Kingdom	• Revised Waste Strategy for England published in 2007 includes tougher targets on recycling and composting household waste: 40% by 2010, 45% by 2015 and 50% by 2020. • New target to reduce amount of household waste not re-used, recycled or composted – by 29% of 2000 totals by 2010 and by 45% by 2020. • Implementing economic incentives such as a landfill tax which will escalate from £32/te now to £48/te in 2010. • Targeting action on key waste materials: paper, food, glass, aluminum, wood, plastics and textiles as well as actions on products in order to achieve sustainable consumption and production. • More effort being place on prevention of illegal transboundary movement under the framework of the Basel Convention.
United States of America	• The US promotes 3Rs principles though a wide range of measures and programs, including Green Buildings, the Electronic Product Environmental Assessment Tool (stimulating the purchase of environmentally sound electronics and development of electronics take-back programs), Green Suppliers network, and similar standards and product stewardship programs; focus is on source reduction, toxics reduction, recycling and reuse of materials, and remanufacturing. • The US promotes the safe use of industrial materials like coal combustion residue, foundry sands, and construction and demolition debris, with a target of 50% of coal combustion residue beneficially used by 2011; the current rate is 43%. • The national municipal solid waste recycling goal is 35%, with a focus on containers, paper, and food wastes; through the efforts of a stakeholder partnership, paper recycling reached 56% in 2007. • The US issued an Executive Order in January 2007 to strengthen federal environmental, energy, and transportation management by reflecting the concept of 3Rs.

Source：Compiled by the Ministry of the Environment Japan and the WMR Project, Institute for the Global Environmental Strategies, based on materials for the 2nd Senior Officials Meeting on the 3R Initiative (4-6 October 2007, Bonn, Germany)

(Provisional Translation)

In pursuit of "Japan as a Low-carbon Society" Speech by H.E. Mr Yasuo Fukuda, Prime Minister at the Japan Press Club 9 June 2008

Introduction

The past, present and future

Last week I made brief visits to the Federal Republic of Germany, the United Kingdom (UK) and the Italian Republic. With exactly one month to go before the G8 Hokkaido Toyako Summit, I had very useful exchanges of view with the leaders of four European countries.

Ironbridge, in the UK, where the world's first iron bridge was built in the second half of the eighteenth century, is preserved as a World Heritage site.

Recognised as the start of the Industrial Revolution, the construction of the Iron Bridge was made possible by the use of coke, a fossil fuel that replaced charcoal to make the mass production of steel possible.

The energy source that underpinned the Industrial Revolution as symbolized by the Iron Bridge subsequently shifted from coal to petroleum. Through the use of fossil fuels, humanity has managed to build modern society at breakneck speed to this day.

Yet at the beginning of the twenty-first century, we face the depletion of natural resources and global warming. Our society stands at a major crossroads.

We can proudly look back on the achievements of the Industrial Revolution more than two hundred years ago. However, what is now at stake is how future generations will look back upon us in two hundred years' time.

Against the backdrop of these changes in history, today I should like to speak on the issue of global warming.

Transforming into a low-carbon society

As the Intergovernmental Panel on Climate Change (IPCC) has repeatedly warned, if we fail to address the issue global warming, it will force future generations into a critical situation.

Moreover, the world's heavy dependence on fossil fuels, which lies behind the issue of global warming, is already giving loud warnings to the current generation.

When I was working for an oil company some forty years ago, the price of crude oil was just a dollar per barrel. It has been said since that time that Japan's rapid post-war growth was made possible by cheap energy in the form of petroleum. Today, however, the price of oil has surpassed 130 dollars per barrel. In addition, the surge in energy prices, together with other causes, has triggered other serious issues including the rise in food prices and the difficulty of securing sufficient supplies of food.

Now is indeed the time when we must free ourselves from our dependence on fossil fuels since the wake of the Industrial Revolution. We must greatly shift the country's helm towards a low-carbon society for the sake of future generations.

This is not an issue for Japan alone. Global warming is a global problem which knows no borders. Hence a broad, world-level perspective is the first requirement when discussing global warming.

At the same time, it is each Japanese citizen that will bring about a low-carbon society. Indeed, we should not forget that each member of the public is a stakeholder and a protagonist in this undertaking. We cannot achieve a low-carbon society without national action.

Achieving a low-carbon society requires a dual perspective: the need for a global undertaking, and at the same time that for grass-roots action by the whole nation.

Stepping forward with confidence

Such transition to a low-carbon society is undoubtedly a major challenge confronting our generation. Yet we cannot meet this test only by viewing it as a burden upon us.

First, we should view the transition to a low-carbon society as "a new opportunity for economic growth".

Countermeasures to global warming will create new demand, new jobs and new income. A low-carbon society is one that offers great opportunities for economic activity that is compatible with the environment.

The emerging global view that CO_2 emissions are a lia-

bility will assure an international competitive edge to Japanese technology related to energy conservation and the environment, which boasts top levels of energy efficiency.

Secondly, clues on how to achieve a low-carbon society already exist in Japan's inherent qualities and its traditions.

At the source of Japanese culture lies the idea of coexistence with nature. In the process of economic growth we once did suffer from environmental degradation. Yet by learning from our mistakes, we succeeded in building one of the foremost economies in the world under the banner of environmental harmony.

The spirit of mottainai will certainly serve as a keyword in low-carbon societies to come.

With such points in mind, we need not flinch. Indeed, now is the time when we should take the first step towards a low-carbon society with full confidence.

Now I should like to give my views on the concrete policies necessary for the transition. First, though, I point to the goals Japan should seek to attain.

Japan's long- and mid-term goals

Long-term goals

The effects of global warming are already apparent. In order for us to avert these dangers, we must stabilize CO_2 concentrations at a fixed level.

For this we must halve global CO_2 emissions by the year 2050. This reduction target forms the crux of the "Cool Earth Programme" which Japan has proposed to the world. I aim to have this goal shared by the G8 and other major economies.

It is impossible to meet this goal unless *all* countries tackle the issue of global warming one way or another, not just the main carbon emitters. It is also obvious that in this process developed countries should contribute more than developing countries. For its part, Japan will set a long-term goal of reducing, by 2050, 60-80% of its current level of emissions, so as to bring about a low-carbon society that we can proudly present to the world.

I believe it is incumbent upon Japan, as one of the countries which has achieved development prior to others, should bear a heavier responsibility in this struggle to save our planet.

Mid-term goals

In order seriously to achieve our long-term goal of halving CO_2 emissions by 2050, it is vital that the world's total emissions peak out in roughly the next ten to twenty years.

Since this period is rapidly approaching, we can no longer afford to waste time making empty calls, or on a target-setting game which serves only as political propaganda.

It is now the time to start well-founded discussions to set targets for each nation, targets in whose certain attainment we can respectively take responsibility. The sectoral approach which I proposed at the World Economic Forum meeting in Davos is none other than a methodology for achieving such a realistic solution.

The European Union (EU) has set the goal of reducing emissions by 20% compared to the 1990 level by 2020. This will require a 14% reduction from the current (2005) level. Advanced in the field of energy conservation, Japan has already achieved energy efficiency rates that greatly exceed those of the EU countries. Notwithstanding, Japan recently announced that it is possible for it to achieve a further reduction of 14% from the current level, a reduction of the same order as that to be made by the EU.

Japan's emission levels since 1990 have fluctuated somewhat, but the reality it has been on a slightly upward trend. A 14% reduction by the year 2020 will not only entail a definitely peak-out of Japan's emissions within the next year or two as well as surely achieving the 2008-2012 targets provided for in the Kyoto Protocol. We must achieve even bigger reductions by 2020 and continue to lead the world in energy conservation as a global leader with the highest standards.

The number I am quoting is by no means conjecture. It was calculated through a rigorous application of the sectoral approach, considering in great detail to what extent we would realistically be able to introduce the most advanced energy-saving and renewable-energy technologies that are expected to exist at various points in time. The potential emissions reductions were each tallied up, resulting in this percentage figure.

Setting aside the cost involved, this was the first attempt in the world to present a concrete picture of what is feasible at least technically.

In setting quantified national emission reduction targets, I will strive to gain the understanding of nations around

the world on this sectoral approach. In concrete terms, we should persuade other nations to analyse the actual extent of their reduction potentials by applying a sectoral approach like Japan's and to report on the results at the Fourteenth Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP14) due to be held in December this year.

As for the base year, there is debate on the wisdom of maintaining the year 1990 which is two decades ago. Given this and other points of discussion, a common methodology should be established, bearing in mind other countries' assessments of the sectoral approach. Japan, for its part, intends to announce its quantified national target at an appropriate time next year.

In any event, in order to achieve the goal of having total world emissions to peak out in the near future, it is essential to have a "total participation" framework that includes all the major economies, not just the EU and Japan.

Japan will negotiate tenaciously in order to build international agreement on "fair and equitable rules" which are approved by all. The premise of such rules will be greater contributions by developed countries compared with developing countries.

Concrete policies

We must squarely face the current state of the global environment and, instead of repeating empty calls, step up real action that will actually reduce greenhouse gas emissions. This is my sincere belief.

What then can we do to accomplish this? The concrete policies I have formulated consist of four main pillars.

First, developing innovative technologies while disseminating existing advanced technologies;

Second, framework-building to move the entire country to lower carbon emissions;

Third, active roles to be played by local regions; and

Fourth, having each citizen as protagonist in reducing emissions.

1. Developing innovative technologies while disseminating existing advanced technologies

Innovative technologies

The first pillar is the importance of technology. We shall not be able to halve emissions by 2050, let alone reduce them by 80% no matter how extensively we disseminate existing technologies on energy conservation and other relevant areas. The challenge we face cannot be overcome without technological breakthroughs.

The key lies in whether we succeed in developing innovative, carbon-free technologies that do not presently exist. Such developments will require a tremendous amount of effort and a certain number of years.

Yet despite the announcement of bold targets to achieve 50% or 60-80% reductions by 2050, we hear very little about concrete measures for developing innovative technologies. Rather, the funding allocated worldwide to this purpose has now fallen to half its peak level at the time of the second oil crisis.

The situation in Japan, however, is different. Comparing research and development investments in the energy sector in 2005 by national governments around the world, one finds that Japan has spent much more than the United States or European countries. In other words, more than any other nation in the world, Japan is seriously expending effort to develop innovative technologies that will be the key to saving the future of our planet.

At the Davos Conference in January, I announced a "Low-carbon Technology Plan" through which Japan will invest 30 billion dollars over the next five years, as well as the establishment of a financial mechanism called the "Cool Earth Partnership" through which Japan will provide 10 billion dollars in order to assist measures to be taken in developing countries.

Towards the future, as an advanced nation in terms of the environment, Japan intends to provide generously world-leading energy-saving technologies and knowledge to developing countries and major economies such as China and India. However, Japan's efforts alone will not be sufficient to resolve the issue of global warming. The entire international community must be involved.

As a means to assist developing countries to address the

issue of climate change, Japan is working with the US and the UK to establish a new multilateral fund. For its part, Japan will contribute up to 1.2 billion dollars. I intend to make use of the G8 summit process and other opportunities to call for a greater number of countries to contribute.

Although the global circle to assist developing nations is progressively expanding, I must point out the delay in efforts to develop innovative technologies.

Thus in order to further accelerate efforts to develop innovative technologies, I intend to propose at the G8 Hokkaido Toyako Summit an "International Partnership for Environment and Energy" which would encompass collaboration with international organisations.

The purpose is to share a global roadmap for technological development which looks thirty to forty years ahead and which would cover innovative technologies in solar cells, carbon dioxide capture and storage (CCS) technology, as well as next-generation nuclear power technology. By having each country work on its respective area of advantage, the international community will work in unison to advance technological development.

A scheme will be created through which the achievements of this partnership will be shared also with developing countries as a common international asset.

Disseminating existing advanced technologies: renewable energy

In order to achieve a low-carbon society, we will need to make full use of existing advanced technologies until innovative technologies are developed.

If we were to reduce our emissions by 14% from the current level by 2020, as I outlined earlier, we must increase to above 50% the ratio of "zero-emission power supply", consisting of renewable energy sources that include solar, wind and hydro energy, biomass and untapped energy sources, as well as nuclear power. At the same time, we must also achieve several ambitious goals, such as introducing next-generation vehicles at the rate of one in every two new units sold.

In particular, Japan currently trails Germany in the prevalence of solar energy power generation, an area in which Japan was renowned. In order to regain the global top spot in terms of solar power energy generation, I hereby set the goal of a tenfold increase by 2020, and of an increase to forty times the current level by 2030.

The calculations are that, in order to reach these goals, power utilities need to install some of the world's biggest mega-solar power generation facilities on a nationwide basis, while more than 70% of newly-built, privately-owned homes need to use solar energy.

While sustaining technological development to reduce costs and to ensure systemic stability, we must also consider bold measures to support the introduction of solar energy as well as new pricing systems, taking as an example the burden of 500 yen per month per household borne in Germany.

As for nuclear power, there are active moves in both developed and developing countries alike to introduce nuclear power stations owing to their zero emission of CO_2 and the recent steep rise in energy prices. A major role expected of Japan amidst such international trends is to promote its nuclear energy policy based on the most fundamental premise of ensuring safety and security on the one hand, and to provide Japan's excellent safety technology as well as convey its strict position on nuclear non-proliferation on the other.

Disseminating existing advanced technologies: energy conservation

We should now turn to the way we use energy. Owing to its industry's technological prowess and the *mottainai spirit*, Japan has the most efficient energy structure in the world.

Japan can contribute to the world by further advancing this low-carbon move and to spread this around the world.

In order to do this, a major leap in energy conservation is of the essence.

For example, we will work to replace all incandescent light bulbs with energy-efficient ones by 2012. Fluorescent light bulbs produce sufficient brightness while reducing energy consumption to a fifth, and they last ten times longer. By also replacing tube (CRT) televisions with liquid crystal TVs, accelerating the introduction of water heaters, air-conditioners and refrigerators that make use of energy-saving technologies such as heat-pump technologies in which Japan is at the forefront, we can significantly reduce CO_2 emissions while reducing electricity fees.

I now also intend to press ahead with a wide range of low-carbon policies, including the development of systems for mandatory energy-efficient housing and office buildings, accelerating the introduction of renewable energy to office buildings, and promoting housing which lasts two hundred years.

We will also establish standards and mechanisms to facilitate the flow of public and private funds into eco-businesses and good environmental social infrastructure projects, aiming to make Japanese finance and capital markets a top runner in terms of environmental friendliness.

2. Framework-building to move the entire country to lower carbon emissions

The second pillar is framework-building to move the entire country to lower carbon emissions.

Emissions trading

The Government must certainly play a major role in solving environmental issues. Yet it is the private sector that bears the actual burden of reducing emissions. Hence, there is a need to ensure active use of methods which encourage the development of technologies and the reduction of emissions by pricing CO_2 transactions and making full use of market mechanisms.

As one such method, an emissions trading scheme (EU ETS) was introduced within the EU in 2005. Japan should not devote endless time and effort merely to find problems with the scheme. I believe we should rather shift to a more proactive approach, for example propose a more effective set of rules.

It is with this in mind that from autumn this year we will begin an experimental introduction of an integrated domestic market of emissions trading with the inclusion of as many sectors and companies as possible.

Only by having direct experience can one offer persuasive views when the rules of emissions trading are draw up. It is essential to make effective rules that actually lead to reduction efforts and technological development, while at the same time develop a healthy market which is based on real demand and does not lend itself to money games.

I intend to use the experience thus gained, to clarify the conditions which need to be met, the issues of design that must be dealt with and other relevant matters in the event an emissions trading scheme is to be fully introduced. I will duly consider the type of system that is appropriate for Japanese industries, which are focused on technology and manufacturing.

We will design a system that enhances Japanese qualities, and will exercise leadership in international rule-making.

Tax system reform

Policy instruments to accelerate carbon reductions by making use of market mechanisms are certainly not limited to emissions trading. As a means to encourage voluntary efforts to reduce emissions in the private sector, we need proactively to consider using the tax system and bring about a “visualisation” of emissions.

When a fundamental reform of the tax system is considered this autumn, we will not limit consideration to the expenditure purposes of revenue which is to be re-allocated from road construction to general purposes. We will conduct a comprehensive review of the system with a view to promoting a low carbon society, including consideration of an environment tax, and thereby promote greening of the tax system.

This will be done from a broad perspective, and will include the possibility of introducing tax incentives for restricting CO_2 emissions from cars, household appliances and housing construction.

Furthermore, developed countries should play a central role in studying the right form of global environmental tax, on which the international community would collaborate, as a source of revenue to be used jointly for developing innovative technologies and assisting developing countries.

Visualisation

It is not just the industrial sector which needs to take responsibility for its carbon emissions. Each member of the public must take considered and responsible action in order to bring about a low-carbon society.

For this we must visualise CO_2 emissions so as to provide the necessary information for consumers to take suitable decisions.

In the UK, a carbon footprint system, which measures and labels the amount of CO_2 that is emitted in the course of the production, transport to disposal of goods, and a food mileage system are being experimented, and there are moves to expand these on an international scale.

From the coming fiscal year, I intend to begin the experimental introduction of similar systems so as to enable Japan to engage actively in international rule-making and to achieve further reductions in emissions. I will instruct the relevant ministries and agencies to make preparations in this regard, and I will ask industry to cooperate. Once fully launched, this undertaking should be among the most extensive in the world.

3. Active role of local regions

The third major pillar is the role to be played by local regions.

The importance of agriculture and forestry in a low-carbon society is without precedent. Increasing the self-sufficiency level in food will cut CO_2 emissions which occur when transporting food from abroad. The promotion of forestry will increase natural absorption of CO_2.

In future, local regions that play host to agricultural and forestry industries have an extremely important role also as a supplier or supply base of domestic energy such as biomass.

Achieving a low-carbon society means nothing other than local regions taking the lead in this direction. This would lead to local self-sufficiency in the production and consumption of both food and energy.

Although not widely known, a recent survey shows that as many as seventy-six municipalities already have more renewable energy resources than required to satisfy local consumer demand for power. By expanding such moves throughout the country we will be able to lead the world in this respect.

In order to expand such regional efforts and to have excellent examples replicated, we will select some ten environmental model cities from around the country and take innovative measures with broad support from the central government.

Large cities, medium-sized cities, small cities, agricultural villages and mountain villages throughout the country would each seek locally-suited methods to achieve major emissions reductions. Japan as a whole will achieve major reductions by creating a virtuous cycle, with the central government, various local regions and the people all supporting such efforts and each making use the lessons learnt.

4. Having each citizen as protagonist

The fourth and final pillar is making each citizen the protagonist in this endeavour. The creation of a low-carbon society requires each citizen to act with an understanding of the meaning and importance of this goal as well as of the methods and burden involved.

The Japanese people are not to be spectators who merely sit back and observe the move towards a low-carbon society. Each citizen is an actor and protagonist. To achieve a low-carbon society it is essential for people to have knowledge, to envision a new society, to act and to propagate.

Enlightened people are already taking dynamic steps. In order to enable such people to do more and to reach out, the government should provide a framework which will induce people to alter their conduct in a way that promotes a low-carbon society. It should also provide the opportunity to alert those who are yet unaware the importance of such steps.

Education plays an extremely important role. We must introduce systems to teach and to learn about low-carbon and sustainable societies during compulsory education as well as at every level and occasion in the life-long process of learning.

We also need to change our lifestyles to bring about a low-carbon society. One way to share this awareness among the entire population is to introduce summer time. The ruling parties are among those who are studying this matter and I hope they will reach a conclusion as soon as possible.

I should also like to establish a “Cool Earth Day” as another way to change people’s way of thinking.

The G8 Hokkaido Toyako Summit will begin on 7 July, which is the day of the Tanabata festival. There is a movement underway to encourage people around the country to turn their lights off all together at night on that day, admire the beauty of the Milky Way and remind ourselves of the importance of the earth’s environment.

This should not be a one-off event. I thus wish to designate 7 July as “Cool Earth Day” and make it a day not just to turn off the lights but for all Japanese citizens to make various efforts to remind themselves of the path they should take towards a low-carbon society.

Furthermore, we will look to NGOs and community groups around the country to play a leading role in communicating to the people around them about the importance of the environment, spread the message and carrying people forward. I intend to assist and expand such dynamic efforts.

Conclusion

Today, I outlined my thoughts on what Japan should do in order to achieve a low-carbon society.

I believe more detailed policy proposals will shortly be prepared by the Advisory Panel on the Global Warming Issue. Today I explained my own views on the basic approach that should be taken in addressing global environmental issues, based on the discussions by the Panel and within the ruling parties, as well as on exchanges I have had with members of non-profit organizations and other experts.

The Fukuda Cabinet is currently tackling head-on a range of major issues, including reform of the social security system, fundamental reform of the tax system, integration of consumer policy, and reform of the civil service. A common thread that links all of these efforts is the need to rise above traditional methods and modes of thinking: without doing so we cannot devise solutions that are truly suited to meeting the challenges of the present day.

Global environmental issues cannot be resolved by some spectacular measure. The industrial sector and each member of the public must change their mode of thinking, and it is paramount that we work with countries around the world to move things forward in a steady and sustained manner. This issue can only be resolved by changing all of the following: economies, societies, communities and lifestyles.

Just as the Iron Bridge, built in the UK more than two hundred years ago, is now a World Heritage site and conveys to us today the successes of our ancestors during the Industrial Revolution, we must ensure that our descendants shall look back proudly two hundred years hence at our efforts as representing a “Low-carbon Revolution”.

Working seriously for this Low-carbon Revolution will enable Japan to enhance its standing in the international community. By leading the world in this way, we can further strengthen the Japanese economy. That is all the more reason why we must achieve a low-carbon society.

The cover picture depicts a Japanese crested ibis taking flight from a furoshiki that has an Earth design. The picture reflects our hope for creating a low carbon society, a sound material-cycle society, and a society in harmony with nature, and our determination to care for the global environment.

Furoshiki

Furoshiki is a stylish, reusable, traditional Japanese cloth which is used to wrap clothes, gifts, or other goods. It is a symbol of waste reduction for Japanese culture.

Toki

The Japanese crested ibis (Toki, Nipponia nippon) is a bird that was commonly sighted throughout Japan during the Edo era. However, excessive hunting of wild ibises during the Meiji era led to their drastic decline, and they finally became extinct in the wild in 1981. Currently, breeding of ibises which were given by China, is ongoing, and the reintroduction project is underway.

If you have any opinions and comments regarding this booklet, please contact the following.

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